

Development Design Manual

Coachella Valley Water District



August 2018

Table of Contents

Section 1	1-1
General Information and Development Project Review and Approval Process.....	1-1
1.1 Coachella Valley Water District.....	1-1
1.2 Development Design Manual-General Information	1-1
1.3 General Project Design Requirements.....	1-1
1.3.1 Design	1-1
1.3.2 Water Supply Assessment and Water Supply Verification.....	1-2
1.3.3 CEQA and NEPA (National Environmental Policy Act).....	1-2
1.3.4 Right-of-Way.....	1-3
1.4 Agreements, Fees and Annexations	1-3
1.4.1 Standard Installation Agreement	1-3
1.4.2 Special Installation Agreement	1-3
1.4.3 Fees and Credits	1-3
1.4.4 Annexations.....	1-4
1.5 Development Review Letter and Notice of Water/Sewer Service Availability... 1-4	
1.6 Development Project Review and Approval Process	1-4
1.6.1 Initial Contact and CVWD Infrastructure Location.....	1-5
1.6.2 Initial Meeting with CVWD Departments	1-5
1.6.3 Plan Check Submittal Requirements	1-5
1.6.4 Construction Requirements.....	1-6
1.6.5 Progress for Fire Protection, Progress for Service and Project Completion and Acceptance	1-6
1.6.6 Construction Delay.....	1-7
Section 2	2-1
Drawing Format and Requirements.....	2-1
2.1 Drawings-General	2-1
2.2 Sheet Format	2-1
2.3 Cover Sheet.....	2-2
2.4 Plan and Profile.....	2-3

2.5	Easements	2-4
2.6	Digital Drawings	2-5
2.7	Revisions to Drawings.....	2-5
Section 3 Right-of-Way		3-1
3.1	General	3-1
3.2	Dedication of Real Estate Assets.....	3-1
3.3	Dedication of Easement.....	3-2
3.4	CVWD Noninterference Review Letter and Encroachment Permit Process.....	3-3
3.4.1	Interference	3-3
3.4.2	Noninterference Review Letter (NIRL).....	3-3
3.4.3	Encroachment Permit (EP).....	3-4
3.5	USBR License Agreement and Consent Agreement Process.....	3-4
3.5.1	General.....	3-4
3.5.2	USBR Irrigation Pipeline (Lateral) Abandonment and Relocation.....	3-5
3.6	CVWD Drainage Pipeline Abandonment and Relocation/Replacement Process	3-8
3.6.1	Identity Affected Drainage Pipeline.....	3-8
3.6.2	Drainage Pipeline Abandonment.....	3-8
3.6.3	Drainage Pipeline Relocation	3-9
3.7	Compensation for CVWD ROW	3-9
3.8	Final Map Review and Approval Process.....	3-11
3.8.1	Proposed Easements	3-11
3.8.2	Signature Omissions.....	3-11
3.8.3	Environmental Constraints	3-11
Section 4 Inspection		4-1
4.1	General	4-1
4.2	Materials Submittals.....	4-1
4.3	Cash Deposit	4-1
4.4	Preconstruction Conference.....	4-1
4.5	Field Inspection Procedures.....	4-2
4.6	Project Completions Steps.....	4-2
4.6.1	Progress for Fire Service	4-2

4.6.2	Progress for Service	4-2
4.6.3	Project Completion and Acceptance	4-3
Section 5	.....	5-1
Design Criteria Domestic Water Facilities	.....	5-1
5.1	Background.....	5-1
5.2	Demand Criteria.....	5-1
5.2.1	Demand Criteria – Non-Potable Water.....	5-3
5.3	Pressure Zones.....	5-3
5.4	Pipeline Requirements.....	5-3
5.4.1	Pipeline Sizing Criteria.....	5-4
5.4.2	Pipeline Location and Horizontal Separation.....	5-4
5.4.3	Pipeline Cover and Vertical Separation	5-6
5.5	Connection to CVWD Domestic Water System.....	5-6
5.6	Well Site and Well Pumping Plant Criteria	5-6
5.6.1	Well Sites	5-6
5.6.2	Well Sites With Pumping Plant	5-7
5.6.3	Well Site Separation	5-7
5.7	Reservoir Storage.....	5-8
5.7.1	Storage Calculations.....	5-8
5.7.2	Location (Base Elevation).....	5-8
5.8	Booster Pump Stations and Pressure Reducing Valve (PRV) Stations	5-10
5.8.1	Booster Pump Station Types.....	5-10
5.8.2	Booster Pump Stations-Open System	5-10
5.8.3	Booster Pump Stations-Closed Systems	5-10
5.8.4	Booster Pump Station General Design Criteria	5-11
5.8.5	Pressure Reducing Valve Stations	5-12
5.9	Emergency Standby Power Facilities.....	5-13
5.10	Fire Systems/Backflow Requirements.....	5-14
5.10.1	Wet-Pipe Fire Sprinkler Systems.....	5-15
5.10.2	Deluge Fire Sprinkler Systems.....	5-15
5.10.3	Dry Pipe and Preaction Fire Sprinkler Systems.....	5-15
5.10.4	Residential Fire Systems.....	5-15

5.10.5 Other Fire System Hazards Requiring Backflow Protection	5-15
5.11 Fire Flow Calculations + Hydraulic Modeling	5-16
5.12 Fire Hydrants	5-16
5.12.1 Fire Hydrant Location	5-16
5.12.2 Fire Hydrant Type	5-16
5.13 Services and Meters	5-16
5.13.1 Service Lines	5-17
5.13.2 Meters	5-17
5.14 Pipe Material	5-18
5.14.1 Pipe Backfill and Bedding	5-18
5.15 Valves	5-19
5.16 Combination Air-release and Air/Vacuum Valves	5-19
5.17 Blow-Off Assembly	5-19
5.18 Customer Pressure Reducing Valves	5-20
Section 6	6-1
Design Criteria Sanitation Facilities	6-1
6.1 Background	6-1
6.2 Sanitation Sewer Design Capacity	6-2
6.3 Design Flow Criteria	6-3
6.3.1 Peak Hour Design Flow	6-3
6.4 Sewer Pipeline Design	6-4
6.4.1 Slope and Velocity	6-4
6.4.2 Gravity Sewer Pipeline Sizing Criteria	6-5
6.4.3 Change in Pipe Size	6-5
6.5 Sewer Pipeline Location	6-5
6.5.1 Horizontal Alignment and Separation	6-5
6.5.2 Pipeline Cover and Vertical Separation	6-7
6.6 Construction	6-8
6.6.1 Manholes	6-8
6.6.2 Cleanouts	6-9
6.6.3 Gravity Sewer Pipe Material	6-10
6.6.4 Pipe Backfill and Bedding	6-10

6.6.5	Sewer Laterals.....	6-11
6.6.6	Facility Location Markers	6-12
6.6.7	Source Control and Wastewater Pretreatment	6-12
6.6.8	Business Sewer Lateral for Grease, Lint, Oil or Sand Interceptors.....	6-13
6.7	Lift Stations	6-13
6.7.1	Lift Station Location	6-14
6.7.2	6-Lift Station Capacity.....	6-15
6.7.3	Lift Station Design	6-15
6.7.4	Wet Well Design.....	6-16
6.7.5	Discharge Piping and Valves.....	6-16
6.7.6	Odor Control	6-17
6.7.7	Control and Telemetry	6-17
6.7.8	Emergency Standby Power Facilities	6-17
6.7.9	Electrical and Power Equipment Builds	6-18
6.8	Force Mains	6-18
6.8.1	Force Main Pipeline Sizing Criteria.....	6-19
6.8.2	Force Main Cover and Alignment	6-19
6.8.3	Force Main Pipe Material.....	6-20
6.8.4	Force Main Valves	6-20
6.8.5	Force Main Fittings	6-20
6.8.6	Combination Air and Vacuum Relief Valves	6-20
6.8.7	Thrust Restraint – Force Mains	6-21
6.9	Inverted Siphons.....	6-21
6.9.1	Inverted Siphon Location	6-21
6.9.2	Inverted Siphon Design	6-21
6.9.3	Invert Siphon Structures	6-22
Section 7	.....	7-1
Design Criteria Irrigation and Drainage Facilities	.....	7-1
7.1	Background.....	7-1
7.2	Flow Criteria.....	7-2
7.2.1	Irrigation Distribution System.....	7-2
7.2.2	Drainage System	7-2

7.3	Distribution Zones	7-3
7.3.1	Irrigation Distribution Zones.....	7-3
7.3.2	Irrigation Distribution Pumping Plants.....	7-5
7.3.3	Drainage System Distribution System	7-6
7.4	Irrigation and Drainage Pipeline Requirements.....	7-6
7.4.1	Irrigation Pipeline Requirements.....	7-6
7.4.2	Drainage Pipeline Requirements	7-6
7.4.3	Pipeline Location and Horizontal Separation	7-7
7.4.4	Pipeline Cover and Vertical Separation	7-7
7.5	Canal Water for Construction and Dust Control Purposes	7-8
7.6	Connection to CVWD Irrigation/Drainage Distribution System.....	7-8
7.6.1	Drainage Discharge Monitoring	7-8
7.7	Booster Pump Stations	7-8
7.8	Meters.....	7-8
7.9	Baffle Stands.....	7-9
7.10	Pipe Material	7-9
7.10.1	Pipe Backfill and Bedding.....	7-9
7.11	Thrust Restraint	7-10
7.12	Irrigation/Drainage Pipeline Replacement and/or Abandonment	7-10
7.13	Valves and Fittings.....	7-10
7.13.1	Irrigation Valves	7-10
7.13.2	Fittings	7-10
7.14	Combination Air and Vacuum Relief Valves.....	7-11
7.15	Drainage Manholes	7-11
7.15.1	Manhole Spacing	7-11
7.15.2	Manhole Depth and Size	7-11
7.15.3	Manhole Invert Elevation	7-11
Section 8	.....	8-1
Design Criteria Stormwater Facilities	.....	8-1
8.1	Introduction	8-1
8.1.1	The Coachella Valley Water District (CVWD).....	8-1
8.1.2	Background	8-1

8.1.3	Application	8-2
8.1.4	Proviso.....	8-2
8.2	CVWD Guiding Regulations	8-2
8.2.1	California Drainage Law	8-2
8.2.2	Riverside County Ordinance 458.....	8-2
8.2.3	CVWD Ordinance 1234.1	8-3
8.2.4	Municipal Separate Storm Sewer System (MS4) Permit	8-3
8.3	CVWD’s Regional Stormwater System	8-4
8.4	Standards for Projects near the Regional Stormwater System	8-6
8.4.1	Hydrologic Standards.....	8-6
8.4.2	Hydraulic Standards	8-7
8.4.3	Engineering Design Standards	8-8
8.4.3.1	Slope (Bank) Protection for development within 300 feet of CVWD stormwater facilities.....	8-8
8.5	Development Projects within CVWD Stormwater Unit Boundary	8-10
8.5.1	Existing Hazard Studies and Maps	8-10
8.5.2	Flood Hazards.....	8-10
8.5.3	Flood Hazard Identification	8-11
8.5.4	Hydrologic Analysis.....	8-12
8.5.5	Hydraulic Analysis.....	8-12
8.5.6	Flood Hazard Zoning	8-14
8.5.7	Flood Hazard Mitigation.....	8-14
8.5.8	Sediment Analysis and Sediment Hazard Mitigation	8-15
8.5.9	Long Term and Post Storm Operation & Maintenance Plans	8-16
8.5.10	Conditional Letter of Map Revision/ Letter of Map Revision	8-16
8.6	Technical Appendix	8-17
8.7	References	8-17
Section 9	.....	9-1
Design Criteria Non-Potable Water Facilities	.....	9-1
9.1	Background.....	9-1
9.2	Water Code Sections 32600 - 32603	9-2
9.3	Non-Potable Demand Criteria	9-3

9.4	Non-Potable Pipeline Sizing Criteria	9-3
9.5	Connection to CVWD Non-Potable Water System.....	9-4
9.6	Booster Pump Stations and Pressure Reducing Valve (PRV) Stations	9-5
9.7	Emergency Standby Power Facilities.....	9-6
9.8	Services & Meters	9-6
9.9	Pipe Material, Valves, Combination Air and Vacuum Relief Valves and Blow-off Assemblies	9-6
Section 10		10-1
Design Criteria Landscape/Irrigation		10-1
10.1	Landscape Water Conservation.....	10-1
10.2	Applicability	10-1
10.3	Landscape/Irrigation Submittal Package.....	10-2
10.4	CVWD Easements	10-2

Section 1

General Information and Development Project Review and Approval Process

1.1 Coachella Valley Water District

The Coachella Valley Water District (CVWD) provides domestic water, wastewater (sanitation), non-potable water (reclaimed wastewater and Colorado River water), irrigation/drainage, stormwater and groundwater management services to a population of 300,000 throughout the Coachella Valley, California.

CVWD was formed in 1918 under the state water code provisions of the County Water District Act (Water Code § 30000 et seq.). A governing board of five members is elected from five general divisions for terms of four years each.

CVWD boundaries encompass an area of nearly 1,000 square miles in the Coachella Valley, California. Most of this land is in Riverside County, but CVWD also extends into Imperial and San Diego Counties. Communities served include Cathedral City, Indian Wells, La Quinta, Mecca, North Shore, Palm Desert, Rancho Mirage, Thermal and Thousand Palms in Riverside County as well as the communities of Bombay Beach, Desert Shores, Hot Mineral Spa, Salton Sea Beach and Salton City in Imperial County. The CVWD Service Area Map is located in Appendix A.

This manual and additional information regarding CVWD can be found on the CVWD website at www.cvwd.org.

1.2 Development Design Manual-General Information

This Development Design Manual (DDM) provides comprehensive procedural and technical requirements for the planning, design and construction of CVWD service infrastructure required for new development.

Section 1 provides general information and the requirements for processing a new development and Sections 2 through 9 present drawing format, right-of-way (ROW) procedures, inspection requirements and CVWD service function technical design standards. The Appendices provide more detailed information including checklists, construction notes, specifications, etc.

1.3 General Project Design Requirements

1.3.1 Design

The developer shall employ, at its sole expense, a qualified professional engineering firm (engineer) to plan, design and prepare detailed construction plans and specifications (plans) for the CVWD service infrastructure in accordance with the DDM. All such planning and design work and plans performed and prepared by the developer's engineer shall be subject to review and written approval by CVWD prior to providing to contractors for bidding

purposes. The plans will conform to all applicable federal, state and local governmental rules, ordinances and regulations and all applicable environmental protection laws.

The project must also incorporate, if applicable, the elements of the current version of the Coachella Valley Water Management Plan (CVWMP) and the CVWD Urban Water Management Plan (UWMP). These documents are located on CVWD's website.

1.3.2 Water Supply Assessment and Water Supply Verification

Senate Bill 610 (SB610) was enacted in 2001 and became effective on January 1, 2002. SB610 requires cities and counties to request the preparation of a Water Supply Assessment (WSA) that includes specific information on water supplies from the public water supply agency that would serve any project that is subject to California Environmental Quality Act (CEQA) and is defined as a "Project" in Water Code Section 10912. This information is to be included into environmental review documents prepared pursuant to CEQA.

Senate Bill 221 (SB221) was enacted in 2001 and became effective as of January 1, 2002. SB221 establishes the relationship between the WSA prepared for a project and the project approval under the Subdivision Map Act. Pursuant to California Government Code Section 66473.7, the public water supply agency must prepare a written Water Supply Verification (WSV) that indicates sufficient water supply is available prior to the approval of a new subdivision.

The WSA and WSV apply to developments with 500 or more residential units and larger commercial and industrial projects. If the proposed project requires a WSA/WSV, please contact the Engineering Department for more information on the development of these document(s).

1.3.3 CEQA and NEPA (National Environmental Policy Act)

An action is subject to CEQA when it qualifies as a "project" as stated above in Section 1.3.2. Per the Council on Environmental Quality (CEQ), an action or project generally is also subject to NEPA when it; (1) has federal funding, (2) is located on or impacts federal lands, or (3) requires a federal permit.

The developer shall, at developer's sole cost and expense, be responsible for compliance with the CEQA, NEPA and all other applicable state and federal environmental laws and all requirements of the Federal Endangered Species Act, Clean Water Act and the California Endangered Species Act arising out of or in connection with the design and construction of the standard and/or special facilities (see Section 1.4.1 and 1.4.2) and for compliance with all conditions and mitigation measures which must be satisfied in connection with the same. The developer shall cause the appropriate public agency(s) of the State of California and/or United States of America to act as lead agency(s) for the purposes of complying with CEQA, and/or NEPA. CVWD may elect, but shall have no obligation, to act as lead agency. As part of its obligation to fund the CEQA and/or NEPA processes, the developer shall prepare or cause to be prepared all

instruments, documents, reports and other like or kind writings required to be prepared and/or filed by CEQA and/or NEPA.

1.3.4 Right-of-Way

All new CVWD service infrastructure is required to be installed in appropriate right-of-way (ROW) as determined by CVWD, which can include:

- Land which CVWD has fee title
- Easement-dedicated to CVWD on the final map or by separate instrument
- Public ROW (public street requiring an encroachment permit issued to CVWD by the City/County or a public utility easement (PUE))

CVWD in its sole and absolute discretion shall determine whether a PUE dedication may be relied upon for installation of CVWD service infrastructure. PUEs within major thoroughfares and arterial streets are generally accepted. PUEs within private streets or private driveways may require separate dedication of ROW in favor of CVWD.

Section 3-Right-of-Way provides the detailed information related to the dedication of ROW and other related requirements.

1.4 Agreements, Fees and Annexations

1.4.1 Standard Installation Agreement

Standard infrastructure includes onsite pipelines. A Standard Installation Agreement will be required prior to the first plan check. See Appendix B for an example of a Standard Installation Agreement. All standard infrastructure plans must be reviewed and approved by the Engineering Department. See Section 2 for drawing format and requirements and Sections 5 through 9 for design details.

1.4.2 Special Installation Agreement

Special infrastructure include offsite pipelines, well sites, reservoirs, booster stations, lift stations, stormwater facilities, irrigation/drainage facilities, etc. A Special Installation Agreement will be required prior to the release of the plans. See Appendix B for an example of a Special Installation Agreement. All special infrastructure plans must be reviewed and approved by the Engineering Department. See Section 2 for drawing format and requirements and Sections 5 through 9 for design details.

1.4.3 Fees and Credits

CVWD's infrastructure funding is based on the premise that the capital expenditure for new infrastructure should be funded by new customers. Therefore, developers are responsible for all infrastructure capital costs required to serve the proposed development.

Development fees exist for domestic water and wastewater to fund the construction of regional facilities and obtain new sources of water supply. These fees include the Sanitation Capacity Charge (SCC) and Water System Backup Facilities Charge (WSBFC) and its components including the Dwelling Unit Charge (DUC), Building Unit Charge (BUC), Meter Surcharge and Supplemental Water Supply Charge (SWSC) (see Fees Section for current fees). Development fees for all units are due for each approved phase after progress for service and prior to release of the first water meter.

CVWD will provide a development fee credit (for each applicable development fee) in consideration of the off-site infrastructure construction costs borne by the developer up to a maximum amount equivalent to the total applicable fee for the project. The DUC and BUC and the Collection portion of the SCC are creditable. The SWSC is not creditable.

Developer is responsible for payment and installation of infrastructure to serve its development (Required Facilities). If CVWD requires Developer's Required Facilities to be Oversized, then Developer shall construct and install the Oversized Facilities and CVWD shall be responsible to pay the difference between the Required Facilities and the Oversized Facilities. This difference in cost is not creditable.

1.4.4 Annexations

CVWD requires new development to annex into the Stormwater Unit if the land is not already included in the Stormwater Unit. The land so annexed shall be subject to all assessments, taxes and charges which may be levied within the Stormwater Unit. The Annexation Petition is provided by the Stormwater Division as part of the City/County approval process (see Appendix K).

1.5 Development Review Letter and Notice of Water/Sewer Service Availability

At the very early stages of a development project, CVWD will prepare a Development Review Letter at the request of the County or City. This letter provides the County or City and the developer/engineer with a basic description of the services that CVWD will provide, notice of water/sewer service availability subject to CVWD regulations concerning water supply, along with any service concerns and potential conflicts with existing CVWD infrastructure, policies or guidelines. An example of the Development Review Letter is shown in Appendix A.

If a Development Review Letter has not been provided for the project, CVWD will provide a Notice of Water and/or Sewer Service Availability at the request of the developer/owner. An example of the Notice of Water/Service Availability is shown in Appendix A.

1.6 Development Project Review and Approval Process

After the Development Review Letter and/or Notice of Water and/or Sewer Service Availability has been issued, the developer/engineer begins the Development Project Review and Approval Process. Figures 1 & 2 presents the CVWD Development Project

Review and Approval Process in flow chart form. The flow chart presents the sequence of events throughout the life of a development project. The primary CVWD department responsible for each process function is depicted in a small box in the lower-right hand corner. The referenced DDM section for key flow chart items are shown in brackets. The Standard Installation Agreement and Special Installation Agreement include the detailed process requirements. The following sections describe the Development Project Review and Approval Process in general terms.

1.6.1 Initial Contact and CVWD Infrastructure Location

The primary contact throughout the life of the development project will be the Development Services Division of the Engineering Department. All plans or inquiries should be submitted to Development Services for routing to the appropriate CVWD departments for review.

The developer/engineer should contact the Utility Coordinator in the Engineering Department to obtain existing utility infrastructure locations.

1.6.2 Initial Meeting with CVWD Departments

When preliminary development project plans are available, the developer/engineer should set up the Initial Development Project Meeting with the Development Services Division to discuss CVWD's requirements. Representatives of all applicable CVWD Departments will attend. The developer/engineer should be familiar with the contents of this manual prior to the Initial Development Project Meeting.

After the Initial Development Project Meeting, the developer/engineer will begin the formal Development Project Review and Approval Process as outlined in the following subsections.

1.6.3 Plan Check Submittal Requirements

Prior to acceptance of the first set of plans for plan check, the developer/engineer must submit to Development Services the Plan Check Submittal Application and associated hydraulic modeling deposit/information, fire flow requirements, plan check deposit, forms/agreements and completed plan check checklist (see Appendix A). Upon acceptance of the Plan Check Submittal Application, the plans will be forwarded for plan check.

Prior to accepting the plans for second plan check, the developer/engineer must submit to Development Services any recorded grant deeds, recorded easements, proposed tract map easements and landscape irrigation plans. CVWD's Water Management Division will review and approve the landscape plans and proposed irrigation water meter sizing. In addition, the ROW Division will review the landscape plans to determine any interference with existing CVWD infrastructure and ROW.

Once plan checks are complete and CVWD requests the final plans (mylars), the developer/engineer may submit the final plans electronically or provide mylars for CVWD's signature.

Prior to the release of any plans (mylars) by CVWD, the developer/engineer must submit to Development Services the CAD files for the approved plans in electronic format (no disk), execute any Special Installation Agreements and pay the SCC for sewer-only projects.

1.6.4 Construction Requirements

After approval of the plans and prior to the pre-construction meeting, the developer/engineer must submit to the Inspection Division the Material Submittal Form (See Section 4-Inspection) and provide Development Services an electronic version of the recorded tract map and a cash deposit in an amount equal to the greater of \$5,000 or 5% of the estimated construction costs.

Next, the developer's contractor must schedule a preconstruction meeting with the Inspection Division prior to start of construction. The developer/contractor must provide certification that the contractor is properly licensed in California and that the developer has adequate insurance. The inspection deposit is paid to CVWD at the preconstruction meeting.

The work cannot begin until CVWD has installed all the connection points (primarily domestic water projects). All new CVWD service infrastructure will be constructed under direct CVWD inspection. See Section 4-Inspection for detail construction inspection requirements.

1.6.5 Progress for Fire Protection, Progress for Service and Project Completion and Acceptance

The water system can be progressed for fire protection prior to paving and after the water system has been disinfected and successfully passed CVWD's pressure test and bacteriological screen. This will allow the project to utilize the water system for fire protection during building construction.

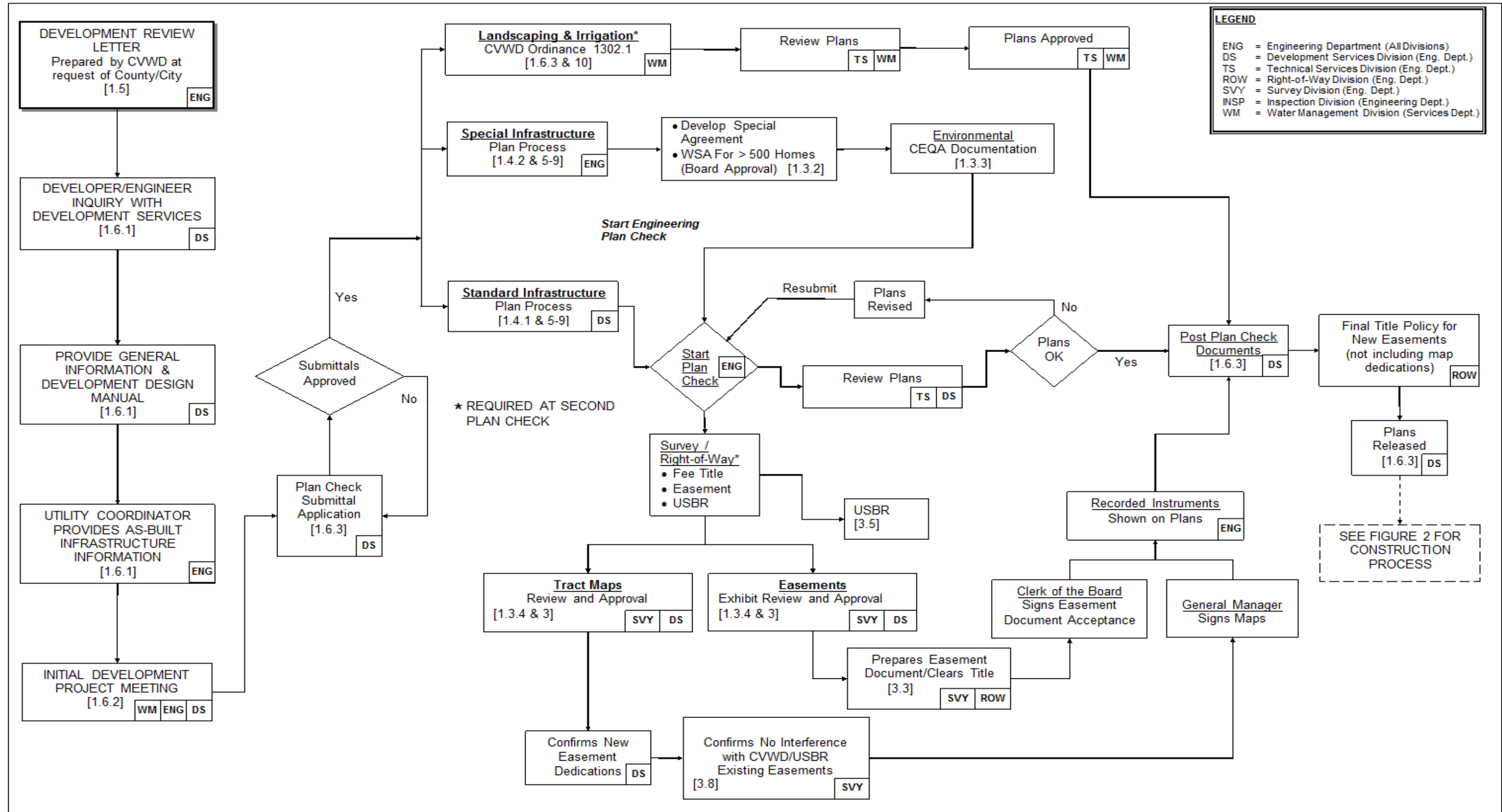
When the base paving is complete and the Development Infrastructure Cost Form (see Appendix D) has been submitted, the CVWD service infrastructure can be progressed for service. The SCC, WSBFC and SWSC for all units within the approved phase must be paid prior to the issuance of the first meter.

When final paving is complete, CVWD Inspection will develop a final punchlist. All punchlist items must be corrected and the developer must provide CVWD a copy of the CC&Rs for the project prior to final acceptance. Upon final acceptance by CVWD, the developer will file a Certificate of Completion and Final Acceptance with the County and provide CVWD with the Bill of Sale conveying the facilities to CVWD along with the final construction costs. At this point, the eighteen (18) month warranty period begins.

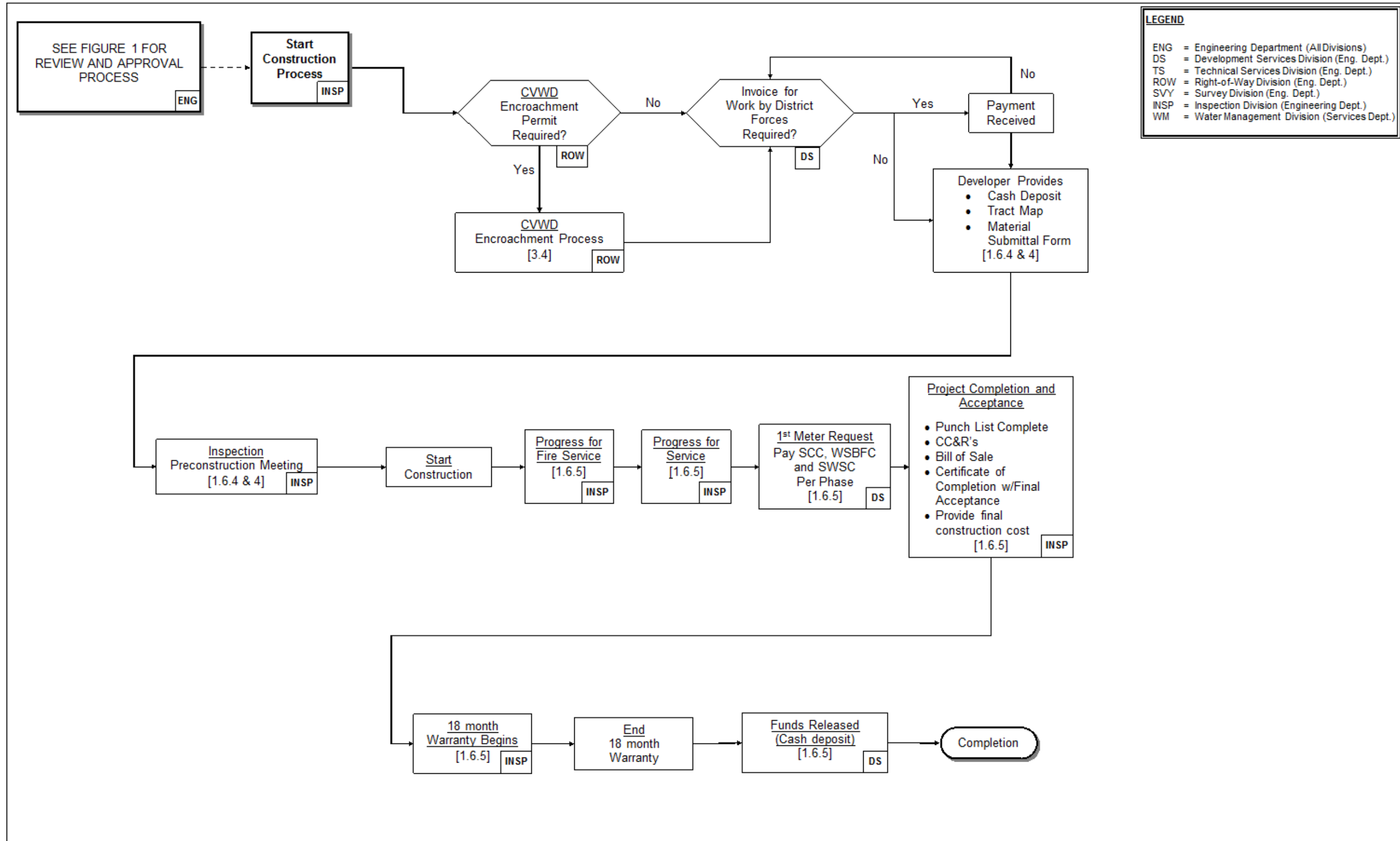
1.6.6 Construction Delay

Construction must begin within one year of approved CVWD service infrastructure plans. If more than one year has elapsed since approved plans, the developer/engineer shall re-submit the plans for review and approval.

**FIGURE 1
CVWD DEVELOPMENT PROJECT REVIEW & APPROVAL PROCESS**



**FIGURE 2
CVWD CONSTRUCTION PROCESS**



LEGEND

ENG	=	Engineering Department (All Divisions)
DS	=	Development Services Division (Eng. Dept.)
TS	=	Technical Services Division (Eng. Dept.)
ROW	=	Right-of-Way Division (Eng. Dept.)
SVY	=	Survey Division (Eng. Dept.)
INSP	=	Inspection Division (Engineering Dept.)
WM	=	Water Management Division (Services Dept.)

Section 2

Drawing Format and Requirements

2.1 Drawings-General

The developer's engineer shall prepare CVWD service infrastructure drawings that are clear, concise, and meet CVWD drawing format and requirements. Drawings that are difficult to interpret and/or do not meet CVWD drawing standards are unacceptable and will be subject to rejection without review.

All drawings are submitted and returned through the Development Services Division within the Engineering Department. The Engineering Department will review all CVWD service infrastructure drawings except landscape irrigation drawings which are reviewed by the Water Management Division.

Construction must begin within one year of approved CVWD service infrastructure drawings. If more than one year has elapsed since approved drawings, the Development Project Review and Approval Process restarts and drawings must be re-submitted for plan check.

Detailed plan checklists for domestic water, wastewater (sanitation), non-potable water, irrigation/drainage, stormwater, and groundwater management services are located in Appendix E along with drawing examples. The following serves to describe the general drawing format and requirements.

2.2 Sheet Format

2.2.1 General

CVWD service infrastructure drawings shall be of professional quality. Separate drawings must be submitted for each CVWD service function, i.e. domestic water, wastewater (sanitation), irrigation/drainage, stormwater, and landscape irrigation. Drawings shall be of standard engineering practice, well arranged, neat, legible and present the proposed construction in bold font to eliminate confusion. Drawings shall show both plan and profile (except domestic water mains less than 12" in diameter).

2.2.2 Sheet Layout

All drawings shall be 24" x 36" size. The horizontal scale shall be 1" = 40' (preferred) or 1" = 20' and the vertical scale shall be 1" = 4' (preferred) or 1" = 2'. Scale bars shall be provided.

Match lines and continuations from sheet to sheet shall be used and identified with applicable station points and cross reference. Stationing shall be provided along the centerline of pipe. New stationing shall start at 10+00.

As a minimum, the general sheet layout shall show the following:

- North Arrow shall point up or to the right
- Indicate the sheet number and total number of sheets on the drawing in large bold font at the bottom right corner of all sheets
- All sheets to include a geographic title block
- Engineers signature block
- Basis of bearing
- Benchmark
- Underground service alert (USA) statement
- City/County signature is added after CVWD has approved final drawings

Provide detail sections for special assemblies and complex connections (preferably on the same sheet). The detail shall be drawn to an appropriate scale showing pipe size and shall fully identify all the parts in the detail.

The engineer shall note on the drawings all connections to existing CVWD facilities and the party responsible for making the connections.

CVWD service infrastructure drawings shall not be used as construction drawings for streets, curbs, grading, electrical, gas, television, storm drains or any other non-CVWD improvements.

2.3 Cover Sheet

As a minimum, the Cover Sheet shall show the following:

- Project title, centered at top of sheet in large bold font
- Index Map with scale and north arrow
- Vicinity Map, upper left corner with north arrow
- Geographic title block (Township, Range, Section and Quadrant), and sheet numbering lower right corner
- Owner/developer
- APN
- USA information
- Basis of bearings and benchmark
- List of abbreviations and symbol legend
- Typical street section(s) called out as either public or private
- Utility contacts, static water pressure
- Manhole/cleanout legend (sewer)

- Easement and reference drawing information
- Engineers information block with current seal
- An 8-1/2" wide strip kept clear along entire right-hand side for CVWD notes and signature block to be supplied and affixed by CVWD
- Sheet Index

2.4 Plan and Profile Format

2.4.1 Plan View

The plan view sheets, shall be drawn at a horizontal scale of 1" = 40' (preferred) or 1" = 20'. Drawings shall be arranged in a clear legible manner with all facilities clearly identified. Proposed facilities shall be called out in large bold font with type and size of facility. Leaders shall be utilized to offset facilities descriptions to improve drawing legibility. All existing CVWD and United States Bureau of Reclamation (USBR) facilities shall be called out with drawing numbers. All lines representing other utility infrastructure shall utilize a unique identifier.

Separation between all facilities and roadway centerline shall be shown. Stationing shall be readable, and shall follow pipeline centerline. All connection points, crossings, and appurtenances shall call out stationing (i.e. bends, manholes, laterals, services). Pipeline data shall be placed in a table format on each corresponding sheet.

No topographical or contour lines shall be added to drawings unless requested by CVWD. Contour lines will be required for stormwater, retention/detention basins and gravity sewer.

Restrained joints shall be called out in bold with stationing in accordance with the checklist requirements. The area of pipeline being restrained shall be shaded or hatched to distinguish the restraint joint areas. For projects in which the entire pipeline is restrained, only call out "ALL RESTRAINED JOINTS" in the plan view.

Easements shall be identified on all sheets including the Instrument Number. All CVWD and USBR easements shall be lightly shaded.

Street names or line references shall be called out in large bold font and identified as public or private. No cross-hatching shall be used to represent asphalt removal. Cross-hatching may be used for pipeline encasement.

An area 3"x 6" along the bottom right-hand side of the drawing shall be left clear for CVWD to affix the signature block.

Construction notes are to be included on each sheet numerically listing each described item with item number inscribed in a circle. The numerical callouts with leader lines shall point to the location of the described construction note.

2.4.2 Profile

Profile sheets shall be drawn at a vertical scale of 1" = 4' (preferred) or 1" = 2'. Profile shall show all existing and proposed surfaces and utility crossings over or under proposed facility. Stationing shall be shown along bottom of profile at 100 foot intervals. Profile stationing shall line up with plan view stationing. Elevations shall be clearly shown on both ends of profile sheet.

Sewer and drainage drawings shall show distances between manholes, top of manhole elevation, manhole number, stationing, depth and inverts in/out. All profile types shall show slope of pipeline, pipe invert elevation, restrained joints, grade breaks, crossings, and stationing of appurtenances and connection points with reference drawings called out.

For all profile sheets the vertical datum bench mark information shall be included in the title block along the bottom of each sheet.

2.5 Easements

CVWD requires easements to ensure the ability to properly operate and maintain its facilities. The detailed process for securing and dedicating easements to CVWD is described in Section 3-Right-Of-Way (ROW). The general physical requirements for CVWD easements are depicted in Table 2.1.

Table 2.1 CVWD Minimum Easement Width

Depth of Pipe Less Than 10'	Easement Width
Single Pipe	20 feet
Two Pipes ¹	32 feet (10' curbs/walls to pipe CL + 12' between pipe CL)
Depth of Pipe Greater Than 10'	
Single Pipe ²	Minimum-Depth x 2.0
Two Pipes ^{1,2}	Minimum-Depth of Deepest Pipe x 2.0 + 10' curbs/walls to pipe CL + 12' between pipe CL)

¹The 12" pipe center line (CL) offset applies when the sum of the inside diameter of the two pipes is 24" or less. If the sum of the diameters is greater than 24", then the separating distance between the outside edge (including bells) of the pipes shall be 10'.

²CVWD may require additional easement width depending on field conditions

There shall be no unreasonable interference with the CVWD infrastructure within the easement area. Please see Section 3-Right-of-Way for more information on interference and encroachments.

2.6 Digital Drawings

Prior to the release of mylars (see Section 1.6.3 and Appendix C), a digital copy of the drawings (on CD or DVD) shall be provided in dwg format, including streets, units, cross reference drawings, section and midsection lines, and state plane coordinates.

California state plane coordinates, zone 6 (NAD 83) are required to be shown at all street intersections, tract boundary points and two known section or $\frac{1}{4}$ section points. Development Services can supply known points for the area. Should any changes in the development project take place after this time, a revised digital drawing shall be provided immediately.

2.7 Revisions to Drawings

Drawings that are revised after approval by the CVWD shall be resubmitted for approval of the revision. Revisions to approved drawings need to be submitted by the original engineer or with the original engineer's written consent. The revisions will be labeled with a triangle (numbered with the appropriate sequential number) and a brief description of the revision in the CVWD signature block will be initialed by CVWD. The area to be revised should be identified by a cloud or other descriptive method.

Revisions can be made in two forms:

- By hand on the original mylar
- Resubmit replacement mylar showing the revisions and marking the drawing "REPLACEMENT MYLAR" in bold above the CVWD title block.

If any modifications to the CVWD service infrastructure are made after the drawings have been revised to "As-Built" by CVWD, the modifications shall be made by the Engineer on CVWD's copy (if not too extensive-to be determined by CVWD) and not on the Engineer's original or digital copy. If the revisions are extensive the drawings may be submitted as a regular revision as described above.

Section 3

Right-of-Way

3.1 General

For the purposes of this section, Right-of-Way (ROW) is considered fee-owned land and/or easement.

CVWD owns approximately 7,000 acres of land and has approximately 3,240 easements. CVWD ROW contains a host of facilities required to provide domestic water, wastewater (sanitation), non-potable water, irrigation/drainage, stormwater, and groundwater management services.

In addition, CVWD has unique ROW obligations related to the irrigation system.

The irrigation system is comprised of the Coachella Branch of the All-American Canal, Protective Works (Flood Protection Dikes and Channels), and Irrigation Distribution System. The United States Bureau of Reclamation (USBR) owns these facilities and CVWD operates and maintains (O&M) them in perpetuity. Accordingly, CVWD is responsible for administering and protecting USBR ROW. These facilities are located in the geographical area known as Improvement District No. 1 (ID 1). See Appendix J for a map of ID 1.

CVWD's ROW Division provides the following essential services in regards to the development design process:

- Dedication of real estate assets including land, buildings, and other facilities
- Dedication and quitclaim or release of ROW including those related to managed assets for USBR
- Processing of CVWD encroachment permits and Noninterference Review Letters (NIRL)
- Processing of USBR License (fee-owned land) and Consent (easements) Agreements
- Processing Irrigation and Drainage System Relocations and Abandonments

The following subsections provide the details for these essential services.

3.2 Dedication of Real Estate Assets

The developer is required to dedicate to CVWD real estate assets for a variety of utility purposes as a condition of development. This may include raw land and/or improved land for well sites, pump stations, reservoirs, lift stations, treatment facilities, stormwater facilities, etc. There are two methods for dedicating real estate assets to CVWD; (1) dedication by final map or (2) dedication by separate instrument/document. In either case, the recorded instrument/document numbers and/or map book and page must be shown on the plans prior to release of the plans for construction (see Figure 1).

The dedication of real estate assets is defined in the Special Installation Agreement (see Section 1.4.2 and Appendix B). The Special Installation Agreement defines the basic requirements of the real estate asset(s), e.g. size, type, general location, etc. and the timing of the dedication. Please note CEQA/NEPA compliance is the responsibility of the developer.

CVWD requires four items for each dedication by separate instrument/document; (1) Preliminary Title Report (PTR) and Title Insurance (TI), (2) Substitution of Trustee and Partial Reconveyance, if applicable, (3) Proof of the signer's capacity to sign on the fee title owner's behalf (Corporate Resolution, Operating Agreement, etc.) and (4) Grant Deed. The PTR/TI ensures that the real estate asset(s) has no adverse encumbrances. The Partial Reconveyance ensures that the real estate asset is not subject to beneficiary foreclosure. The Grant Deed includes Exhibit "A" (legal description) and Exhibit "B" (plat depiction of the real estate asset(s), both Exhibits to be prepared by a CA Licensed Surveyor and are subject to the CVWD Standards for Legal Descriptions and Plats). CVWD will require a Record of Survey (including field survey and monument placement) and Certificate of Compliance to be filed if the parcel(s) are a part of a larger parcel. Examples of these documents are located in Appendix F.

3.3 Dedication of Easement

The developer is required to dedicate easements for a variety of utility purposes as a condition of development. Typically easements are dedicated for pipelines and appurtenances but could be dedicated for other facilities.

There are two methods for dedicating easements to CVWD; (1) dedication by final map or (2) dedication by separate instrument/document. Typically, easements for pipelines and appurtenances located within the final map development area are dedicated on the final map and off-site easements are dedicated by separate instrument/document. In either case, the recorded easement instrument/document numbers and/or map book and page must be shown on the plans prior to release of the plans for construction (see Figure 1).

CVWD requires a Title Policy Commitment (TPC) and TI for each easement dedication by separate instrument/document. The TPC/TI ensures that the real estate asset(s) has no adverse encumbrances. The developer is responsible for providing these items at no cost to CVWD. These are subject to CVWD's review and approval. Please refer to the Title Insurance Steps for easements in Appendix F.

In addition, CVWD requires three items for each dedication by separate instrument/document: (1) Grant of Easement, (2) Proof of the signer's capacity to sign on the fee title owner's behalf (Corporate Resolution, Operating Agreement, etc.) and (3) Consent of Easement, if required. The Grant of Easement includes Exhibit "A" (legal description) and Exhibit "B" (plat depiction of the real estate asset(s), both Exhibits to be prepared by a CA Licensed Surveyor and are subject to the CVWD Standards for Legal Descriptions and Plats). Examples of these documents are located in Appendix F.

Dedication by final map is further elaborated in Section 3.8.

3.4 CVWD Noninterference Review Letter and Encroachment Permit Process

CVWD may allow limited access to its ROW holdings for temporary access or permanent construction. A Noninterference Review Letter (NIRL) and Encroachment Permit (EP) process has been established to formalize review and approval of proposed encroachments. The CVWD EP process is also utilized in conjunction with the USBR permitting process as further defined in Section 3.5. This process ensures the proposed activity will not unreasonably interfere with CVWD's or USBR's use of the ROW.

3.4.1 Interference

CVWD and the USBR have defined interference as follows:

- CVWD—anything that would unreasonably interfere with the easement rights, endanger the CVWD facility, or cause additional funds to be expended on O&M
- USBR—anything that would compromise the USBR facility, impede use or access, or cause additional funds to be expended on O&M

3.4.2 Noninterference Review Letter (NIRL)

CVWD requires the project proponent to submit a request for noninterference review for certain activities within CVWD and USBR easements. Examples of interference and noninterference include:

Interference Examples

- Activities that cause interference include, but are not limited to, permanent structures including buildings, walls, gates, fences, trash enclosures, swimming pools, parallel underground wet and dry utilities, etc. Some parallel underground runs may be acceptable for a short distance.
- Potential interference may include driveway, sidewalk, parking lot, curb and gutter—depending on prior rights and extent of improvements. CVWD may suggest replacement/relocation of CVWD/USBR facility at applicant's cost to prevent future damage to surface improvements. If CVWD/USBR facility is not replaced/relocated, then any damage to surface improvements would not be CVWD's responsibility.
- Existing and/or proposed agricultural cultivation (crops) encroachments within a CVWD/USBR easement are considered interference, but may be authorized to remain through an Agricultural NIRL. USBR consent will also be required.

Noninterference Examples

- Grass and plants less than 3 feet in height
- Trees outside 15 feet of CVWD/USBR infrastructure (e.g. pipelines)
- Landscape irrigation system

- Perpendicular underground wet and dry utilities (gas and electric may require additional review) with proper separating distance
- Other activities not listed will be considered on a case-by-case basis

CVWD will make a noninterference determination and issue a NIRL that requires acknowledgement by the project proponent. CVWD's NIRL application package and an example of a NIRL is located in Appendix F. The typical processing time for a CVWD NIRL is 30 days from receipt of a complete request. See Fee Section for CVWD's applicable fees.

3.4.3 Encroachment Permit (EP)

CVWD administers three types of EPs as defined below:

- EP-a recordable permit required for the long term use of CVWD fee-owned land; or a non-recordable permit required for the long term use of any stormwater channel facility where CVWD has easement.
- Construction EP-required for each entity/contractor installing:
 - Any improvement within USBR fee-owned land or easement
 - Any improvement within CVWD fee-owned land
 - Improvement involving CVWD facilities within CVWD easement if CVWD facilities are at risk
- Temporary EP-required for all temporary uses of CVWD/USBR ROW, e.g. potholing, temporary canal water use, etc.

Upon completion of the NIRL process, it may be determined that a Construction EP is required. Each EP is executed by CVWD and the applicant. Recordable EPs are recorded in the respective County. CVWD's EP application packages and examples of the EPs are located in Appendix F. The typical processing time for a CVWD EP is 30 days from receipt of a complete application package. See Fee Section for CVWD's applicable fees and deposits.

3.5 USBR License Agreement and Consent Agreement Process

As outlined in Section 3.1, CVWD is responsible for administering and protecting USBR ROW. USBR will allow limited access to its ROW holdings for temporary access or permanent construction if CVWD approves the encroachment. The following subsections describe the USBR ROW permitting process in general and the process for abandoning and relocating irrigation laterals.

3.5.1 General

USBR utilizes two primary ROW permitting documents; (1) License Agreement and (2) Consent Agreement. USBR also issues Temporary Access and Temporary Construction Permits on a limited basis. The first step is to complete the USBR Right-Of-Use Application-Federal Form 299 (see Appendix F) which will be utilized by the USBR to determine which permitting document applies.

The License Agreement is required for all projects affecting USBR fee-owned land. Engineering review by CVWD and USBR is required. A CVWD Construction EP is issued after the License Agreement has been fully executed by all parties.

The Consent Agreement must be secured for any projects that may interfere ¹ with USBR facilities within USBR easements over private lands. Engineering review by CVWD and USBR is required. A CVWD Construction EP is issued after the Consent Agreement has been fully executed by all parties.

CVWD NIRL (see 3.4.2) alone may be acceptable for minor perpendicular utility crossings and other minor activities that do not interfere with USBR facilities within USBR easements over private lands.

CVWD Temporary EP can be utilized for temporary noninterference activities, e.g. potholing, temporary canal water use, etc. within USBR fee-owned land or USBR easements over private lands.

¹Interfere means anything that would compromise the USBR facility, impede use or access, or cause additional funds to be expended on O&M.

3.5.2 USBR Irrigation Pipeline (Lateral) Abandonment and Relocation Process

Within the irrigation/drainage service area known as ID 1, USBR owns approximately 485 miles of irrigation piping (laterals). The irrigation laterals deliver Colorado River water from the Coachella Branch of the All-American Canal to the high point of each 40 acre parcel within the majority of the ID 1 boundary. As agricultural land transforms to urban uses, some irrigation laterals will become obsolete and may be abandoned. However, many of these facilities will be needed in the future to service agriculture that remains and non-potable water uses in the lower portion of the Coachella Valley. CVWD may condition a development to abandon, relocate, or replace an irrigation lateral as a condition of development.

The irrigation laterals are located within USBR ROW which was obtained in the 1940s, some of which were pursuant to the 1890 Act and may not be recorded. Therefore, many of these easements will not show up in a PTR and it is incumbent on the developer/engineer to contact the Utility Coordinator (CVWD Engineering) to obtain the as-built and ROW information for these facilities and show the facilities and associated ROW on the plans. The following describes the steps for the irrigation lateral abandonment, abandonment and relocation, and replacement process. The USBR Abandonment and Abandonment and Relocation Application Packages are located in Appendix F.

3.5.2.1 Identify Affected Irrigation Laterals

- Contact the Utility Coordinator (CVWD Engineering) to obtain the as-built and ROW information

- Plot the irrigation laterals and USBR ROW on the proposed plans showing all proposed improvements
- Schedule a meeting with Irrigation Engineering Division through Development Services to determine which facilities need to be abandoned, relocated, or replaced

3.5.2.2 Irrigation Lateral Abandonment Only

- Coordinate abandonment plan with Engineering Irrigation Division
- Existing irrigation laterals may be abandoned by four methods; (1) physically remove, (2) crush in place, (3) fill with 2-sack slurry, or (4) abandon in place with an indemnity quitclaim. See Irrigation Standard Details in Appendix J.
- Irrigation lateral abandonment plans must be prepared in the same format as domestic water improvement plans.
- All USBR ROW must be identified on the plans by the recorded instrument/document numbers (Ex. Instrument No. 3619, Book 105, Page 250 recorded 9/30/1948, O.R.) or pursuant to the 1890 Act by Right-of-Way Notice and USBR Parcel (Ex. R/W Notice dated 11/23/1949 per Parcel C-7-46), as appropriate.
- Once the irrigation lateral abandonment mylars are approved by CVWD, submit USBR abandonment application package (located in Appendix F)
- After USBR approval, obtain CVWD Construction EP
- USBR will issue a Quitclaim Deed to release easements acquired by a recorded instrument/document or an Affirmation of Abandonment for any ROW acquired by the 1890 Act. The appropriate release document will be issued after final inspection and approval by CVWD.
- Fees assessed by USBR after receipt of the initial abandonment application package need to be paid directly to CVWD on USBR's behalf.
- See Fee Section for CVWD's applicable fees and deposits
- Total process time after a complete application is received is typically 90 days.

3.5.2.3 Irrigation Lateral Abandonment and Relocation/Replacement

- Coordinate relocation plan with Engineering Irrigation Division
- CVWD will determine the size and location of the relocated facilities. New irrigation laterals will be PVC pipe (see Irrigation Standard Details in Appendix J). Existing irrigation laterals may be

abandoned by four methods; (1) physically remove, (2) crush in place, (3) fill with 2-sack slurry, or (4) abandon in place with an indemnity quitclaim. See Irrigation Standard Details in Appendix J.

- Irrigation lateral abandonment and relocation/replacement plans must be prepared in the same format as domestic water improvement plans.
- All USBR ROW must be identified on the plans by the recorded instrument/document numbers (Ex. Instrument No. 3619, Book 105, Page 250 recorded 9/30/1948, O.R.) or pursuant to the 1890 Act by Right-of-Way Notice and USBR Parcel (Ex. R/W Notice dated 11/23/1949 per Parcel C-7-46), as appropriate.
- Once the irrigation lateral abandonment and relocation/replacement mylars are approved by CVWD, submit USBR abandonment and relocation application package if the relocation is outside of the existing easement. If relocation (replacement) is within the existing easement then apply for CVWD Construction EP only.
- Applicant executes a USBR Relocation Agreement/Grant of Easement. If the original ROW was acquired by Right-of-Way Notice pursuant to the 1890 Act, USBR may elect to proceed with recording a Right-of-Way Notice to acquire the new ROW for the relocated irrigation lateral in lieu of the Relocation Agreement/Grant of Easement.
- After USBR approval, obtain CVWD Construction EP to relocate the irrigation line.
- Apply for CVWD Construction EP to abandon irrigation line once the newly relocated line is progressed for service.
- USBR will issue the Quitclaim Deed to release its interest in the easements acquired by a recorded instrument/document or an Affirmation of Abandonment for any ROW acquired by the 1890 Act. The appropriate release document will be issued after final inspection and approval by CVWD.
- Fees assessed by USBR after receipt of the initial abandonment and relocation application package need to be paid directly to CVWD on USBR's behalf.
- See Fee Section for CVWD's applicable fees and deposits
- Total process time after a complete application is received is typically 180 days.

3.6 CVWD Drainage Pipeline Abandonment and Relocation/Replacement Process

Within the irrigation/drainage service area known as ID 1, CVWD owns approximately 166 miles of underground drainage pipeline and 21 miles of open drains. The drainage system was installed for two purposes; (1) keep the high groundwater table below the root zone and (2) act as a conduit for salinity leaching. As agricultural land transforms to urban uses, some drainage pipelines will become obsolete and may be abandoned. However, many of these facilities will be needed in the future to service agriculture in the lower portion of the Coachella Valley. CVWD may condition a development to abandon or relocate/replace a drainage pipeline as a condition of development.

CVWD will consider use of these drainage facilities for urban drainage if (1) the surface and subsurface drainage facilities can physically handle the new urban drainage, (2) the area is incorporated into the National Pollutant Discharge Elimination System permit and Waste Discharge Requirements for the discharge of stormwater in the Whitewater River Watershed, which is known as the MS4 Permit and (3) the project is annexed into a future district(s) for recovery of capital and operation/maintenance costs associated with the new urban drainage system.

The drainage pipelines are located in CVWD ROW and they should appear in a PTR. However, it is incumbent on the developer/engineer to contact the Utility Coordinator (CVWD Engineering) to obtain the as-built and ROW information for these facilities and show the facilities and associated ROW on the plans. The following describes the steps for the drain pipeline abandonment or relocation/replacement process.

3.6.1 Identify Affected Drainage Pipelines

- Contact the Utility Coordinator (CVWD Engineering) to obtain the as-built and ROW.
- Plot the drainage pipelines and ROW on the proposed plans showing all proposed improvements.
- Schedule a meeting with Irrigation Engineering Division through Development Services to determine which facilities need to be abandoned or relocated/replaced.

3.6.2 Drainage Pipeline Abandonment Only

- Coordinate abandonment plan with Irrigation Engineering Division.
- Existing drainage pipelines may be abandoned by four methods; (1) physically remove, (2) crush in place, (3) fill with 2-sack slurry, or (4) abandon in place with indemnity quitclaim. See Irrigation Standard Details in Appendix J.
- Once mylars are approved by CVWD, submit formal request in writing to abandon and if applicable, obtain letter of authorization from any upstream users.

- Provide PTR and legal description and plat (Exhibits “A” and “B”, both Exhibits to be prepared by a CA Licensed Surveyor and are subject to the CVWD Standards for Legal Descriptions and Plats) for easement to be quitclaimed. Examples of these documents are located in Appendix F.
- Obtain CVWD Construction EP to physically abandon the drainage pipeline.
- See Fee Section for CVWD’s applicable fees and deposits.
- CVWD will issue and record the Quitclaim Deed after final inspection and approval by CVWD. See Section 3.7 for Compensation for CVWD ROW.

3.6.3 Drainage Pipeline Relocation/Replacement Requirements

- Coordinate abandonment and relocation/replacement plan with Irrigation Engineering Division.
- Existing drainage pipelines may be abandoned by four methods; (1) physically remove, (2) crush in place, (3) fill with 2-sack slurry, or (4) abandon in place with an indemnity quitclaim. See Irrigation Standard Details in Appendix J.
- Once mylars are approved by CVWD, submit written request along with PTR and legal descriptions and plats (Exhibits “A” and “B”, both sets of Exhibits to be prepared by a CA Licensed Surveyor and are subject to the CVWD Standards for Legal Descriptions and Plats) for the new easement and easement to be quitclaimed. Examples of these documents are located in Appendix F. If the replacement is within existing easement, then apply for CVWD Construction EP only.
- Applicant executes a Grant of Easement and obtains a Consent to Easement, if applicable.
- After CVWD approval, obtain CVWD Construction EP to relocate the drainage pipeline.
- Apply for CVWD Construction EP to physically abandon the drainage pipeline once the newly relocated line is progressed for service.
- See Fee Section for CVWD’s applicable fees and deposits.
- CVWD will issue and record the Quitclaim Deed after final inspection and approval by CVWD. See Section 3.7 for Compensation for CVWD ROW.

3.7 Compensation for CVWD ROW

The majority of CVWD ROW is currently utilized for domestic water, wastewater (sanitation), non-potable water, irrigation/drainage, stormwater, groundwater management services, and conservation mitigation purposes. Some CVWD fee title land and easements are held for future use. However, in some cases these property rights can be relinquished if they are deemed surplus.

There are four general property rights categories by which CVWD might receive compensation:

1. Sale of CVWD's Fee Title Land-Resolution No. 2014-169, Disposal of Surplus Real Estate Policy, was approved by the Board of Directors on August 26, 2014. This policy describes the procedures to be utilized for selling CVWD fee title land that has been deemed surplus. CVWD fee-owned land will be sold at current market value or higher (see Appendix F).
2. Leasing of CVWD Fee Title Land-CVWD fee title land may be leased at current market value or higher. If similar leases are not available for comparative purposes, the lease value shall be based on the true carry-cost of the asset. Examples of current leases include:
 - Cell Tower Sites - \$2,600 to \$3,700/month
 - Wind Energy Sites - \$6,125 to \$55,000/quarter + royalties
 - Golf Course - \$450 to \$650/acre/year
 - Ag Land - \$350 to \$4,500/acre/year
 - Parking Lot - \$2,700/year (0.32 acres)
 - Dog Park - \$4,000/year (0.50 acres)
3. Quitclaim of CVWD Easement Rights-CVWD easements (or portions of easements) may be quitclaimed to an applicant if there is no interference with existing or planned CVWD infrastructure or mitigation within the easement area to be quitclaimed.

Private party applicants (developers, individuals, etc.) will be required to compensate CVWD for relinquishing this property right. The fee title market value may be established by appraisal or using CVWD's standard market values in effect. The fee title market value will then be discounted by an easement value factor (20% to 80%), as determined by CVWD, to obtain the value of the quitclaimed easement.

This is consistent with Resolution 2007-100, CVWD Right of Way Encroachment Policy, approved by the Board of Directors on May 8, 2007 which calls for "full mitigation" of CVWD property rights (see Appendix F).

4. Overlying Easement within Existing CVWD Easement- An existing CVWD easement may be utilized by an applicant if there is no interference with existing or planned CVWD utility infrastructure or mitigation within the easement area. The applicant will be required to obtain the approval of the underlying fee owner. Private party applicants (developers, utilities, individuals, etc.) will be required to compensate CVWD for the use of this property right. The fee title market value may be established by appraisal or using CVWD's standard market values in effect. The fee title market value will then be discounted by an easement value factor (20% to 80%) as determined by CVWD to obtain the value of the easement. The applicant will be required to obtain all necessary CVWD EPs.

3.8 Final Map Review and Approval Process

Section 66436 of the Subdivision Map Act provides that a public entity or utility has the right to review and approve a tract or parcel map (final map). If the public entity or utility finds that the proposed activity as defined by the final map will unreasonably interfere with the full and complete exercise of its ROW, then the public entity or utility can object to the recording/filing of the final map. It is strongly suggested that the developer/engineer work with CVWD to ensure the final map is correct before filing. CVWD will not release plans until the final map or separate instrument/document easements are recorded.

Final map review and approval is performed by CVWD's Survey Division. CVWD reviews each final map in detail to ensure there will be no interference with CVWD/USBR existing and/or future ROW. A typical final map has three sections of interest to CVWD; (1) Proposed CVWD easements and fee title parcels/lots to be dedicated via the final map, (2) Signature Omissions-listing existing CVWD and USBR easements, and (3) Environmental Constraints. These are further elaborated below.

3.8.1 Proposed Easements

CVWD will cross check the approved plans to ensure the proposed easements match with the proposed infrastructure plans.

3.8.2 Signature Omissions

All existing CVWD and USBR easements must be shown on the final map. As outlined in Section 3.5.2, many USBR easements are not recorded and will not show up on a PTR. Therefore, it is incumbent on the developer/engineer to contact the Utility Coordinator (CVWD Engineering) to obtain the as-built and ROW information for these facilities and show the facilities and associated ROW on the plans and final map.

3.8.3 Environmental Constraints

As described in Section 8-Stormwater, CVWD is the major regional stormwater agency for the Coachella Valley. It is important that the Environmental Constraints portion of the final map contain the necessary language to call out stormwater requirements.

If interference is discovered during the review of the final map, then CVWD will issue an Interference Objection Letter to the City or County to ensure the final map is corrected.

Section 4

Inspection

4.1 General

CVWD provides on-site inspection of all approved CVWD service infrastructure including domestic water, wastewater (sanitation), non-potable water, irrigation/drainage and stormwater. The Inspection Division is part of the Engineering Department and all inspection is directed and coordinated by the Chief Inspector.

CVWD Inspectors ensure that construction of CVWD service infrastructure is in conformance with the drawings and specifications. The cost for inspection is borne by the developer. Figure 1 depicts the CVWD Development Project Review and Approval Process in flow chart form and includes the Inspection portion of the process.

During construction, any changes from the approved drawings and specifications must be approved by the Engineer of Record and the Engineering Department prior to implementation.

4.2 Materials Submittals

All materials to be used during construction shall be submitted to the Inspection Division for review and approval utilizing CVWD Materials Submittal Form (ENG_INS-002) which is located in Appendix G. This submittal must be made prior to the Preconstruction Conference.

4.3 Cash Deposit

The developer shall provide CVWD a Cash Deposit in an amount of \$5,000 or 5% of the estimated construction costs (CVWD facilities), whichever is greater. The Cash Deposit must be received prior to the preconstruction meeting. The detailed requirements for the Cash Deposit are located in Appendix G.

4.4 Preconstruction Conference

After the material submittals are approved, the Cash Deposit is received and prior to starting work, the developer/contractor shall contact the Chief Inspector to schedule a mandatory pre-construction conference. At the preconstruction conference, the developer/contractor shall provide the following items:

1. City or County encroachment permit granted to CVWD for the installation, operation and maintenance of the proposed CVWD infrastructure
2. Inspection deposit (See current CVWD Fee Schedule)
(Note: The estimated inspection fee is to be collected at or prior to the preconstruction meeting. Additionally, hourly inspection fee rates may vary when CVWD contracts with outside consulting firms for inspection services.)
3. Proof of Insurance (See Standard Agreement in Appendix B)

4. Proof of Contractor's License

4.5 Field Inspection Procedures

After the pre-construction conference, contractors/developers are required to schedule inspection of all construction activities by calling before noon two business days in advance of the work.

Example

- If work is to be performed on Tuesday, the contractor/developer is required to call in to schedule inspection by noon on the previous Friday.
- If work is to be performed on Monday, the contractor/developer is required to call in to schedule inspection by noon on the previous Thursday.

A CVWD inspector will visit the project construction site and verify that the work is being constructed in conformance with the drawings and specifications.

4.6 Project Completions Steps

The following presents the process for bringing the project to various levels of completion.

4.6.1 Progress for Fire Service

The domestic water system may be progressed for fire service when the system has been disinfected and successfully passed CVWD's pressure test and bacteriological screen. At this stage paving is not required (except required curb must be installed) and all Progress for Fire Service Checklist items must be complete. No water meters will be issued but hydrants will be activated and the system will be placed into service to provide fire protection only. See Appendix G for the Progress For Fire Service Checklist Items.

4.6.2 Progress for Service

The domestic water system may be progressed for service when it has been disinfected and successfully passed CVWD's pressure test and bacteriological screen. Sanitation system and/or irrigation/drainage system may be progressed for service when the systems have successfully passed CVWD's pressure test and video inspection. At this stage, base course paving is required and all Progress for Service Checklist items (exclusive of valve covers, manhole covers and meter lids) must be complete. In addition, the Water System Backup Facility Charge, and its Supplemental Water Supply Charge component and Sanitation Capacity Charge must be paid in full for all units in the approved phase upon the first meter request. Water meters and sewer lateral connections can be installed when the preceding items are satisfied. See Appendix G for the Progress For Service Checklist Items.

4.6.3 Project Completion and Acceptance

The Inspection Division will develop a punchlist within 90 days after the CVWD service infrastructure is Progressed for Service. These items typically include final asphalt, raising valve covers and manholes, etc. When all checklist items are complete, CVWD Inspectors will final the project utilizing CVWD Form ENG_INS-004 (see Appendix G). In addition, the developer shall prepare and file the Certificate of Completion and Final Acceptance with County. Once the preceding is complete, the remaining portions of the Development Project Review & Approval Process can be completed (see Section 1).

Section 5

Design Criteria Domestic Water Facilities

5.1 Background

The CVWD Domestic Water System is comprised of 30 pressure zones supplied by wells which withdraw water from the Whitewater River Subbasin and the Mission Creek Subbasin. The CVWD Domestic Water Service Area Map is located in Appendix H. Most pressure zones include reservoir storage. There are pressure booster pump stations and pressure regulating valve (PRV) stations that transfer water between zones. The only treatment for the majority of the wells is chlorination to ensure disinfection throughout the water distribution system. Three ion exchange treatment facilities provide arsenic removal in the Mecca, Thermal and Oasis area. A future source of supply may include treated Colorado River water from the Coachella Canal. Domestic Water System statistics can be found in the most recent edition of CVWD's Annual Report.

The Domestic Water System design/construction standards and regulations for service are governed by the following documents:

- Regulations Governing Domestic Water Service-Appendix H
- Domestic Water Standard Specifications-Appendix H
- Domestic Water General Drawing Notes-Appendix H
- Green Book
- AWWA Standards
- Title 22, California Code of Regulations California Regulations Related to Drinking Water

CVWD has developed a Domestic Water System Hydraulic Model of the entire water supply and distribution system. This model will be utilized by CVWD staff and/or a CVWD consultant to verify the size of the domestic water system facilities required for each development at the developers cost.

5.2 Demand Criteria

CVWD requires new developments to install domestic water system infrastructure that satisfies CVWD's Domestic Water System design criteria. On-site and off-site domestic water infrastructure shall be sized to meet the Peak Daily Demand (PDD) of the proposed development in accordance with the following design criteria.

Table 5.1 Domestic Water Pipeline Design Criteria

Design Parameter	Criteria	
ADD	0.50 gpm/unit (720 gpd/unit)	
PDD	0.90 gpm/unit (1,296 gpd/unit)	
PHD	1.50 gpm/unit (2,160 gpd/unit)	
PDD/ADD	1.8	
PHD/ADD	3.0	
Storage Volume	$V = [0.5 \times \text{PDD (Diurnal)} + 0.5 \times \text{PDD (Emergency)}] \times \text{no. of units} \times 1,440 \text{ min/day} + \text{Fire Flow}$ PDD = 0.90 gpm/unit Fire Flow = _____ gpm x _____ hours x 60 min/hour (determined by Fire Marshall)	
Pipelines	Designed to transmit the greater of the following: <ol style="list-style-type: none"> 1. Peak Hourly Demand (PHD) 2. Peak Day Demand (PDD) + Fire Flow 12" and smaller: Max velocity = 5 ft/sec 18" and larger: Max HL = 1 psi /1,000 feet of pipeline	
Pump Stations	PDD w/ largest unit out of service Hydropneumatic systems include fire flow	
PRVs	PDD w/ largest unit out of service	
Treatment Facilities	PDD w/ largest unit out of service	
Well Capacity	No. of Wells = $(0.90 \text{ gpm} \times \text{no. of units} \times 1.2) / 1,800 \text{ gpm/well}$ <ul style="list-style-type: none"> • average well capacity = 1,800 gpm • 1.2 Factor of Safety = for maintenance or emergency • approximately one well for every 1,667 units 	
Well Sites	Less than 100 acres	None
	Greater than 100 acres	1 per 100 acres or major portion thereof, major portion being 50 or more acres.

CVWD is located in a hot desert environment and peak demands are significant. CVWD utilizes a PDD allowance of 0.90 gpm per dwelling unit to ensure adequate service during the hot summer months. CVWD may adjust this factor depending on the location of the project, type of development and proposed landscaping.

5.2.1 Demand Criteria – Non-Potable Water

Where Non-Potable Water is available CVWD may allow a reduction of up to 70% in the domestic water demand for ADD, PDD and PHD as shown in Table 5.1 (See Section 9 for additional information on Non-Potable Water Facilities).

5.3 Pressure Zones

CVWD Domestic Water System includes approximately 30 operating pressure zones. These zones operate nominally within a static pressure range between 60 to 100 pounds per square inch (psi). Figure 5.1 schematically depicts a major pressure zone representing elevated storage. Individual single family homes connecting to pressure below 60 psi will require a “Low Pressure Agreement” as shown in Appendix B. If static pressure exceeds 80 psi, an individual PRV is required (see Sect. 5.18). Water pressure zone information is available from the Engineering Department. The domestic water drawings must identify the existing or proposed pressure zone(s) serving the development and the static water pressure.

Proposed developments located outside of an existing pressure zone will need to create a new domestic water pressure zone and/or connect to an existing domestic water pressure zone(s) while mitigating impacts to the existing zone. As a result, the proposed development will need to provide facilities satisfactory to CVWD. These facilities may include wells sites, wells, treatment plants, booster stations, reservoirs, transmission mains, and pressure reducing stations. The required facilities to serve such developments will include redundant facilities within the new pressure zone and/or existing pressure zone(s) in order to ensure reliable and sustainable service. The degree of operation and maintenance, risk of failure of each facility, as well as demands to existing pressure zone(s) will also serve as a basis for the extent of the required facilities of the proposed development.

5.4 Pipeline Requirements

The CVWD Domestic Water System provides potable water for industrial, commercial and residential use and fire protection. For some projects, a detailed analysis of domestic and fire flow demands utilizing CVWD’s Domestic Water System Hydraulic Model may be required to properly define requirements for system design.

Domestic Water System design requirements may include installing pipelines along the frontage(s) of a development for pipeline looping purposes (peak daily demands, fire flow and water quality requirements) and/or for future system expansion purposes. For example, when an area outside the development can logically be served by a future extension of a proposed domestic water pipeline, CVWD may require the pipeline be extended to the tract boundary or to the end of a paved street in a manner to facilitate the future extension. Oversizing may be required where such pipelines can logically serve an upstream area for future use (See Section 1.4.3 for additional information on Oversizing).

Developments desiring to connect to the CVWD's Domestic Water System may be required to provide a minimum of two connections in order to provide a redundant supply connection to the development. Redundant connections will enable CVWD to provide more reliable service, improved water circulation, and increased fire flow capacities to the development. In addition, on some occasions a development may be required to provide a pipeline extension to close a loop in the vicinity pipe network.

5.4.1 Pipeline Sizing Criteria

Table 5.2 provides the domestic water pipeline design criteria to be utilized for all hydraulic analyses.

Table 5.2 Domestic Water Pipeline Design Criteria

Design Criteria	Standard
Maximum Velocity	
12 inch and smaller	5 ft/sec
Cul-de-sac/dead end pipelines	10 ft/sec
Maximum Head loss	
18" and larger	1 psi /1,000 feet of pipeline
Minimum Pressure	
Static	60 psi
Fire	20 psi

Pipelines shall be 8, 12, 18, 24, 30, 36 or 42 inches in diameter. Pipelines larger than 30 inches in diameter may be required for projects with high demand requirements. No pipe smaller than 8 inches in diameter shall be permitted except for blow-off assemblies, meter manifolds, services and appurtenances.

A Hazen-Williams Coefficient (C) for new CML ductile iron shall be C = 110. For all older pipe, C shall be based on the age of the pipe for hydraulic analysis.

5.4.2 Pipeline Location and Horizontal Separation

Domestic water pipelines shall be located within public right-of-way (ROW), easements dedicated by tract map or specific easements or fee title land granted to CVWD. The design shall be adjusted to take into consideration utility conflicts, soils, groundwater and any other factors. Table 5.3 represents the minimum horizontal separation of domestic water pipelines from other infrastructure by pipeline size.

Table 5.3 Minimum Horizontal Separation – Domestic Water Pipeline

Horizontal Separation from Domestic Water Pipeline	Minimum Separation (Outside to Outside)
Sewer Pipeline ¹	10 feet
Sanitation landfill, wastewater disposal pond, hazardous waste disposal site.	100 feet
Cesspool, Septic Tank, sewage leach field, seepage pit, underground hazardous material storage tank, or groundwater recharge project site	25 feet
Non-Potable Pipeline ¹	10 feet
Storm Water Pipeline ¹	10 feet
Curb (Lip of gutter)/Edge of Pavement 12 inch and Smaller Domestic Water Pipelines	3 feet
Curb (Lip of gutter)/Edge of Pavement 18 inch and Larger Domestic Water Pipelines	6 feet
Horizontal Separation from Domestic Water Service Line	
Sewer Laterals	10 feet
Sewer Manhole	10 feet
Domestic Water Main Fittings and Bends	2 feet
Fire Hydrant Run	4 feet
Catch Basin	4 feet
Separation between Domestic Service Runs	2 feet

¹The 10' separating distance is measured between the outside edge (including bells) of the pipes. If the sum of the inside diameters of the two pipes is 24" or less, then the centerline (CL) distance between the two pipes shall be 12'. This will aid in layout and plan checking. If the sum of the diameters is greater than 24", then the separating distance between the outside edge (including bells) shall be 10'.

Note: This is not an all-inclusive list, see Title 22 Code of Regulation, Section §64572 Water Main Separation.

No deflection shall be allowed off any flanges. Table 5.4 shows the Maximum Deflection of full length pipe by pipe joint type and size.

Table 5.4 CVWD Maximum Deflection DIP*

Type of Pipe Joint	Pipe Size- Inches									
	8	10	12	14	16	18	20	24	30	36
Push-On	2.5°	2.5°	2.5°	1.5°	1.5°	1.5°	1.5°	1.5°	1.5°	1.5°
Mechanical Joint	2.5°	2.5°	2.5°	1.75°	1.75°	1.5°	1.5°	1°	--	--
Restrained Joint	2°	2°	2°	1.5°	1.5°	1.5°	1.5°	1.5°	1°	1°

* The "Design" deflections shown are 50 percent of the maximum value allowed by the Ductile Iron Pipe Research Association (DIPRA).

5.4.3 Pipeline Cover and Vertical Separation

Table 5.5 shows the minimum cover for various pipeline sizes.

Table 5.5 Pipeline Cover

Pipe Size or Development Type	Minimum Cover
12 inch and smaller	36 inches
18 inch and larger	48 inches
18 inch (in residential development w/curb and Gutter)	36 inches
Unimproved areas or parking lots	48 inches

The cover for pipelines in shopping centers and commercial complexes shall be 48 inches and all pipelines shall be located in driving aisles. No pipelines or appurtenances shall be located under parking spaces or islands.

Water and sewer crossings and associated separations shall be in accordance with CVWD Standard Drawing Nos. W-1/S-3 and W-2/S-4 (see Domestic Water Standard Drawings in Appendix H).

5.5 Connection to CVWD Domestic Water System

All connections to the existing CVWD domestic water system will be made by CVWD at the Developer's expense. The Contractor may connect to an existing valve when approved by CVWD under CVWD inspection.

5.6 Well Site and Well Pumping Plant Criteria

There are two well criteria---well sites and sites with installed pumping plant. The number of well sites is based on the acreage of the development. The number of these well sites to include an active pumping plant is based on the water demands of the development.

5.6.1 Well Sites

The number of well sites is based on the following in accordance with Table 5.6.

Table 5.6 Well Sites

Development Size (Acreage)	Number of Well Sites
Less than 100 acres	None
Greater than 100 acres	1 per 100 acres or major portion thereof, major portion being 50 or more acres.

Well sites shall be a minimum of 150 feet by 150 feet in dimension (0.50 acres) in cases where the blow-off water is discharged to an approved off-site location. For situations where the blow-off water is discharged to an on-site detention basin system, the well site shall be a minimum of 0.75 acres. The Detention Basin System shall be designed to accept 2 hours of well discharge at 2,000gpm. CVWD reserves the right to require larger sites in special cases.

The Developer will be required to design and construct well site improvements including; (1) grading, (2) block walls, (3) water pipeline stubs, (4) power, (5) driveway and gates, (6) blow-off structure and piping and (7) detention basin (See Appendix E, CVWD Well Site Check List).

5.6.2 Well Sites with Pumping Plant

The number of well sites (as determined in 5.6.1) to be outfitted with a well and a pumping plant is generally one well for every 1,667 units and based on the following formula:

$$\text{No. of Wells W/Pumping Plant} = (\text{PDD} \times \text{no. of units} \times 1.2 \text{ FS}) / 1,800 \text{ gpm/well}$$

1.2 Factor of Safety = for maintenance or emergency (one well for every 1,667 units).

5.6.3 Well Site Separation

Well sites can be located within a development or at an approved off-site location within the same water pressure zone as the development. Wells shall be sited according to the minimum separating distances depicted in Table 5.7.

Table 5.7 Well Site Separation

Horizontal Separation from Well Site	Minimum Separation
Base of Mountain	4,000 feet
Existing Well Site	1,000 feet
Seepage pit, Cesspool, Leach Line or Tank	150 feet
Sewer Pipeline or Sewer Lateral	50 feet
Sewer Manhole or Sewer Lift Station	100 feet

Note: This is not an all-inclusive list, see CDPH Requirements for New Well dated November 1981, Guidelines for the Protection of Public Domestic Water Supply Wells from Sources of Contamination or Pollution dated March, 1986, Table 1 Minimum Horizontal Distance and California Well Standards Bulletin 74-90.

5.7 Reservoir Storage

Generally, construction of reservoir storage is required for large developments and if there is limited or no existing storage in the pressure zone or a new pressure zone is being created due to the development. Figure 5.1 schematically shows a major pressure zone representing elevated storage.

5.7.1 Storage Calculations

Reservoir storage includes three components—Peak Daily Demand (PDD) (Diurnal), Fire Flow and Emergency Storage. The specific requirements include:

$$V = [0.50 \times \text{PDD (Diurnal)} + 0.5 \times \text{PDD (Emergency)}] \times \text{no. of units} \times 1,440 \text{ min/day} + \text{Fire Flow}$$

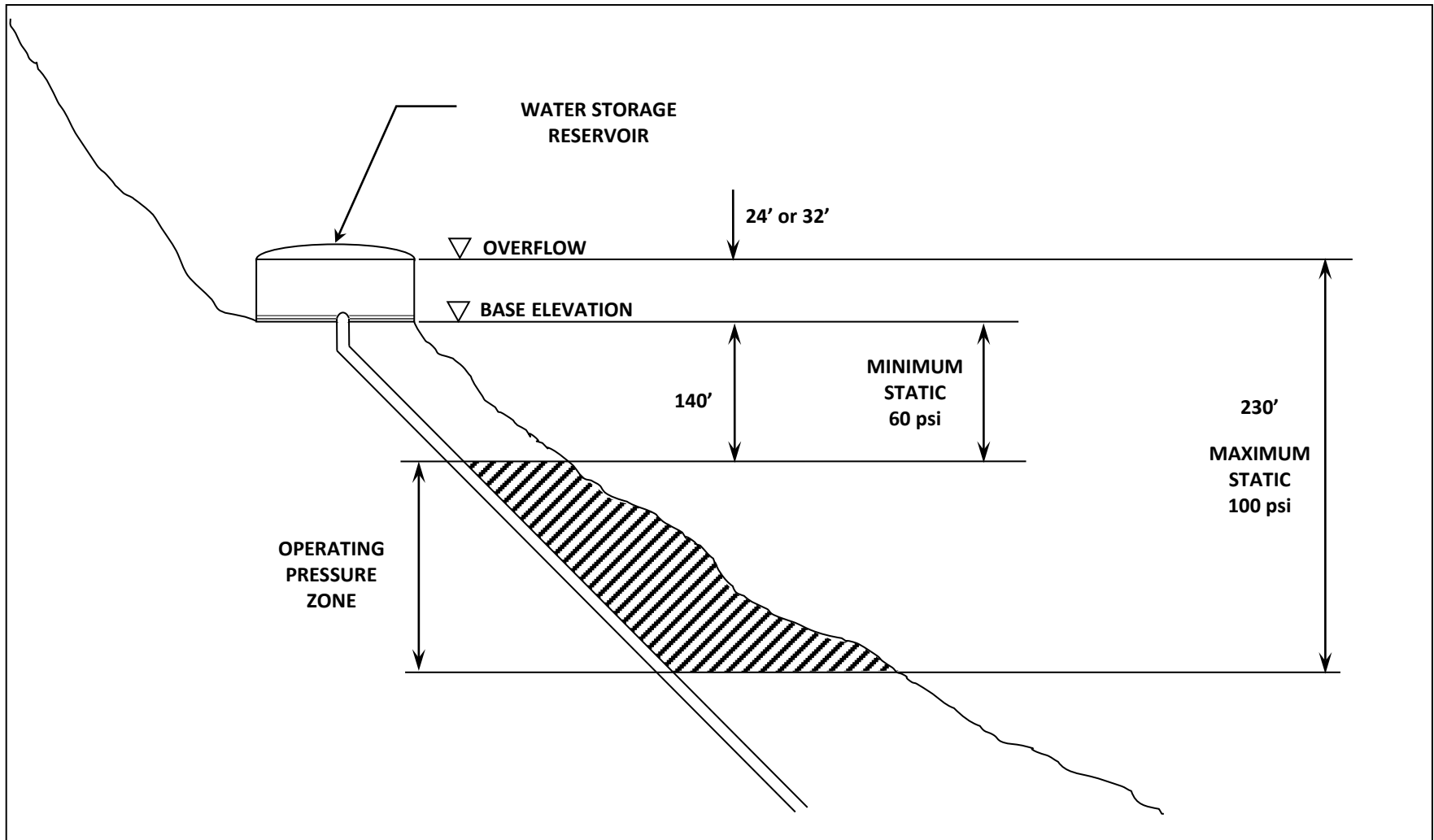
$$\text{PDD} = 0.90 \text{ gpm/unit}$$

$$\text{Fire Flow} = \text{_____gpm} \times \text{_____hours} \times 60 \text{ min/hr (determined by Fire Marshall)}$$

5.7.2 Location (Base Elevation)

The location of a reservoir is dictated by the hydraulic gradeline (feet above MSL) of the pressure zone when the reservoir is empty (base elevation). CVWD requires a minimum static pressure of 60 psi at all points within the development based on the base elevation of the reservoir. Reservoir heights are generally 24 or 32 feet.

**Figure 5.1 Typical Pressure Zone/Reservoir Configuration
(Pressures have been rounded)**



5.8 Booster Pump Stations and Pressure Reducing Valve (PRV) Stations

5.8.1 Booster Pump Station Types

In general, booster pump station types shall be defined as **open systems** or **closed systems**. It is the responsibility of the Engineer of Record to select the appropriate booster pump station design, consideration shall be given as to location, service area, pressure zone, flow rate required, operation, power supply backup and such other criteria to provide reliability to the system. The Engineer of Record is required to meet and confer with CVWD Engineering staff on preliminary design requirements prior to plan submission.

A booster pump station (BPS) is required if a development is located at an elevation that does not allow a minimum pressure of 60 psi or at the boundary of two pressure zones whereby the BPS pumps from the lower pressure zone to the higher pressure zone. The booster pump station also provides a backup source of water during high demands or in the case of an emergency.

5.8.2 Booster Pump Stations – Open System

An open system booster pump station is one which transfers water to a higher pressure zone that is governed by an atmospheric storage reservoir (water surface open to atmosphere - See Figure 5.2a). A typical example of this type of booster pump station pumping operation is:

The booster pump station pumps out of an atmospheric storage reservoir or from a lower distribution system into a separate distribution system with higher atmospheric reservoir storage. Typical pump operation is controlled by water surface elevation in the higher storage reservoir.

5.8.3 Booster Pump Stations – Closed Systems

A closed system booster pump station is one which transfers water to a higher pressure zone closed to the atmosphere (See Figure 5.2b). A closed system (or hydropneumatic system) may be allowed in areas where it is not feasible to install a gravity storage reservoir and there is less than 100 units within the pressure zone. This system generally consists of a ground storage tank, booster pump station with at least two domestic water pumps and a high demand pump. A typical example of this type of booster pump station pumping operation is:

Pump operation is typically controlled by pre-set discharge pressure settings. Normally, at least one pump is continuously in service. System over-pressurization and/or pump damage is avoided with the installation of a pressure relief valve/control valve. The pressure relief valve/control valve maintains a constant pressure and can return a portion of the pump discharge to a lower “open” pressure zone system.

5.8.4 Booster Pump Station General Design Criteria

The total capacity of the booster pumping station (or stations) must be sized to provide the water demand for the service area planned. Total capacity shall include:

- Open System - PDD with the largest pump unit out of service
- Closed System - PHD with the largest pump unit out of service

All piping within the pumping station shall be sized for total water demand at planned build-out for the water service area. Space shall be reserved along the manifold and ground at the pumping station site, with blind flanged lateral(s) provided, for future pump additions anticipated to meet total water demand at planned build-out of the area.

In general, booster pump stations are located adjacent to storage reservoirs. In special cases, approved by CVWD, offsite booster pump station sites shall be a minimum of 150 feet by 150 feet. CVWD reserves the right to require larger sites in special cases.

The typical type of pump shall be vertical turbine can pump or horizontal centrifugal pump.

A minimum of two (2) domestic booster pumps and one (1) high demand pump shall be provided to meet the design capacity.

The booster pumps shall be designed to insure that total dynamic head and flow for the system curve can be obtained by all combinations and VFD's.

Pump sizing shall not exceed capacity of the suction line or the NPSH requirements of the pumps.

On site pipelines for the pumping station shall be sized at five (5) feet per second maximum velocity for discharge piping, three (3) feet per second maximum for suction piping, based upon total station capacity.

Since the service area of booster pump station is dependent upon the continuous operation of the booster pump station for its source of water supply and pressure, emergency standby power facilities must be provided. Back-up power in these cases shall be operated to start the moment that the utility power is interrupted. See Section 5.9 for more details on emergency standby power requirements.

5.8.5 Pressure Reducing Valve (PRV) Stations

A pressure reducing valve station (PRV) is required if a project is located at the boundary between two pressure zones whereby the PRV provides water from the higher pressure zone to the lower pressure zone. The PRV provides a backup source of water during high demands or in the case of an emergency.

CVWD shall make the determination of the water demand data to be used, which may include the development project's demands, existing and future, as the basis for sizing of the PRV and associated piping.

Velocity shall not exceed five (5) feet per second in the supply and discharge piping. Reducers and increasers shall be used to connect the typically large onsite supply and discharge piping to meet pipeline velocity requirements before and after the pressure reducing valve. PRV's may be downsized from the inlet and outlet pipeline sizes to which they are connected, provided the velocity across the valve does not exceed the valve manufacture's specifications.

PRV's shall be Cla-Val or approved equal and shall be in compliance with CVWD's Standard Specifications and Materials List.

All PRV stations shall be so equipped with pressure controls that allow the adjusting of pressure settings.

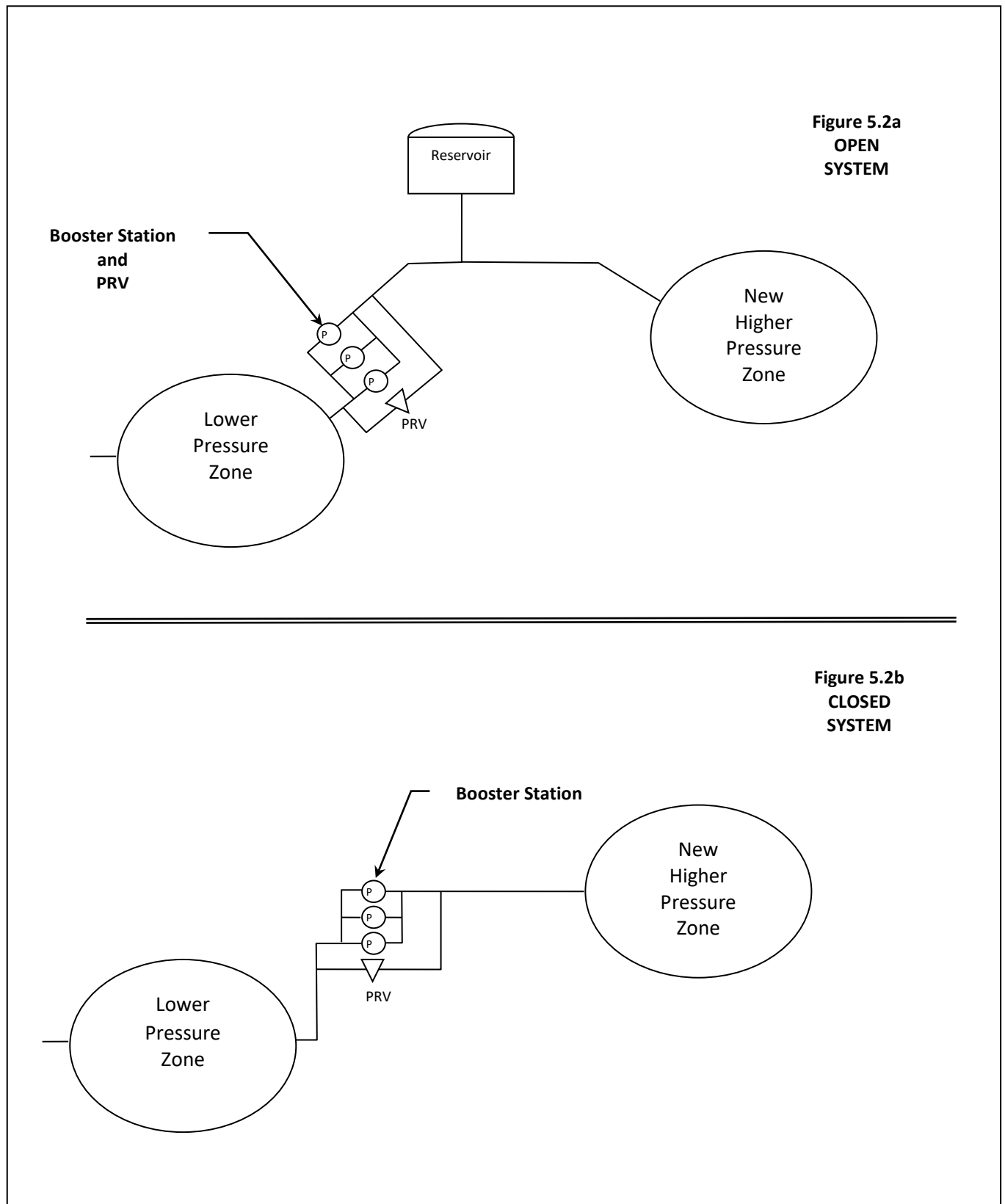
PRV stations that serve as the supplement or back up source of water supply for meeting peaking or fire flow demand shall be set slightly below the high-pressure setting (i.e. $10 \pm$ psi below normal operating pressure).

A PRV station shall have two pressure regulating valves installed in parallel, to provide reliability during maintenance periods or failure of components.

Each PRV and lateral piping shall be sized to independently accommodate the full flow of the pressure reducing station.

PRV station sites shall be a minimum of 100 feet by 100 feet. CVWD reserves the right to require larger sites in special cases.

Figure 5.2 Typical Booster/PRV System Configurations



5.9 Emergency Standby Power Facilities

The project site shall provide adequate space for a diesel fueled standby generator in a recessed concrete structure. The generator shall be sized to operate at connected load (full site load) of the designed station. The standby power project fees shall include applicable Air Quality Management application fees, one-full fuel tank, sound attenuation enclosure testing and installation of CVWD's specified equipment.

The concrete recessed structure (approximately 32 feet x 18 feet) shall include but is not limited to exterior lighting, receptacles, safety rails, stairs, drain sump pumps, automatic sump pump controls and drain filtration system (manufactured to control infiltration of oils and other contaminants from entering the ground water system). The recessed structure shall provide reduced viewable generator height from the public. Vehicle access (20-feet) shall be available on the longer side of the recessed structure.

In order for the internal combustion engine to operate the electric generator, a permit to construct and operate must be obtained from the Air Quality Management District having jurisdiction. Permitting fees and engine procurement are greater if the project site is within 1,000-feet of an existing school.

The internal combustion engine operated generator shall be enclosed in a weather resistant sound attenuated metal enclosure. The metal enclosure shall reduce the engine noise to 75-dBA at 23-feet from the generator when operating at full load in all directions from the generator. When a block building is constructed to house the booster pumps and other equipment, the generator shall be incorporated inside the block building.

The generator shall be equipped with a fuel tank mounted on the same base rails as the generator and its metal enclosure. The fuel tank shall be sized to allow full load operating condition for a period not less than 12-hours minimum.

5.10 Fire Systems/Backflow Requirements

All developer plans showing fire system connections shall provide information on the type of fire system that is being installed for the development (e.g. wet-pipe fire sprinkler systems, deluge fire sprinkler systems and dry pipe and preaction fire systems). The developer's engineer shall fill out and check the appropriate fire system box on the CVWD Plan Check checklist for domestic water. Upon request for additional information on the fire system, the fire system plans shall be submitted to CVWD to review the complexity and type of proposed fire system so the degree of hazard can be assessed. The level of protection given to each fire system connection shall be in accordance with criteria listed below and the ***Manual of Cross-Connection Control, tenth edition, Chapter 7 Fire Systems, as published by the University of Southern California and AWWA Manual M14, third edition, Chapter 5 "Typical Hazards."***

Since a fire system design can vary, the level of backflow protection will be based on the type of potential cross-connection and the degree of hazard. The three types of backflow protection that will be considered are: (1) Single (lead free) Detector Check, below ground installation. (2) Double Check Detector Assembly (DCDA), above ground installation. (3) Reduced Pressure Detector Assembly (RPDA), above ground installation.

5.10.1 Wet-Pipe Fire Sprinkler Systems

Wet-pipe systems are the most common type of fire sprinkler systems. A wet-pipe system is one in which the fire sprinkler piping is constantly charged by a direct connection to the public water supply. When a fire sprinkler activates, water is immediately discharged. A Single (lead free) Detector Check shall be installed unless a hazard such as those mentioned in section 5.10.5 “Other Fire System Hazards Requiring Backflow Protection” are present.

5.10.2 Deluge Fire Sprinkler Systems

Deluge fire sprinkler system (system) is a dry-pipe non-pressurized fire suppression system. These systems are open to atmosphere and a Single (lead free) Detector Check shall be installed. Additional backflow protection is not required unless chemicals will be added when water flows, in which case, a RPDA will be installed.

5.10.3 Dry Pipe and Preaction Fire Sprinkler Systems

Dry pipe and preaction fire sprinkler systems are similar in design. A dry-pipe pressurized system is typically pressurized with air or nitrogen, whereas a preaction system may or may not be pressurized. In either case, a DCDA shall be installed unless there is a risk of a high hazard (e.g. chemicals), in which a RPDA will be installed.

5.10.4 Residential Fire Systems

See Section 5.13.

5.10.5 Other Fire System Hazards Requiring Backflow Protection

- DCDA shall be installed if the private fire system has a looped system (multiple connections), a private fire main with multiple (3 or more) on-site private hydrants, elevated storage tanks, pumps pumping from above-ground covered reservoirs or tanks, an auxiliary water supply on or available to the premises, or an auxiliary water supply located within 1,700 feet of the pumper connection.
- RPDA shall be installed if the fire system has an interconnection with auxiliary supplies, such as pumps pumping from reservoirs exposed to contamination, rivers, ponds, wells or industrial water systems, or where antifreeze or other additives are used.

5.11 Fire Flow Calculations + Hydraulic Modeling

CVWD has a hydraulic model of the existing domestic water system. The domestic water daily demands and fire flow requirements must be verified by the hydraulic model by coordinating with the CVWD Engineering Department. Please refer to Appendix A, Plan Check Submittal Application, Hydraulic Modeling checklist.

5.12 Fire Hydrants

5.12.1 Fire Hydrant Location

Fire hydrants shall be placed per Fire Department requirements or, approximately every 330 feet in locations that minimize damage by traffic. Fire hydrant runs or valves shall be installed outside decorative paving areas wherever possible. The minimum distance between a block wall and a fire hydrant shall be 6 feet. Bends and water service connections are prohibited on hydrant runs. All hydrant runs shall use restrained joint piping and a thrust block at the hydrant.

5.12.2 Fire Hydrant Type

All fire hydrants shall be of wet barrel type.

Fire hydrants in shopping centers and commercial complexes shall be of the three nozzle (two 2-1/2-inch and one 4-inch) wet barrel type.

5.13 Services and Meters

Effective January 1, 2011, Residential Fire Sprinkler Systems are required by California Residential Code, Title 24, Part 2.5. A single permanent service connection shall provide water service for both the domestic water and residential fire sprinkler portions of the customer service line. The Developer's Engineer of Record (EOR) is responsible for calculating and designing the required service line and meter size based on the critical pressure and fire sprinkler and/or domestic water demands needed at each lot. The required table (See Appendix E) must be placed on the Domestic Water plans for first plan check. At the time of application for service, the customer will provide CVWD with the required domestic water and residential fire sprinkler water demands and minimum pressures for the proposed dwelling. The customer's demands will be compared against the EOR's plans for meter sizing approval.

For individual lots that are not part of a development, CVWD will check the size of the single permanent service connection and meter to meet the customer's demands and pressure requirements.

A single service connection to each individually owned premise is required. Mobile home developments are included in this requirement. CVWD owns, operates and maintains the portion of the service connection from the pipeline to the downstream side of the shut-off valve on the property owner's side of the meter-with the customer owning the remaining portion of the service line to the building.

A backflow prevention device will be required on all services that represent a potential or real hazard to the CVWD domestic water system. See Appendix H, Regulations Governing Domestic Water Service for a partial listing of the type of services requiring protection and the level of protection required.

The developer’s contractor shall install the service and meter box and shall maintain both until meter installation. CVWD will install the meter and backflow prevention device.

5.13.1 Service Lines

- Service connections to single-family residences shall be a minimum of 1 inch in diameter and in accordance with the Domestic Water Standard Specifications.
- A single service connection may be installed to each suite within a commercial/industrial building.
- A single service connection may be installed to each building within a commercial/industrial complex.
- Services or service lines shall be installed outside decorative paving areas whenever possible.
- Service connections shall be installed perpendicular to the pipelines unless prior approval is obtained from CVWD.
- **Service saddles shall be used for all service connections.**

5.13.2 Meters

The normal maximum meter size is 2-inch. Multiple 2-inch meters may be used if the demand exceeds the allowable flow rate. Meters larger than 2 inches will be permitted in special cases.

Table 5.8 Meter Sizing

Meter (Inches)	Maximum Velocity	Maximum Flow Rate
¾	10fps	30
1	10fps	50
1-1/2	10fps	100
2	10fps	150
4, 6 and 8	10fps	Case by case

*Meters shall be sized to allow the above flow rates.

All irrigation meters are sized by CVWD’s Water Management Division in accordance with CVWD’s Landscape Ordinance.

5.14 Pipe Material

Piping and appurtenances used in the domestic water system shall comply with the following general material requirements:

- Pipelines shall be cement-mortar lined (CML) ductile iron pipe.
- Fittings shall be CML ductile iron.
- Fire hydrant runs and detector check runs shall be CML ductile iron pipe.
- All pipelines, fire hydrant runs, detector check runs, service line runs, fittings, valves shall have restrained joints and have V-Bio enhanced or approved equal polyethylene encasement.

Under certain circumstances, the construction of the domestic water system shall comply with the following special requirements in addition to the general requirements listed above:

- In locations where the surrounding soil is determined to be corrosive or where the pipeline will be within shallow groundwater, CML ductile iron pipe shall also be zinc coated with restrained joints.
- In locations where the pipeline will be located under decorative paving, the valves, hydrants and fittings shall be located outside of this area, wherever possible (CVWD is not responsible for the repair or replacement of decorative pavement).
- In locations where the water pressure is or will be 110 psi or greater, the class of the pipe will be determined by CVWD.
- In locations where the pipeline will not be located under a paved street, the pipeline shall be CML ductile iron pipe with restrained joints with 48 inches of cover at final grade. Final grade shall be established prior to installation of pipeline.

Please see documents in Appendix N for reference (Pipe Materials for Non-Pressurized Pipeline Projects and Pipe Materials for Pressurized Pipeline Projects).

5.14.1 Pipe Backfill and Bedding

Backfill and bedding zones shall be as shown on Domestic Water Standard Drawing No. W-3 in Appendix H unless special consideration is required.

Special consideration shall be applied to the design of pipe bedding and backfill where soil conditions, or a high groundwater table or other factors warrant additional analysis. The developer and its engineer shall be solely responsible for determining the appropriateness of CVWD Standard Drawing W-3 for the project and for determining whether special consideration is required, and shall provide supporting calculations upon request.

5.15 Valves

Three valves are required on tees or wyes and four valves are required on crosses, excluding fire hydrant, detector check or meter manifold runs. Tees and valves at new points of connection shall match the pipe size of the new connection.

Valve size shall equal fitting diameter. If a reducer is required, the reducer shall be installed after the valve for change of pipe size.

Marker posts are required if valves or blow-offs are to be installed outside of paved areas.

Valves shall be installed outside decorative paving areas, whenever possible.

All valves shall be installed perpendicular to final grade.

No run of pipe shall exceed 1,320 feet in length without an in-line valve installed of the same diameter as the pipe for diameters less than 24 inches. For pipeline diameters 24 inches and larger the valve spacing shall be at CVWD's recommendation.

5.16 Combination Air-Release and Air/Vacuum Valves

Combination air-release and air/vacuum valves shall be installed at all high points in the pipeline where air is isolated and as specified by CVWD. The size of the combination air-release and air/vacuum valve to be installed shall conform to the chart below unless otherwise approved by CVWD.

Table 5.9 Combination Air-Release and Air/Vacuum Valves

Size of Pipeline (Inches)	Size of Combination Valve (Inches)
8	1
12	2
18	2
24	2
30 and larger	4 or as required

5.17 Blow-Off Assembly

A blow-off assembly shall be provided to facilitate draining and flushing of the pipeline where it dead-ends. A fire hydrant assembly can be utilized as a blow-off for pipelines 8 inches in diameter or larger. The blow-off shall be located in a paved street a minimum of 3 feet from the curb within a minimum of 6 feet between the gate valve and the bend. The size of the blow-off to be installed shall conform to the chart below unless otherwise approved by CVWD.

Table 5.10 Blow-Off Assembly Sizing

Size of Pipeline (Inches)	Size of Vacuum Relief Valve (Inches)
8	4
12	6
18	6
24	CVWD to determine
30	CVWD to determine

Marker posts are required if blow-offs are to be installed outside of paving areas.

5.18 Customer Pressure Reducing Valves

Pressure reducing valves shall be installed on the customer side of the meter and are the responsibility of the customer to maintain. Pressure reducing valves shall comply with the Uniform Plumbing Code, Section 608 “Water Pressure, Pressure Regulators, Pressure Relief Valves and Vacuum Relief Valves.”

Section 6

Design Criteria

Sanitation Facilities

6.1 Background

CVWD provides sanitation (wastewater) service for a large portion of the Coachella Valley including the communities of Bombay Beach, Cathedral City, Indian Wells, La Quinta, Mecca, North Shore, Palm Desert, Rancho Mirage, Thermal, Thousand Palms and other unincorporated areas. CVWD has an agreement to accept flows from a portion of Desert Water Agency’s service area in Palm Springs. CVWD’s Sanitation boundary map is located in Appendix I.

CVWD operates six (6) Water Reclamation Plants (WRPs) as shown in Table 6.1. WRP 1 and WRP 2 are smaller lagoon facilities providing service to the communities of Bombay Beach and North Shore, respectively. WRP-4 is located in Thermal and provides service to the lower portion of the sanitation system. WRP-4 discharges secondary effluent under a National Pollution Discharge Elimination System (NPDES) permit to the Coachella Valley Stormwater Channel. WRP-7 and WRP-10 provide service to the northern portions of the system and are located in Indio and Palm Desert, respectively. These facilities provide tertiary treatment and recycled water is distributed to area golf courses and other large landscape customers. WRP-9 is located in Palm Desert and its secondary effluent is used to irrigate a portion of a golf course.

Table 6.1 Water Reclamation Plants (WRPs) & Non-Potable Water

Facility	Plant Capacity (mgd)	Tertiary Treatment Capacity (mgd)	Number of Non-potable Water Customers
WRP-1	0.15	0.0	0
WRP-2	0.033	0.0	0
WRP-4	9.9	0.0	0
WRP-7 ²	5.0	2.5	2
WRP-9 ¹	0.4	0.0	1
WRP-10	18.0	15.0	13
Total	33.483	17.5	16

¹WRP-9 provides secondary treated wastewater to the Palm Desert Country Club for golf course irrigation.

²WRP-7 is located near the Coachella Canal and canal water is blended with tertiary treated wastewater to serve Sun City Palm Desert golf courses.

The collection system includes over 1,000 miles of buried pipelines and over 17,000 manholes. The majority of gravity sewers are vitrified clay pipe (VCP). There are over 150 miles of pressurized force mains receiving sewage from the 34 lift stations. The majority of the force mains are polyvinylchloride (PVC) pipe.

Sanitation System statistics can be found in the most recent edition of CVWD's Annual Report.

The Sanitation System design/construction standards and regulations for service are governed by the following documents:

- Regulations Governing Sanitation Service -Appendix I
- Sanitation Standard Specifications-Appendix I
- Sanitation General Drawing Notes-Appendix I
- Green Book
- WEF Standards
- AWWA Standards
- 2003 edition of the California Plumbing Code

6.2 Sanitation Sewer Design Capacity

In general, the sanitation sewer capacity should be designed for the estimated ultimate tributary area. Likewise, consideration should be given to the maximum anticipated capacity of different types of development.

Several factors shall be considered in determining the required capacity of sanitation/sanitary sewers (sewers). The following are examples of factors to be considered:

- Maximum peak hourly domestic sewage flow
- Additional maximum sewage or waste flow from developments
- Inflow and ground water infiltration
- Topography
- Water Reclamation Plant locations
- Pipeline excavation depth
- Lift Station requirements (Pumping)

When an area outside the development can be logically served by future extension of a proposed gravity sewer, the sewer shall extend to the tract boundary or to the end of a paved street in a manner to facilitate the future extension. Over sizing and extra depth of sewers will be required where such sewers can logically serve an upstream tributary area and extra size and/or depth are required for such future use. (See Section 1.4.3 for additional information on Oversizing).

CVWD has developed a Sanitation Collection System Hydraulic Model of the entire wastewater collection system. This model will be utilized by CVWD staff and/or a CVWD consultant to size the sanitation system facilities required for each development at the developers cost. Please refer to in Appendix A. Plan Check Submittal Application, Hydraulic Modeling checklist.

6.3 Design Flow Criteria

Sewage flow shall be based on the criteria in Table 6.2. The basis for flow is the equivalent dwelling unit (EDU) or the flow from a typical residential home.

Table 6.2 Sewage Flow Criteria

Design Item	Flow Criteria	Flow
Average Flow per EDU	Average Flow	200 gpd/EDU
Treatment Facility	Average Day Peak Month	250 gpd/EDU (200 x 1.25)
Sewer (Gravity)	Peak Hour Dry Weather Flow (d/D)	400 gpd/EDU (200 x 2.0)
Sewer and Lift Station	Peak Hour Wet Weather Flow – WRP 4	540 gpd/EDU (200 x 2.7)
Sewer and Lift Station	Peak Hour Wet Weather Flow – WRP 7	600 gpd/EDU (200 x 3.0)
Sewer and Lift Station	Peak Hour Wet Weather Flow – WRP 10	480 gpd/EDU (200 x 2.4)

Commercial/industrial flow shall be based on average wastewater flow for existing comparable uses provided by CVWD. EDUs will then be established by dividing the flow by the average flow/EDU from Table 6.2. If similar facilities are not available, CVWD will establish flow and EDUs utilizing Table A-1 which is located in Appendix I.

6.3.1 Peak Hour Design Flow

Peak hourly dry weather flows and peak hourly wet weather flows, as indicated in Table 6.2, are used for sizing gravity pipelines, force mains, and sewer lift stations, and in accordance with the criteria set forth in subsequent sections.

6.4 Sewer Pipeline Design

The criteria for the design of sewer pipeline include the design period, slope, design depth of flow and velocity. In no case shall gravity sewer pipelines be less than 8 inches in diameter.

Gravity sewers shall be stationed from the downstream connection point with stationing increasing upstream. Negative stationing referred to as "back stationing" should be avoided.

Table 6.3 represents the minimum slope for various gravity sewer pipeline sizes.

6.4.1 Slope and Velocity

Subsequent to the determination of the design flow the engineer shall use Manning's formula to calculate the required pipe size. The engineer shall quantify the relation of slope, design flow, velocity, diameter, and "n" value utilizing the criteria's set forth in Table 6.3 "Minimum Pipe Slope" and Table 6.4 "Pipe Velocities." The minimum "n" value shall not be less than 0.013 for all pipe materials.

Table 6.3 Minimum Pipe Slope

Sewer Diameter (Inches)	Slope (Foot per Foot)
4 (house lateral)	0.021
6 (house/commercial lateral)	0.021
8	0.0033
10	0.0024
12	0.0019
15	0.0014
18 and up	0.0014

Table 6.4 Pipe Velocity

Velocities	Design	Minimum	Maximum
Sewer Pipelines	3 fps	2 fps	10 fps
Force Mains	4 to 7 fps	3 fps	7 to 10 fps
Inverted Siphons	4 fps	3 fps	5 fps

6.4.2 Gravity Sewer Pipeline Sizing Criteria

Gravity sewer pipelines shall be sized such that the peak hourly dry weather flows established in Table 6.2 do not exceed the d/D ratios depicted in Table 6.5.

The designer shall also check for adequacy of gravity sewer pipelines during peak hourly wet weather flows. Surcharged conditions for the gravity sewer pipelines are acceptable during peak hourly wet weather flows, provided that the hydraulic grade line (HGL) is at least 3 feet lower than the manhole rim elevation. If the HGL is within, or higher, than 3 feet below the manhole rim elevation, the gravity sewer pipeline is considered undersized.

Table 6.5 Depth to Diameter Ratios (d/D)

Gravity Sewer Pipeline Diameter (Inches)	Maximum d/D ¹
8	d/D = 0.50, (1/2 D)
10 – 27	d/D = 0.67, (2/3 D)
≥ 30	d/D = 0.75, (3/4 D)

¹ d = depth of flow & D = diameter of sewer pipe

6.4.3 Change in Pipe Size

When a smaller sewer pipeline joins a larger sewer pipeline, the invert of the larger sewer pipeline should be lowered sufficiently to maintain the same energy gradient. See Section 6.6.1.3 “Manhole Invert Elevations” for the minimum change in grade across the manhole.

6.5 Sewer Pipeline Location

Sewer pipelines shall be located within public right-of-way (ROW), easements dedicated by tract map or specific easements or fee title land granted to CVWD. The design shall be adjusted to take into consideration utility conflicts, soils and any other factors.

6.5.1 Horizontal Alignment and Separation

The horizontal alignment in general for major, primary and secondary roadways shall be located in the center of the driving lane nearest to the centerline of the street. Considering other design limitations and construction factors, a minimum separation between sewer pipeline and other infrastructures shall be maintained. Table 6.6 represents the minimum horizontal separation from other infrastructure facilities.

Table 6.6 Minimum Horizontal Separation – Sewer Pipelines

Horizontal Separation from Sewer Pipeline	Minimum Separation
Domestic Water Pipeline ¹	10 feet
Non-Potable Pipeline ¹	10 feet
Stormwater Pipeline ¹	10 feet
Well	50 feet
Curb (Lip of gutter)/Edge of Pavement	7 feet
Horizontal Separation from Sewer Manhole or Lift Station	
Sewer Laterals	6 feet
Domestic Service Pipeline	10 feet
Well	100 feet

¹The 10 foot separation distance is measured between the outside edges (including bells) of the pipes. If the sum of the inside diameters of the two pipes is 24-inches or less, then the centerline (CL) distance between the two pipes shall be 12 feet. This will aid in layout and plan checking. If the sum of the diameters is greater than 24-inches, then the separating distance between the outside edge (including bells) shall be 10 feet.

Table 6.4 (Continued)	
Horizontal Separation from Sewer Lateral	
Water Pipeline	10 feet
Water Service Line	10 feet
Well	50 feet
Sewer Manhole	6 feet
Sewer Lateral (Opposite Direction)	2 feet
Sewer Lateral (Same Direction)	4 feet
Catch Basin	4 feet

Sewer pipeline and domestic water pipeline crossings and separations shall be in accordance with CVWD Standard Drawings W-1/S-3 and W-2/S-4 in Appendix I.

Horizontal curves are allowed by CVWD; however, not encouraged except when necessary to maintain the required separation from other infrastructure.

Table 6.7 represents the minimum pipeline radius by pipeline size.

Table 6.7 Minimum Pipeline Radius

Sewer Diameter (Inches)	Radius* (Feet)
8-10	100
12-24	145
27-36	190
39-42	290

* Standard pipe lengths. Shorter pipe lengths may be used under certain circumstances.

Shopping centers and commercial complexes shall comply with the following special requirements:

- All sewer pipelines shall be located in drive aisles
- No sewer pipelines or sewer laterals shall be located under parking spaces or islands
- All sewer laterals shall be equipped with a cleanout
- All sewer lateral cleanouts shall be located in a planter area or clear area of drive aisle.

6.5.2 Pipeline Cover and Vertical Separation

The typical minimum depth of a sewer pipeline is 7.0 feet. CVWD may allow shallower depths in special cases when approved by the Engineering Department. Depths greater than 25.0 are not allowed without approval of the Engineering Department.

Concrete encasement is required in the following cases:

- When the clearance between the outside pipe wall of the sewer pipeline and the outside pipe wall of any other structure is less than 36-inches above the sewer pipeline or 12-inches below the sewer pipeline.
- When separation between sewer pipelines, domestic water pipelines, irrigation pipelines or storm drain pipelines cannot be maintained as described in Section 64572, California Waterworks Standards, Title 22 of the California Administrative Code and shown on CVWD Standard Drawings W-1/S-3 and W-2/S-4. Any exceptions to the separation requirements described in Section 64572 shall require California Department of Public Health approval.
- When the depth of cover to the top of the sewer pipeline is less than four feet.

No vertical curves shall be permitted in the sewer.

6.6 Construction

6.6.1 Manholes

Manholes shall be installed at the intersection of sewer pipelines; at all changes in grade, size or alignment; and at the end of any sewer pipeline more than 200 feet in length.

6.6.1.1 Manhole Spacing

Manholes shall be installed on spacing not to exceed 400 feet. Sewer pipelines with a radius greater than 400 feet shall be considered as straight with manhole spacing not to exceed 400 feet. Manhole spacing on curved sewer pipelines less than a 200 foot radius shall be 200 feet. Manhole spacing on curves between 200 and 400 feet shall be adjusted proportionately and approved by CVWD. Sewer pipelines with reverse curves are required to have a manhole at the point of tangency of the curve. Standard manhole details are shown on CVWD Standard Drawings S-5 in Appendix I.

6.6.1.2 Manhole Depth and Size

The minimum manhole depth is to be 7 feet unless approved by the Engineering Department. The manhole depth is to be calculated from the proposed finished grade to the lowest pipe invert. The minimum manhole diameter size shall be as indicated in Table 6.8 "Manhole Minimum Diameter."

Table 6.8 Manhole Minimum Diameter

Sewer Diameter	Depth	MH Dia	Depth	MH Dia
8 to 24-inch	< 12 feet	48-inch	≥ 12 feet	60-inch
24-inch & larger	-	60-inch	≥ 16 feet	72-inch

6.6.1.3 Manhole Invert Elevation

For straight flow through the manhole the sewer pipeline invert elevation for pipe of the same diameter shall have a minimum of 0.10-foot drop from the entering and exiting pipe. For flows with a change in direction through the manhole of 90-degrees the sewer pipeline invert elevation for pipe of the same diameter shall have a minimum of 0.20-foot drop from the entering and exiting pipe. Junction manholes with sewers of the same diameter shall match all inlet inverts and have a minimum of 0.1-foot drop from the entering and exiting pipe.

The invert elevation for pipe of different diameters through a manhole or junction structure shall match the crown of the outlet pipe. The crown of the inlet pipe shall be at the same elevation or higher than the outlet pipe and shall have a minimum of 0.1-foot drop from the inlet and outlet pipe.

6.6.1.4 Drop Manhole

Drop manholes shall be provided for sewers entering a manhole at an elevation of 3 feet or more above the manhole invert. Where the difference in elevation between the incoming sewer pipeline and the manhole invert is less than 3 feet, the slope of the incoming sewer pipeline shall be increased to eliminate the need for the drop. All manholes shall be constructed with an outside drop connection per CVWD Standard Drawing S-8A. Inside drop connections may be permitted when the manhole is a minimum 5 feet in diameter, and when the manhole is of excessive depth and is constructed per CVWD Standard Drawing S-8B.

6.6.1.5 Special Manhole Construction Requirements

Any manhole determined to have a high potential of generating excessive sulfide gases shall be epoxy coated. Manholes identified shall include, but are not limited to, the first manhole originating from a sewer trunk main 15-inches in diameter or larger, force main transition manholes, drop manholes, or as determined by CVWD.

Residential properties with services located at the end of cul-de-sacs or when the sewer is greater than 10 feet deep may connect to manholes providing that no more than four (4) 4-inch house lateral are installed. The maximum angle between the residential 4-inch lateral and the manhole is 45-degrees.

Manholes located in any nonresidential area shall have a sealed manhole frame and cover, bolted-down type, in accordance with CVWD Standard Drawing S-10A and S-10B and shall also be noted on the drawings.

6.6.2 Cleanouts

Cleanouts shall be installed at the end of a sewer if the distance from a manhole is less than 200 feet.

Six-inch diameter house laterals shall be equipped with a cleanout at the property line or curb. If the City or County requires a cleanout at the curb or property line, it may be substituted for the required cleanout by the CVWD. The drawings shall be so noted.

6.6.3 Gravity Sewer Pipe Material

Generally available pipe materials commonly used for gravity sewer pipe installations are suitable for use in CVWD's system. Each pipe material, lining, and coating should be evaluated for the given site and soil conditions, installation challenges, and conditions of service of the project. Materials for consideration for both flexible and rigid pipe systems include:

- Flexible Pipes:
 - Thermoplastic-based materials including polyvinyl chloride (PVC), high-density polyethylene (HDPE), and polypropylene (PP)
 - Thermoset plastic pipe or fiberglass composite-based materials
- Rigid Pipes:
 - Vitrified Clay Pipe (VCP)
 - Reinforced Concrete Pipe (RCP) with a corrosion resistant liner

Selection between flexible and rigid pipe and the different types of materials within these categories depends on many factors. Flexible pipe may provide certain advantages when the pipe is subjected to ground movement due to soft soil conditions or due to potential seismic hazards such as liquefaction. Certain rigid pipes may provide advantage in terms of resistance to corrosive environments or other factors. The proposed pipe material should also be evaluated based on exterior and interior protective coatings that are best suited for the project's specific site conditions.

Please see documents in Appendix N for reference (Pipe Materials for Non-Pressurized Pipeline Projects and Pipe Materials for Pressurized Pipeline Projects).

6.6.4 Pipe Backfill and Bedding

Backfill and bedding zones shall be as shown on CVWD Standard Drawing S-2 and S-7 in Appendix I unless special consideration is required.

Special consideration shall be applied to the design of pipe bedding and backfill where soil conditions, high groundwater table or other factors warrant additional analysis. The developer and its engineer shall be solely responsible for determining the appropriateness of CVWD Standard Drawing S-2 and S-7 for the project and for determining whether special consideration is required, and shall provide supporting calculations upon request. Table 6.9 provides a comparison of pipe material with pipe size, native soil class, and proposed depth of bury. Alternative trench designs can extend the range of applicability, but the design should consider soil-structure interaction in order to develop the proper trench configuration.

Table 6.9 Pipe Selection – Maximum Cover Depth versus Soil Stiffness Class

Pipe Material	Size Range (inches)	Maximum Depth (feet)	Native Soil Conditions			
			Class II	Class III	Class IV	Class V
VCP	8 - 36	30	30	20	Alt Design	Alt Design
RCP	39 - 96	30	30	20	Alt Design	Alt Design
PVC – SDR 35	8 - 24	20	20	15	Alt Design	Alt Design
PVC – SDR 26	8 - 15	25	25	20	Alt Design	Alt Design
PVC – Profile Wall	18 - 36	35	35	20	Alt Design	Alt Design
HDPE – Solid Wall	18 - 36	20	20	15	Alt Design	Alt Design
HDPE – Profile Wall	72 - 96	35	35	20	Alt Design	Alt Design
CFFRM (HOBAS®)	18 - 96	50	50	20	Alt Design	Alt Design
GRP (Flowtite®)	12 - 96	50	50	20	Alt Design	Alt Design

6.6.5 Sewer Laterals

The sewer lateral is comprised of two components—the house lateral (from wye at the sewer to the property line) and the building sewer (from the property line to the building). The customer is responsible for the operation and maintenance of both components of the sewer lateral. CVWD does not allow the installation of sewer laterals in driveway areas except in certain cases in cul-de-sacs. In this special case, an offset cleanout must be installed with the cleanout located adjacent to the driveway.

Sewer laterals shall be installed to each dwelling unit or commercial unit except for multistory structures and apartments. Four-inch diameter sewer laterals shall be installed for single dwelling units and 6-inch diameter or greater sewer laterals shall be installed for other customers depending on sewage flow.

Depth of house laterals shall be sufficient to provide service to the lowest or most distant point to be served on each lot at a minimum grade of two percent with not less than one foot of cover over the top of the pipe. The minimum depth of the house lateral at the curb or edge of pavement shall be 4.0 feet.

In areas where CVWD has approved the depth of the sewer to be less than 7 feet, the invert of the lateral at the wye of the street sewer shall be indicated at the curb or edge of pavement and include the finish surface elevation of the lot to be served and shall be so noted on the drawings.

6.6.6 Facility Location Markers

Marker posts shall be installed at manholes, force mains and cleanouts located outside of paved areas in accordance with CVWD Standard Drawings W-27/S-38.

6.6.7 Source Control and Wastewater Pretreatment

CVWD shall evaluate all non-residential sewer lateral installations to determine the need for wastewater pretreatment and sampling equipment based on information provided in the sanitation service application. CVWD may require the installation and maintenance of such equipment to conform to CVWD Regulations Governing Sanitation Service.

6.6.7.1 Grease Interceptors

A grease interceptor shall be required for any business having the potential of discharging grease into a public sewer. Prior to service connection, an applicant shall submit to the Source Control Department, stamped plans for Plumbing, Equipment, Fixtures and Drainage of building. CVWD will review for approval, the grease interceptor's attached appurtenances, location, sizing and installation requirements. CVWD will consider minimum requirements contained in the 2003 edition of the California Plumbing Code when approving interceptors. The minimum size of grease interceptor shall be 750 gallons.

6.6.7.2 Oil/Sand Interceptors

Any type of business where oil/sand may be discharged into a public sewer shall have an interceptor. Prior to service connection, an applicant shall submit to the Source Control Department stamped plans for Plumbing, Equipment, Fixtures and Drainage of building. CVWD will review for approval, the oil/sand interceptor's attached appurtenances, location, sizing and installation requirements. CVWD will consider minimum requirements contained in the 2003 edition of the California Plumbing Code when approving interceptors. The minimum size of oil/sand interceptor shall be 750 gallons.

6.6.7.3 Interceptors

Any type of business where lint may be discharged into a public sewer shall have an interceptor. Prior to service connection, an applicant shall submit to the Source Control Department, stamped plans for Plumbing, Equipment, Fixtures and Drainage of building. CVWD will review for approval, the lint interceptor's attached appurtenances, location, sizing and installation requirements. CVWD will consider minimum requirements contained in the 2003 edition of the California Plumbing Code when approving interceptors. The minimum size of Lint Interceptor shall be 500 Gallons.

6.6.8 Business Sewer Lateral for Grease, Lint, Oil or Sand Interceptors

The Business sewer lateral is comprised of two components—the lateral (from the wye at the sewer main in the street to the property line) and the building sewer (from the property line to the building). The customer is responsible for the operation and maintenance of both components of the sewer lateral. CVWD does not allow the installation of sewer laterals in driveway areas except in certain cases in cul-de-sacs. In this special case, an offset cleanout must be installed with the cleanout located adjacent to the driveway.

A single lateral may be utilized for both the buildings regular sewer and interceptor sewer discharge pipeline provided the following criteria exists: 1) the regular sewer pipeline (on-site sewer pipeline conveying only raw sewage) is connected between the interceptor and the end of lateral at the property line, 2) the regular sewer does not exceed the flow rate approved, and 3) the building sewer lateral is for the purpose of one place of business. Any business discharging non-residential wastewater to the sewer may be required to install a sampling station downstream of all service connections to the sewer lateral.

6.7 Lift Stations

Lift stations will only be allowed under unusual conditions in locations that cannot be served by a gravity sewer. It is the responsibility of the developer's engineer to demonstrate that a sewer lift station is the most practical means for conveying sewage into the existing CVWD sanitation system.

The following represents the general design criteria for a sewage lift station facility. It is essential that the developer's engineer meet and confer with CVWD prior to any analysis or preliminary lift station design. Each phase shall be reviewed and approved by CVWD from capacity analysis to preliminary and final design. CVWD reserves the right to modify, change and/or supplement the following in an effort to accommodate changing regulatory requirements, location restrictions, and/or provide for lift station expansion.

6.7.1 Lift Station Location

The lift station should be located at least 100 feet from any buildings or houses and a buffer zone of at least 25 feet should be established between the lift station fence and its surrounding environment.

No portion of the site shall be located within the floodway zone. All parts of the station and the access roadway shall be located a minimum of 2 feet above the 100 year floodplain elevation as shown on FEMA FIRM maps.

Rural lift stations shall have an access road of a minimum of 20 feet wide with a 6-inch layer of class II aggregate base. Urban lift stations shall have the same access width and the access road shall be paved with asphalt concrete. The lift station property shall be adequately sized to provide sufficient space for future bio filter beds and odor control equipment. All lift stations shall have a minimum vehicle turning radius of 42 feet. At stations requiring the use of a crane to pull pumps and other equipment, the turn-around provisions and access points shall be revised accordingly.

The lift station site, including all slabs, equipment, and utilities shall be enclosed within the minimum height block wall of 6 feet. All items located within the lift station shall be at least five feet from the wall.

The station shall include one high pressure sodium type security light mounted on a pole at least 15 feet above the ground, or as directed by CVWD.

At locations where water is available, a $\frac{3}{4}$ -inch hose bib shall be provided for washing down the wet well. All water services shall include a backflow prevention device in an above-ground enclosure.

The lift station site plans shall clearly identify the proposed lift station equipment, future lift station equipment and existing topo features as called out in this section.

Provide complete topographic and control surveying and record of survey as required for design and construction. Identify and locate all existing above ground facilities and utilities. Pothole, locate and identify underground facilities and utilities impacted by the project including all connection points to existing facilities and utilities. All survey information must utilize benchmarks recognized by CVWD, and all elevations are per 1929 datum. All survey control points used for the project must be listed and shown on the drawings with coordinates.

A geotechnical investigation shall be conducted to consider the impacts to design and construction of the lift station, especially when high ground water levels are anticipated at the site. Based on the investigation results, the report shall provide design parameters for the project and include design details for buried pipes. In addition, recommended means for site dewatering and shoring during construction shall be provided if necessary. The report shall be prepared and sealed by an engineer or geologist registered in the state of California.

6.7.2 Lift Station Capacity

Lift stations shall be designed for the peak hour wet weather flow with the largest pump unit out of service. During the design phase, the future flow capacity shall be compared to the initial project design flows capacities, special consideration shall be given to wet well retention time and pumping equipment operational parameters so that they are not exceeded.

The engineer shall provide to CVWD the complete hydraulic analysis and calculations for the above criteria. Included with the submitted calculations shall be the system and pump curves and the required capacities for initial and ultimate flows.

6.7.3 Lift Station Design

Pumps shall be capable of passing 4-inch diameter solids. All pump equipment will be manufactured and supplied by the same company.

All pumps and motors shall comply with the applicable provisions of the Hydraulic Institute, ASTM, and ANSI. All electrical equipment shall comply with the National Electrical Code and be Underwriters' Laboratories (UL) labeled.

Each submersible pump shall utilize a base elbow connection and stainless steel dual tubular sliding guide rail system. The guide rail system shall be designed to permit the installation and removal of the pump from the base elbow discharge connection without having personnel enter the wet well. Each pump shall be fitted with a stainless steel cable or chain of sufficient strength and length to permit the installation or removal of the pump for maintenance and or inspection.

Table 6.10 Lift Stations

Lift Station	
Capacity	Peak Hourly Wet Weather Flow
Emergency Storage	Minimum 6 feet from high water alarm to influent sewer pipe invert. Depth to be determined by CVWD.
Operation	Lead/lag
Maximum Pump Cycles	6 cycles/hour
Pump Discharge Piping	4 to 10 fps

6.7.4 Wet Well Design

The wet well for dual and three pumps shall be a minimum diameter of 10 feet or a concrete rectangular vault, cast-in-place concrete constructed watertight, with concrete base and cover. The rectangular vault structures and sizes will be reviewed on a project specific basis. All metal appurtenances inside the wet well shall be stainless steel unless otherwise directed by CVWD.

The wet well design and detention time shall be such that the deposition of solids is minimized and the sewage does not become septic. An interior protective coating shall be required for the prevention of hydrogen sulfide corrosion of the structure.

A grout fillet shall be properly designed and constructed around the full circumference of the wet well's bottom to direct grit and other solids to the pumps. The slope of this fillet shall be at least 1:1. The inner diameter of this "grout circle" shall be as recommended by the pump manufacturer for the specified pump and approved by CVWD, but in general should be as small as possible without creating a vortex condition around the pumps. The inner "grout circle" shall be centered around the pumps.

The wet well shall also incorporate an emergency storage design at peak hour design flow from the high water alarm to the invert of the influent sewer. In no case shall this distance be less than six feet. CVWD shall determine the required storage volume.

No more than one influent sewer shall enter the wet well, and it shall be located opposite the pumps.

Located adjacent to the wet well shall be a concrete pump wash down pad. The wash down pad shall be provided with a drain and P-trap that drains directly back into the wet well. The pump wash down pad and the discharge manifold slab can be designed together (see 6.7.5) as long as there is sufficient space.

6.7.5 Discharge Piping and Valves

Discharge piping from each pump shall exit the wet well to a valve vault or if specifically approved by CVWD to an above ground discharge manifold for easy access to the valves, piping and flow meter. The above ground piping and valves shall be painted gray to indicate it as a sewage (wastewater) pipeline. A by-pass shall also be furnished with a valved connection to the force main beyond the pump isolation valves for emergency pumping. The manifold shall have a concrete slab that slopes to a 6-inch drain with a stainless steel drain cover. The slab drain shall connect directly to the wet well with an inline P-trap. The slab shall be designed to insure that any liquid from seepage, routine piping and valve maintenance will be drained back to the wet well.

Each lift station shall be provided with a magnetic flow metering device to monitor the discharge flow from the lift station. The discharge piping shall be configured with a straight run of piping (no valves, tees, or reducers) equal to 10 diameters upstream and at least six diameters downstream of the flowmeter or as directed by the flowmeter manufacturer to achieve an acceptable flow pattern through the flowmeter.

6.7.6 Odor Control

The engineer shall consider the need for odor control facilities in the design of the lift station (i.e. bio filter bed, air scrubbers, chemical additives, aeration). Additionally, the engineer shall provide odor analysis considering the average and maximum detention time in the wet well. Each odor control analysis shall include CVWD's preferred bio filter beds odor control system as one of its alternatives. The odor control analysis shall be provided to the CVWD with CVWD selecting the final odor control system. A permit to construct and operate odor control facilities must be obtained from the Air Quality Management District. If odor control is determined not to be required, the lift station shall be designed for the addition of future odor control facilities (i.e. ventilation pipe stubbed out from the wet well).

6.7.7 Control and Telemetry

The sewer lift station pump operation will automatically alternate the pump sequencing (lead/lag operation) to balance pump wear during operation. Pumps set points are to be actuated at predetermined wet well levels as defined in the engineers design report for the lift station. The wet well levels and alarms shall be controlled by a redundant control system.

The lift station shall incorporate a radio telemetry system that is to be capable of automatically contacting the CVWD in cases of emergency (i.e. power failure or pump failure).

6.7.8 Emergency Standby Power Facilities

The project site shall provide adequate space for a diesel fueled standby generator in a recessed concrete structure. The generator shall be sized to operate at connected load (full site load) of the designed station. The standby power project fees shall include applicable Air Quality Management District application fees, one-full fuel tank, sound attenuation enclosure testing and installation of CVWD's specified equipment.

The concrete recessed structure (approximately 32 feet x 18 feet) shall include but is not limited to exterior lighting, receptacles, safety rails, stairs, drain sump pumps, automatic sump pump controls and drain filtration system (manufactured to control infiltration of oils and other contaminates from entering the ground water system). The recessed structure shall provide reduced viewable generator height from the public. Vehicle access (20-feet) shall be available on the longer side of the recessed structure.

In order for the internal combustion engine to operate the electric generator, a permit to construct and operate must be obtained from the Air Quality Management District having jurisdiction. Permitting fees and engine procurement are greater if the project site is within 1,000-feet of an existing school.

The internal combustion engine operated generator shall be enclosed in a weather resistant sound attenuated metal enclosure. The metal enclosure shall reduce the engine noise to 75-dBA at 23-feet from the generator when operating at full load in all directions from the generator.

The generator shall be equipped with a fuel tank mounted on the same base rails as the generator and its metal enclosure. The fuel tank shall be sized to allow full load operating condition for a period not less than 12-hours minimum.

6.7.9 Electrical and Power Equipment Building

Depending on the lift station site, CVWD may require a block building to house electrical equipment, the emergency generator or other equipment. If a building is required, the design should reflect the architectural character and features of buildings in the vicinity of the lift station. For example, a building with a southwestern style incorporating a Mansard roof with clay tiles would be considered.

6.8 Force Mains

The size of the sewer force main shall be determined during the design phase of the lift station. Force mains shall be designed for peak hour wet weather flow, as indicated in Table 6.2. If the initial capacity of the lift station is considerably less than ultimate, consideration should be given to the undesirable effect of prolonged detention times within the force main. The engineer shall evaluate in these situations the feasibility of installing dual force mains to accommodate initial and ultimate flows. In no case shall a force main be less than 6-inches in diameter. The discharge from the lift station shall be into another force main, lift station receiving wet well, a receiving gravity sewer manhole or into the wastewater treatment plant. Force mains that discharge directly to a receiving manhole shall be epoxy coated on the interior or PVC lined for corrosion protection.

The force main and lift station design shall also consider and include facilities to eliminate or sufficiently dampen transient forces and/or surging in the event of power failure or an immediate station shutdown. Lift stations designed with a total dynamic head above 100 feet or force main velocity above 4 feet per second shall be evaluated to determine the need for hydraulic cushion check valves. If indicated, check valves shall be equipped with a hydraulic cushion to dampen the valve closing action. The hydraulic-cushion check valve shall be fully adjustable to control the valve closing speed. Details shall be included in the improvement plans.

The developer's engineer shall evaluate the need for odor control facilities for all force mains.

6.8.1 Force Main Pipeline Sizing Criteria

Force main velocity criteria is used in order to provide velocities that re-suspend solids when the duty pump or pumps are in operation. The maximum velocity for force mains are used to prevent scour, excessive water hammer, and minimize electrical usage. Force main velocities design criteria and limits are listed in Table 6.11.

Table 6.11 Sewer Force Main Design Criteria

Design Criteria	Standard		
	Minimum (fps)	Recommended (fps)	Maximum (fps)
Velocity			
Any Size	3	4 to 7	7 to 10
Maximum Head loss			
18-inch & larger	1 psi /1,000 feet of pipeline		
Pressure			
Operating	40 to 80 psi		

The Hazen-Williams Coefficient (C) values to be used for calculating force main friction losses shall be C=130 for old pipes and C=150 for clean new pipes. The pumping plant and force main must be designed to accommodate variations expected during the life of the system (as in flows, service area, age of pipe etc.). The roughness constant (C) shall be determined on a case by case basis by CVWD.

6.8.2 Force Main Cover and Alignment

Force mains shall have a minimum cover of 4.0 feet and a maximum cover of 12.0 feet from the proposed finish grade to the top of pipe. High points in the force main should be minimized along the alignment. A wastewater air release and air/vacuum valve shall be installed in a vault and shall be located at each high point on the force main. At major low-points a manually controlled drain valve shall be installed in a manhole to allow for cleaning or draining. The force main shall discharge at an elevation not more than 2 feet above the invert of a separate receiving manhole having no upstream gravity sewer connections.

The design of the force main alignment shall use 45-degree elbow fittings to reduce the potential for stoppages where a 90-degree change of direction in the force main is required. The engineer shall show and specify two 45-degree elbows on the improvement plans. Thrust blocks are to be used at all bends on the force main and they shall be constructed against undisturbed soil.

All PVC force mains shall utilize an Electronic Marker System (EMS) manufactured by 3M or an approved equal. Mid-range pipe locators shall be placed on the force main at 500 foot intervals, at horizontal changes in alignment and as directed by the CVWD.

6.8.3 Force Main Pipe Material

All sewer force mains shall be polyvinyl chloride pipe (PVC) pipe meeting AWWA C-900 or C-905. Force mains shall be water pressure tested in accordance with Section 306-1.4.5 of the Green Book. In locations where the sewer system is to be installed in non-corrosive soils and in unimproved areas or in parking lots, construction shall comply with the following special requirements:

- a) Pipelines smaller than 12-inches shall be a minimum of C900-Class 150-DR 18 PVC pipe in accordance with AWWA C900
- b) Pipelines 18-inch through 42-inch diameter shall be a minimum of C905-CL165-DR25 PVC pipe in accordance with AWWA C905.

6.8.4 Force Main Valves

Force main valves smaller than 36-inch shall be ball-centric plug valves by Dezurik. Any valves required for pipelines larger than 36 inch will be as directed by CVWD.

Marker posts are required if valves are to be installed outside of paved areas.

No valves shall be installed in decorative paving areas.

All valves shall be installed perpendicular to final grade.

6.8.5 Force Main Fittings

Fittings for force main pipelines shall be made to fit appropriate size and corrugation patterns and shall comply with section 207-9.2.3 of the Sanitation Standard Specification (see Appendix I).

Fittings include in-line joint fittings such as couplers, bends, tees or reducers. Fittings shall not reduce or impair the overall integrity or function of the pipeline.

Drawings shall depict all fittings, including all stationing and types.

6.8.6 Combination Air and Vacuum Relief Valves

Air vacuum valve assemblies shall be installed at all high points along the pipeline as shown on CVWD Standard Drawings S-40 and S-40B in Appendix I. At the high point of all vertical deflections, an air/vacuum valve will be required on the high side of the siphon.

Two-inch combination air and vacuum relief valve assemblies shall be installed on all sewer force mains greater than 8-inches in diameter. Larger sized combination air and vacuum relief valves will be required as directed by CVWD.

6.8.7 Thrust Restraint – Force Mains

Thrust restraint shall be designed in accordance with CVWD Restrained Joint Guidelines (Appendix H). The type of restrained joint shall be per CVWD Standard Specifications for Sanitation Systems.

6.9 Inverted Siphons

Inverted siphons are considered special structures and are designed to convey sewage flows (liquid and gas) across obstructions. These obstructions can be flood control channels, streams, depressed highways, irrigation channels and other obstructions. Every effort during design should be made to avoid sewer siphons due to high maintenance requirements and odor problems. Inverted siphons are known to have difficulty passing floating material and grease. These materials become easily trapped in the upstream manhole structure. When feasible, inverted siphons shall include airlines (sometimes referred to as “air jumpers”) between the upstream and downstream manholes. The air jumper is used to convey sewer gases across the siphon and can also serve as an overflow if the siphon becomes plugged. The design of inverted siphons and airlines are to ensure proper function during the design period of the system, to be fail-safe and to minimize maintenance and odors.

Inverted siphons shall be approved by CVWD in concept prior to preparation of drawings.

6.9.1 Inverted Siphon Location

Inverted siphons and airlines should be located completely within public right-of-way. If unavailable, an easement or other limited right-of-entry location may be adequate. In all cases, the right-of-way shall provide adequate clearances to not only contain the physical structures, but also allow vehicles, workers and equipment to enter and perform any construction, inspection, flushing, repair, maintenance and operational activity.

6.9.2 Inverted Siphon Design

Inverted siphons shall not have less than two barrels, with a minimum conduit size of 8 inches. A conduit less than 8 inches will be difficult to maintain, clean and operate, and will in turn result in clogging, higher maintenance costs and failure. One redundant barrel shall always be provided for bypass capacity, for emergencies, and for use when another barrel is taken out of service for maintenance or repairs. Dual barrels installed, shall be the same size, each one capable of conveying the full design flow rate.

The hydraulic capacity of an inverted siphon shall not be less than the capacity of the sewer system upstream of the inverted siphon. Hydraulically, inverted siphons shall be designed for the average daily flow with a preferred minimum

velocity not less than 4 fps, and an absolute minimum velocity of 3 fps. Velocities less than these are non-self-cleaning velocities which may allow material to deposit in the conduit, which in turn will result in blockages, higher maintenance costs and a shorter life. The daily peak hour flow shall provide a minimum velocity of 4 fps at least once a day.

6.9.3 Invert Siphon Structures

Inverted siphon inlet and outlet structures shall be designed so that the peak daily design flow can be diverted from one barrel to the other, and so either barrel may be taken out of service for cleaning or maintenance.

Section 7

Design Criteria

Irrigation and Drainage Facilities

7.1 Background

The Irrigation and Drainage system is comprised of the Coachella Branch of the All-American Canal (Coachella Canal), Protective Works (Flood Protection Dikes and Channels), Irrigation Distribution System and the Agricultural Drainage System (Drainage System). The United States Bureau of Reclamation (USBR) owns the Coachella Canal, Protective Works, and Irrigation Distribution System. CVWD owns the Drainage System and operates and maintains the Coachella Canal, Protective Works, Irrigation Distribution System and Drainage System.

The Coachella Canal conveys Colorado River water to the Coachella Valley from the All-American Canal near Yuma, AZ. It begins at Drop No. 1 on the All-American Canal and extends north 123 miles to the Coachella Valley and terminates at Lake Cahuilla in La Quinta. At the All-American Canal turnout, the Coachella Canal has a capacity of 1,500 cubic feet per second (cfs) or 2,975 acre-feet/day. The design capacity of the Coachella Canal decreases in proportion to lower deliveries as it traverses towards the terminus of the canal at Lake Cahuilla in La Quinta.

The Irrigation Distribution System includes a system of 485 miles of irrigation pipelines (laterals) which distribute water to 40-acre blocks of land within Improvement District No. 1 (ID1). ID1 was formed for the purpose of funding the contract repayment obligations and the operation and maintenance costs for the Coachella Canal, Protective Works, Irrigation Distribution System and Drainage System. A map of ID 1 and the Irrigation Distribution System is located in Appendix J.

The Drainage System includes a system of 21 miles of open drains and 166 miles of drain piping which transport agricultural drainage water from private tile drain systems to the Coachella Valley Stormwater Channel and the Salton Sea. A map of the Drainage System is located in Appendix J.

Irrigation and Drainage System statistics can be found in the most recent edition of CVWD's Annual Review.

The Irrigation and Drainage System design/construction standards and regulations for service are governed by the following documents:

- Regulations Governing Irrigation and Drainage – Appendix J (under construction)
- Irrigation Standard Specifications-Appendix J
- Drainage Standard Specifications - Appendix J
- Irrigation and Drainage General Drawing Notes-Appendix J
- Standard Specifications for Public Works Construction (Latest Edition)

- AWWA Standards

7.2 Flow Criteria

The following sections describe the development of flow and hydraulics for the original Irrigation and Drainage Systems.

7.2.1 Irrigation Distribution System

The Irrigation Distribution System was originally designed to provide a delivery point at the high point of each 40 acre parcel. The irrigation laterals supplying the 40 acre parcels were sized assuming a flow per acre as depicted in Table 7.1.

Table 7.1 USBR Irrigation Distribution System-Flow/Acre

Acres	Flow (Q) (cfs) ³
0-120	3.0 ¹
120-240	6.0 ²
240-1,000	Acres/50 + 3.0 cfs
1,000 – 1,150	23 cfs
1,150 and greater	Acres/50

¹ Use 6.0 cfs if serving more than 3 deliveries

² Use $\frac{\# \text{ of ACRES}}{50} + 3.0 \text{ cfs}$ if serving more than 6 deliveries

³ Where $\frac{\# \text{ of Acres}}{50}$ for incoming pipe is greater than the sum of capacities of outlet pipes at a division point, use sum of outlet capacities for incoming pipe.

Baffle stands are located every 1,320 feet to create the head required for each delivery point. The head at the delivery point is determined by using the Factors For Pipeline Design Table (see Appendix J) that provides for a range of 2.0-6.0 feet of head at the high point depending on elevations throughout the 40 acre parcel.

Irrigation pipelines can be designed using the Darcy-Weisbach, Scobey or Hazen Williams formulae. Velocities shall not be greater than 4.0 feet per second. Pipe and fitting friction losses must be minimized to ensure adequate head at the point of delivery. Typically this ranges from 0.1 to 5.0 feet of headloss per 1,000 feet of pipe. The USBR now utilizes a hydraulic model to size irrigation laterals to ensure proper hydraulics and economics.

7.2.2 Drainage System

The CVWD drainage system was originally designed to provide a connection to the private tile drain system at the low point of each 80 acre parcel. The private tile drain system is owned, operated and maintained by the property owner. An

empirical drainage flow equation was developed using on-field data which automatically compensates for the soil conditions in the lower Coachella Valley. The drainage flow equation is:

$$q = 50 \times L^{-0.25} \text{ (up to 960 acres)} + 0.1 \text{ cfs/acre (beyond 960 acres)}$$

q = drainage flow in gallons per minute (gpm) per 1,000 feet of farm tile
L = length of tile/1,000 feet

This equation was further expanded to provide drainage flow from various parcel sizes in order to design the CVWD drainage system. It was assumed there are 162.5 feet of private tile drain per acre. The Farm Drain Tile Discharge Table provides the drainage flow for a variety of acreages and is located in Appendix J. Examples of drainage flows are shown below:

40 acres = 0.4 cfs
80 acres = 0.7 cfs
1,000 acres = 5.0 cfs
5,000 acres = 14 cfs

In 1981, the National Resource Conservation Service (NRCS) of the United States Department of Agriculture (USDA) developed Guidelines For On-Farm Subsurface Artificial Drainage Systems. These guidelines provided a more enhanced approach to designing private tile drain systems. The sizing and spacing of private tile drains is based on the Coachella Valley Field Soil Survey which includes subsurface soil information every 660 feet or about 9 borings per 40 acre parcel. The Guidelines For On-Farm Subsurface Artificial Drainage Systems are located in Appendix J.

The CVWD drainage system piping is sized using the Manning equation assuming full pipe. The minimum slope allowed is 0.0014 ft/ft

The minimum depth to the top of the CVWD drainage system piping is 7.0 feet. The drain must be installed in a gravel filter envelope (minimum of 3-inches around the pipe) designed according to USDA-NRCS specifications. Developers that connect to the CVWD drainage system shall comply with the requirements of the State irrigated lands regulatory program as implemented by the Colorado River Basin Regional Water Quality Control Board.

7.3 Distribution Zones

7.3.1 Irrigation Distribution Zones

There are six distinct service zones within the ID1 distribution system. These zones were determined based on the locations of the parcels served and the ability to schedule water deliveries.

The canal conveyance system is designed as a gravity system dropping approximately one foot per mile for its entire 123 mile length. For example, Service Zone 1 is from Milepost 88.6 to Milepost 97.0 and therefore, the hydraulic grade line of the canal drops 8.4 feet within that zone. The hydraulic grade line of the canal is used to convey the water via gravity through the closed piping irrigation lateral system. Table 7.2 provides the irrigation laterals by zone along with the design flow capacity. Please refer to the Irrigation System map in Appendix J.

Table 7.2 Water Service Distribution Zones

Service Zone	Canal Milepost (MP)	Canal turnouts	Design Q (cfs)
Zone 1	MP 88.6 - MP 97.0	Lateral 88.6 Lateral 91.4 Lateral 92.0 Lateral 93.0 Lateral 94.2 Lateral 95.2 Lateral 95.6 Lateral 96.1 Lateral 97.0	Q = 17.3 Q = 29.2 Q = 9.0 Q = 65.1 Q = 85.6 Q = 6.0 Q = 6.0 Q = 6.0 Q = 80.6
Zone 2	MP 98.0 - MP 105.0	Lateral 98.0 Lateral 99.4 Lateral 99.8 Lateral 100.9 Lateral 101.3 Lateral 102.3 Lateral 102.7 Lateral 103.0 Lateral 103.7 Lateral 104.4 Lateral 105.0	Q = 60.6 Q = 14.6 Q = 86.3 Q = 16.5 Q = 23.0 Q = 23.0 Q = 3.0 Q = 11.0 Q = 13.8 Q = 9.0 Q = 9.4
Zone 3	MP 105.7 - MP 118.1	Lateral 105.7 Lateral 106.3 Lateral 106.9 Lateral 107.3 Lateral 108.2 Lateral 108.3 Lateral 109.2 Lateral 109.8 Lateral 110.2 Lateral 111.2 Lateral 111.7 Lateral 111.9 Lateral 112.2	Q = 23.0 Q = 17.0 Q = 6.0 Q = 17.9 Q = 37.1 Q = 3.0 Q = 13.4 Q = 9.8 Q = 6.0 Q = 3.0 Q = 12.4 Q = 3.0 Q = 9.7
Zone 3	MP 105.7 – MP 118.1	Lateral 112.2	Q = 9.7

Service Zone	Canal Milepost (MP)	Canal turnouts	Design Q (cfs)
		Lateral 112.5 Lateral 112.7 Lateral 112.7A Lateral 113.7 Lateral 113.9 Lateral 114.3 Lateral 114.8 Lateral 115.3 Lateral 115.6 Lateral 115.9 Lateral 116.1 Lateral 116.6A Lateral 117.1 Lateral 117.6 Lateral 117.8 Lateral 118.0 Lateral 118.0A	Q = 3.0 Q = 11.8 Q = 3.0 Q = 3.0 Q = 3.0 Q = 6.0 Q = 3.0 Q = 3.0 Q = 24.8 Q = 14.0 Q = 16.6 Q = 12.9 Q = 36.6 Q = 30.0 Q = 8.6 Q = 50.4 Q = 3.0
Zone 4	MP 118.3 - MP 120.8	Lateral 118.7 Lateral 118.9 Lateral 119.2 Lateral 119.6 Lateral 119.64 Lateral 119.65 Lateral 119.7 Lateral 120.8	Q = 23.0 Q = 3.0 Q = 30.2 Q = 3.0 Q = 182.6 Q = 20.6 Q = 6.0 Q = 58.4
Zone 5	MP 121.3 - MP 123.45	Lateral 120.0 Lateral 120.3 Lateral 120.6 Lateral 121.3 Lateral 121.6 Lateral 122.7 Lateral 123.45	Q = 6.0 Q = 3.0 Q = 3.0 Q = 3.0 Q = 37.8 Q = 21.2 Q = 230.6
Zone 6	MP 97.1 (Oasis System)	Lateral 97.1	Q = 270.0

7.3.2 Irrigation Distribution Pumping Plants

Certain portions of the Irrigation Distribution System cannot be served by gravity and required booster pump stations. Table 7.3 lists the booster pump stations by Service Zone.

Table 7.3 Irrigation System Booster Pumps Stations

Service Zone	Distribution Pumping Plants	Design Capacity (cfs)
Zone 1	NONE	
Zone 2	NONE	
Zone 3	L-1 L-2 L-3 PS113.2 PS114.3 (Out of Service) PS115.3	Q = 16.6 Q = 50.4 Q = 31.8 Q = 9.0 Q = 7.8 Q = 3.0
Zone 4	L-4 PS119.2A	Q = 58.4 Q = 3.0
Zone 5	E-3 E-5	Q = 6.0 Q = 15.8
Zone 6	O-1 O-2 O-3 O-4 O-5 O-6 O-7	Q = 20.4 Q = 6.0 Q = 10.2 Q = 15.4 Q = 3.0 Q = 7.4 Q = 6.0

7.3.3 Drainage System Distribution System

The Drainage System has 32 closed pipe drains and 5 open channel drains that discharge into the Coachella Valley Stormwater Channel. In addition, there are 21 open drains that discharge directly into the Salton Sea. Please refer to the Drainage System map in Appendix J.

7.4 Irrigation and Drainage Pipeline Requirements

7.4.1 Irrigation Pipeline Requirements

Irrigation pipelines shall be polyvinylchloride (PVC) in the sizes of 10, 12, 18, 24, 30, 36 or 42-inches in diameter. Irrigation pipelines shall be Ductile Iron Pipe (DIP) in sizes greater than 42-inch. A Hazen-Williams Coefficients (C) of 110 shall be used for hydraulic analysis.

A hydraulic analysis must be provided that demonstrates that the new pipeline capacity is consistent with the original system design capacity.

7.4.2 Drainage Pipeline Requirements

Drainage pipelines shall be perforated High Density Polyethylene (HDPE) in the sizes of 8, 12, 18, 24, 30 and 36-inches in diameter. Drainage pipelines shall have a full circular cross section with an outer corrugated pipe wall and smooth inner wall and perforated side wall. HDPE pipelines shall have integral bell and

spigot water tight joints with elastomeric gaskets and shall be as manufactured by Advanced Drainage Systems (ADS) Model N-12 or approved equal.

Table 7.4 represents the minimum slope for various drainage pipeline sizes.

Table 7.4 Minimum Pipe Slope

Diameter (Inches)	Slope (Foot per Foot)
8	0.0033
10 and up	0.0020

7.4.3 Pipeline Location and Horizontal Separation

Irrigation pipelines shall be located within existing or new easements dedicated to the USBR. Drainage pipelines shall be located within existing or new easements dedicated to CVWD (or USBR in some cases). The design shall be adjusted to take into consideration utility conflicts, soils, groundwater, and any other factors.

Table 7.5 presents the minimum horizontal separation from other infrastructure by pipeline size.

Table 7.5 Minimum Horizontal Pipeline Separation

Horizontal Separation by Type	Minimum Separation
Domestic Water pipelines ¹	10 feet
Sewers	10 feet
Recycled Water	10 feet
Dry Utilities	5 feet
Storm Drain	10 feet

¹The 10 foot separating distance is measured between the outside edge (including bells) of the pipes. If the sum of the inside diameters of the two pipes is 24-inches or less, then the centerline (CL) distance between the two pipes shall be 12 feet. This will aid in layout and plan checking. If the sum of the diameters is greater than 24-inches, then the separating distance between the outside edge (including bells) shall be 10 feet.

7.4.4 Pipeline Cover and Vertical Separation

Table 7.5 shows the minimum cover for various pipeline sizes.

Table 7.6 Pipeline Cover

Pipe Size or Development Type	Minimum Cover
12 inch and smaller (Irrigation)	36 inches
18 inch and larger (Irrigation)	48 inches
12 inch to 36 inch (Drain)	7 feet

Water and sewer crossings and associated separations shall be in accordance with CVWD Standard Drawing Nos. W-1/S-3 and W-2/S-4 (see Appendix H).

7.5 Canal Water for Construction and Dust Control Purposes

Developers/contractors are encouraged to use non-potable water for construction and dust control. Coachella Canal water may be available for construction and dust control purposes with the proper construction meter connection. Flow in the Coachella Canal varies during the irrigation season depending on water deliveries to irrigators.

7.6 Connection to CVWD Irrigation/Drainage Distribution System

All connections to the existing irrigation and drainage facilities will be made by developer or the developer's contractor under the direction of CVWD and connections will be limited to a maximum 3 day shutdown of the existing irrigation pipeline. All associated costs of the replacements and connections to existing CVWD facilities shall be at the sole expense of the developer.

7.6.1 Drainage Discharge Monitoring

A drainage manhole as described in section 7.15 shall be installed where any developer drainage system connects to the CVWD drainage system. This drainage manhole will be made available to CVWD staff for monitoring drain flows entering the CVWD drainage system.

7.7 Booster Pump Stations

If a booster pump station is required, it will be designed in accordance with the standards identified in Section 5-Domestic Water Design Criteria. The developer may be required to construct a booster pump station to lift canal water to higher elevations in order to provide service to the elevated lands.

7.8 Meters

Irrigation meters for large canal water delivery shall be in-line flow meters within a concrete vault with a two-piece traffic rated spring assisted lid. The flow meter shall be a flanged type with straightening vanes, reading in cfs, with a totalizer in acre-feet. Installation of irrigation meters shall be per CVWD Standard Drawing I-47. Vertical meters shall be warranted in certain applications and shall be at the direction of CVWD. New irrigation meters shall be accessible and installed away from traffic within an

existing easement. All irrigation meters requested to be abandoned by the developer shall be at the developer's expense and shall be returned to CVWD.

Refer to Sections 5.13 and 9.8, for residential/commercial irrigation meter requirements.

7.9 Baffle Stands

Baffle stands shall remain in place unless directed by CVWD. Connections to baffle stands shall be constructed using a Fernco adaptor or approved equal per CVWD Standard Drawing I-48 at a minimum distance of 3 feet from the baffle stand.

7.10 Pipe Material

In locations where the irrigation system is to be installed in unimproved areas or in parking lots, construction shall comply with the following special requirements:

- 1) Pipelines 12-inches and smaller shall be a minimum of C900-Class 165-DR 25 PVC pipe in accordance with AWWA C900
- 2) Pipelines 18-inch through 42-inch diameter shall be a minimum of C905-CL165-DR25 PVC pipe in accordance with AWWA C905.
- 3) Pipelines larger than 42-inch shall be Ductile Iron Pipe (DIP) in standard sizes of 48, 54, 60 and 64-inch and shall be in accordance with AWWA C151. Pressure class will be determined by the CVWD.
- 4) Connections between existing concrete pipe and PVC shall be constructed using a Fernco-type fitting, with a maximum of 6-inch size differential per CVWD Standard Drawing I-48.
- 5) Fittings for PVC or DIP shall be ductile iron with cement mortar lining in accordance with AWWA C110 and C153.
- 6) Ductile iron fittings shall be polyethylene wrapped per AWWA C-105. Deflection from flanges is not allowed. Pipe deflection shall comply with Section 5, Table 5.4.

Please see documents in Appendix N for reference (Pipe Materials for Non-Pressurized Pipeline Projects and Pipe Materials for Pressurized Pipeline Projects).

7.10.1 Pipe Backfill and Bedding

Backfill and bedding zones shall be as shown on CVWD Standard Drawing I-7 in Appendix J unless special consideration is required.

Special consideration shall be applied to the design of pipe bedding and backfill where soil conditions, or a high groundwater table or other factors warrant additional analysis. The developer and its engineer shall be solely responsible for determining the appropriateness of CVWD Standard Drawing I-7 for the project and for determining whether special consideration is required, and shall provide supporting calculations upon request. See Section 6, Table 6.9 that provides a comparison of pipe material with pipe size, native soil class, and proposed depth

of bury. Alternative trench designs can extend the range of applicability, but the design should consider soil-structure interaction in order to develop the proper trench configuration.

7.11 Thrust Restraint

Thrust restraint shall be designed in accordance with CVWD Restrained Joint Guidelines (Appendix H). The type of restrained joint shall be per CVWD Standard Specifications for Irrigation and Drainage Systems.

7.12 Irrigation/Drainage Pipeline Replacement and/or Abandonment

The expansion of urban development into agricultural areas often requires the replacement and/or abandonment of irrigation/drainage pipelines. Please refer to Section 3-Right-of-Way for the detailed replacement and/or abandonment procedures.

Irrigation/drainage pipelines to be abandoned must be completed utilizing one of the following methods:

1. Crushed in place
2. Removed completely
3. Slurry filled with 2-sack slurry

All of the above methods of abandonment must also be followed by backfill and compaction to 95 percent relative density. All irrigation pipeline abandonments must be completed up to the adjacent property line and/or section line. If a pipeline continues onto another property, the end of the pipeline must be completely plugged with concrete to a minimum depth of 3 feet.

7.13 Valves and Fittings

7.13.1 Irrigation Valves

Irrigation pipeline valves smaller than 36-inch shall be ball-centric plug valves by Milliken or approved equal. Any valves required for pipelines larger than 36-inch will be as directed by CVWD.

Marker posts are required if valves are to be installed outside of paved areas.

No valves shall be installed in decorative paving areas.

All valves shall be installed perpendicular to final grade.

7.13.2 Fittings

Fittings for drainage pipelines shall be made to fit appropriate size and corrugation patterns.

Fittings include in-line joint fittings such as couplers, bends, tees or reducers. Fittings shall not reduce or impair the overall integrity or function of the pipeline.

Drawings shall depict all fittings, including all stationing and types.

CVWD requires that 3M EMS Mini-Marker water (1257) be installed 3 feet below grade above every bend or every 500 feet.

7.14 Combination Air and Vacuum Relief Valves

Air vacuum valve assemblies shall be installed at all high points along the pipeline as shown on CVWD Standard Drawings I-21, I-22A and I-22B. At the high point of all vertical deflections, an air/vacuum valve will be required.

Two-inch or as determined by CVWD combination air and vacuum relief valve assemblies shall be installed on all irrigation mains.

7.15 Drainage Manholes

New manholes to be constructed on an existing or proposed drain line shall be constructed in accordance with CVWD Standard Drawings S-5 & S-10B with lid stamped "Drain." All existing manholes shown on plans shall call out stationing, manhole number, rim elevation and CVWD drawing number. Connections to existing manholes are to be made under District inspection. Manholes shall be installed at the intersection of drainage pipelines; at all changes in grade, size or alignment; and at the end of any drain line more than 200 feet in length.

7.15.1 Manhole Spacing

Manholes shall be installed on spacing not to exceed 400 feet. Drainage pipelines with a radius greater than 400 feet shall be considered as straight with manhole spacing not to exceed 400 feet. Manhole spacing on curved drainage pipelines less than a 200 foot radius shall be 200 feet. Manhole spacing on curves between 200 and 400 feet shall be adjusted proportionately and approved by CVWD. Drainage pipelines with reverse curves are required to have a manhole at the point of tangency of the curve. Standard manhole details are shown on CVWD Standard Drawing S-5 in Appendix I.

7.15.2 Manhole Depth and Size

The minimum manhole diameter size shall be as indicated in Table 7.7 "Manhole Minimum Diameter."

Table 7.7 Manhole Minimum Diameter

Drain Diameter	Depth	MH Dia	Depth	MH Dia
8 to 24-inch	< 12 feet	48-inch	≥ 12 feet	60-inch
24-inch & larger	-	60-inch	≥ 16 feet	72-inch

7.15.3 Manhole Invert Elevation

The District requires that the manhole inlet and outlet invert elevations to be at the same elevation.

Section 8

Design Criteria

Stormwater Facilities

8.1 Introduction

8.1.1 The Coachella Valley Water District (CVWD)

CVWD provides regional flood protection within its Stormwater Unit Boundary (see Appendix K) by intercepting and conveying regional flood flows through the Coachella Valley to the Salton Sea. This regional stormwater conveyance system consists of the 50-mile Whitewater River/Coachella Valley Stormwater Channel (WWRSC/CVSC) and related tributary stormwater facilities.

CVWD is the National Flood Insurance Program (NFIP) Administrator for unincorporated areas in Riverside County that are subject to flooding and lie within CVWD's Stormwater Unit Boundary. CVWD also provides floodplain management services to most of the cities in the Stormwater Unit Boundary. On-site drainage for new development within the Stormwater Unit Boundary is reviewed by Riverside County (unincorporated areas) or the Cities (incorporated areas).

8.1.2 Background

This section summarizes the standards that CVWD has adopted to ensure safe conveyance of floodwaters through its stormwater system while providing – to the maximum extent practicable – protection to properties located adjacent to these facilities. Guidance is provided to developers and their engineers on submissions required for approval of the design and construction of projects that encroach on or are adjacent to CVWD stormwater facilities. Section 8.4 summarizes standards and submissions for projects that encroach on or are adjacent to the stormwater facilities.

CVWD has also adopted standards for developments that are in flood-prone areas but not mapped or designated as flood hazard areas. Guidance is provided to developers and their engineers on the studies and analyses that are required for conceptual and final approval of their reports and tract maps. Section 8.5 describes standards for submissions for developments in flood-prone areas.

This section is organized so that standards are described in the main text while technical details, methods or criteria to meet the standards, report outlines and checklists are provided in Appendix K. Where practical, reference is provided for published standards or guidelines of other agencies, such as the US Army Corps of Engineers (USACE) or the Federal Emergency Management Agency (FEMA).

8.1.3 Application

Section 8 applies to projects within the CVWD Stormwater Unit Boundary with emphasis on regional flood hazards related to proposed developments and/or existing regional stormwater facilities.

8.1.4 Proviso

CVWD will review and approve studies and reports related to its stormwater system or for development within flood-prone areas for conformance with its regulations and with County, State and Federal regulations, where appropriate. This notwithstanding, CVWD assumes no liability for inadequate design or improper construction. Review and approval does not absolve the owner, developer, design engineer, or contractor of liability. Compliance with this document or with regulatory standards does not guarantee that properties will be free from flooding or flood damage.

The project engineer retains the responsibility for design of storm water or drainage facilities that meet industry standards of practice and provide public safety. CVWD, its officials, and its employees assume no liability for information, data or conclusions reached by developers or engineers and make no warranty, expressed or implied, when they review or approve projects or studies.

8.2 CVWD Guiding Regulations

CVWD relies on three regulations to ensure flood protection for the Coachella Valley; (1) California Drainage Law, (2) Riverside County Ordinance 458 and (3) CVWD Ordinance 1234.1. The following sub-sections describe the basic principles behind these regulations.

8.2.1 California Drainage Law

California Drainage Law states that property owners have the right to protect themselves from flooding as long as they do not unreasonably increase flood risk for adjacent property owners. Flows must be reasonably received and released in the historical flow paths at the historical flow depths and velocities.

8.2.2 Riverside County Ordinance 458

This ordinance was adopted by Riverside County for the unincorporated areas as a requirement of its participation in the National Flood Insurance Program (NFIP) of FEMA as stipulated in Title 44, Section 65 of the Code of Federal Regulations (44CFR65). Ordinance 458 specifically regulates development in Special Flood Hazard Areas identified on maps prepared by FEMA, the State of California or the County that are based on the 1percent chance flood, also referred to as the "100-Year Flood."

8.2.3 CVWD Ordinance 1234.1

Ordinance 1234.1 provides conditions of approval for development in flood hazard areas within CVWD Stormwater Unit Boundary. The key provisions of Ordinance 1234.1 are as follows (please refer to Guideline K-7 for details):

- Whitewater River/Coachella Valley Stormwater Channel: Designed and constructed utilizing the Standard Project Storm/Standard Project Flood (SPS/SPF) design standard. The SPS/SPF design standard will continue to be utilized for this facility, and for analyses addressing impacts associated with lands adjacent to this facility. The WWRSC/CVSC can be owned, operated and maintained by CVWD or by a private entity that has an existing regional stormwater facilities agreement with CVWD.
- Existing Tributary Regional Facilities: Designed and constructed utilizing the SPS/SPF design standard. The SPS/SPF design standard will continue to be utilized for these facilities and adjacent lands. These existing tributary regional facilities can be owned, operated and maintained by CVWD or by a private entity that has an existing regional stormwater facilities agreement with CVWD.
- Existing Tributary Regional Facilities (100-Year Storm/100-Year Flood): Designed and constructed utilizing the 100-Year Storm/100-Year Flood design standard. The 100-Year Storm/100-Year Flood design standard shall continue to be utilized for these facilities and for analyses addressing impacts associated with lands adjacent to these facilities. These facilities will continue to be owned, operated and maintained by an entity or party other than CVWD.
- Proposed Tributary Regional Stormwater Facilities: Design shall be based on the 100-Year Storm/100-Year Flood design standard. Either CVWD or developer shall assume operation and maintenance (O & M) of proposed 100-year tributary regional stormwater facilities.

8.2.4 Municipal Separate Storm Sewer System (MS4) Permit

The Colorado River Basin Regional Water Quality Control Board has issued a National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System Permit (MS4 Permit) under Order No. R7-2008-0001. In cooperation with the County of Riverside and incorporated cities within the Whitewater River Watershed, CVWD is responsible for *“implementing that portion of the urban runoff management program for any discharges to and from (its) MS4 facilities”*. As such, any discharge into the Whitewater River/Coachella Valley Stormwater Channel (WWRSC/CVSC) or other stormwater facilities within CVWD’s jurisdiction must comply with the MS4 permit.

To accomplish this, CVWD requires the local Land Use Authority to provide a letter supporting their regulatory authority to control the discharge of pollutants from the proposed outlet in compliance with the MS4 Permit. Typically an approved Water Quality Management Plan (WQMP) prepared by the developer gives the city the level of comfort they need to provide CVWD this letter; however specific requirements should be solicited from the respective city or Riverside County. CVWD will provide a Development Review Letter noting this requirement during the entitlement phase of any proposed project with plans to discharge into any CVWD stormwater facility.

8.3 CVWD's Regional Stormwater System

The Whitewater River originates on the southern slopes of the San Bernardino Mountains and flows southeast through the Coachella Valley to the Salton Sea. The drainage area is approximately 1,500 square miles at the Salton Sea. Most of its course is now channelized. Upstream from the vicinity of Washington Street (Point Happy) the channelized section is referred to as the WWRSC; downstream to the Salton Sea, this channelized extension is named the CVSC. The WWRSC/CVSC conveys flood flows for a distance of approximately 50 miles.

The WWRSC/CVSC and its tributary stormwater facilities are described in Table 8.1 and shown on a map in Appendix K. Tributary stormwater facilities convey floodflows that originate in the Santa Rosa Mountains on the southwest or in the Little San Bernardino Mountains on the northeast to the WWRSC/CVSC. These projects include the West Magnesia Channel, Palm Valley Channel, Thousand Palms Channel, Detention Channels 2 and 3, La Quinta Evacuation Channel and Deep Canyon Channel. CVWD also operates stormwater systems that intercept regional floods and convey them to the tributary stormwater facilities. Examples of these types of projects include the East Side Dike, Dike No. 4, and the Bear Creek Detention System. CVWD also operates stormwater facilities or systems that discharge directly to the Salton Sea, such as Detention Channel No. 1.

CVWD also has a number of planned stormwater flood control systems that are in various stages of development and accreditation by FEMA. These include:

- The Whitewater River Basin Thousand Palms Flood Control Project. CVWD is in the process of completing the design and environmental study following the transfer of the project from USACE to CVWD.
- North Cathedral City Stormwater Master Plan
- North Indio Stormwater Master Plan
- Mecca/North Shore Stormwater Master Plan
- Oasis Area Stormwater Master Plan
- Western Shore of Salton Sea Stormwater Master Plan

Table 8.1: CVWD Stormwater Facilities

Facility	Type	Material	Length (mi)
Whitewater River/CVSC	Channel/Levee	Earth/Concrete Slope Lining	50.0
Bear Creek System & La Quinta Evacuation Channel	Levee/Basin/Channel	Earth/Concrete/Soil Cement	5.8
Dead Indian System & Deep Canyon System	Levees/Channel	Earthen/Concrete	7.8
Palm Valley Channel & Cat Creek	Basins/Channels	Earthen/Concrete	7.0
East Magnesia Canyon Channel	Channel	Earthen/Concrete	1.8
West Magnesia Canyon Channel	Basin/Channel	Earthen/Concrete	1.3
Thousand Palms Connecting Channel	Channel	Earthen	0.5
Thunderbird Channel	Channel	Concrete/Earthen	1.0
Thunderbird Villas Stormwater Channel	Channel/Storm Drain	Concrete/Earthen	0.8
Peterson Stormwater Channel	Channel/Storm Drain	Concrete/Earthen	0.5
Sky Mountain Channel	Channel/Storm Drain	Concrete/Earthen	1.8
Eastside Dike	Levee	Earthen	25.5
Detention Channel 1	Channel	Concrete	3.3
Detention Channel 2	Channel	Concrete	2.3
Detention Channel 3	Channel	Concrete	1.3
Dike #2	Levee	Earthen	1.0
Dike #4	Levee	Earthen Dike	3.5
Avenue 64 Evacuation Channel	Channel	Concrete Channel & Pipes	6.8
Guadalupe Dike System	Levee	Earthen Dike	1.0

8.4 Standards for Projects near the Regional Stormwater System

CVWD requires that hydrologic, hydraulic and engineering analyses/design reports be prepared for all projects that may either impact or be impacted by a CVWD stormwater system. Such projects include developments immediately adjacent to CVWD facilities, utility crossings, bridges or other crossings, storm drains entering its facilities, modification or repair of levees, and other projects that may affect performance. CVWD will review and approve reports and plans prior to construction.

The following sections provide minimum standards for design review submissions. Appendix K provides guidance on technical methods that meet these standards and also provides general guidance on the organization of reports.

8.4.1 Hydrologic Standards

The hydrologic standards for CVWD are based on Ordinance 1234.1 as described in Section 8.2.3, and detailed in Appendix K-7. The key features of the 100-Year Storm/100-Year Flood and the SPS/SPF standards are as follows:

8.4.1.1 The 100-Year Storm/100-Year Flood

- 1) Rainfall Depth: Rainfall depth is the depth of water in inches or millimeters that falls as rain, snow, hail or sleet at a given point in a specified period of time. NOAA Atlas 14, 100-Year rainfall depths shall be utilized.
- 2) Depth Area Reduction Factors: Depth area reduction factors (DARFs) are ratios that are applied to convert point rainfall to an equivalent uniform depth of rainfall over the entire watershed. For watershed areas that exceed 10 square miles, the USACE (1980)/ Bechtel (1997) DARFs shall be utilized. For watershed areas less than 10 square miles, a DARF of 1.0 shall be used.
- 3) Freeboard for Incised Channels: An incised channel is one where the adjacent ground elevation is higher than the 100-Year Flood water surface elevation within the channel. Incised stormwater channels shall be designed to convey the 100-Year Flood with a minimum of 3 feet of freeboard as measured from the lowest adjacent ground to the design water surface. CVWD may require additional freeboard based on the size and location of the watershed and the associated flood hazard potential.
- 4) Freeboard for Proposed Levees: A leveed condition is one where the 100-Year Flood water surface elevation is higher than the adjacent ground elevation. Levees shall be designed with a minimum of 4 feet of freeboard from the levee crest elevation to the 100-Year Flood water surface elevation. CVWD may require additional freeboard based on the size and location of the watershed and the associated flood hazard potential.

8.4.1.2 The SPS/SPF Standard

- 1) Rainfall Depth: The rainfall depths from the 6-hour Indio Standard Project Storm of September 24, 1939 shall be utilized for calculating the SPF.
- 2) Depth Area Reduction Factors: DARFs developed by the USACE (1980)/ Bechtel (1997) studies shall be utilized for watershed areas that exceed 10 square miles. A DARF of 1.0 shall be used for watershed areas less than 10 square miles.
- 3) Freeboard for Incised Channels: Incised stormwater channels shall be designed to provide a minimum of one foot of freeboard as measured from the lowest adjacent ground to the design water surface.
- 4) Freeboard for Levees: Levees shall be designed to provide a minimum of one foot of freeboard as measured from the levee crest elevation to the SPF water surface elevation.

8.4.2 Hydraulic Standards

The design of projects near the WWRSC/CVSC and other parts of CVWD stormwater facilities may require analysis of existing and proposed water surface profiles as well as other hydraulic characteristics, such as depths, velocities, and shear stresses. CVWD recommends the following hierarchy of methods for the hydraulic analysis:

- If available, obtain CVWD's HEC-RAS hydraulic model of the stormwater facilities and update the geometry and channel characteristics to reflect existing conditions. Updating the model may require new surveys, field inspection, and model development and calibration. Once existing conditions are established the model can be modified as required to calculate post-project hydraulic conditions.
- Prepare a suitable hydraulic model for the site that is developed from recent topography. Suitable models include one-dimensional hydraulic models such as HEC-RAS or two-dimensional models in areas of complex topography and channel shifting, such as on fans, or in areas of complex flow patterns, such as the confluences of major tributaries or confluences with the WWRSC/CVSC.
- Uniform flow calculations or other simple calculations where the assumptions underlying these procedures are met by the site conditions and are appropriate for the design of the proposed project.

The design water surface profiles discussed above are calculated as the applicable water surface elevation (WSE) from the 100-Year Flood or the SPF with the associated freeboard.

It is recommended that the developer or their engineer contact CVWD prior to undertaking any hydraulic studies, especially for projects near or adjacent to stormwater facilities that do not have existing hydraulic models.

8.4.3 Engineering Design Standards

The following paragraphs briefly summarize the standards for design of projects adjacent to CVWD regional stormwater facilities, projects that contribute stormwater to these facilities or projects that encroach on the facilities or right-of-way. The technical details and methods are described in Appendix K.

8.4.3.1 Slope (Bank) Protection for development within 300 feet of CVWD stormwater facilities

Concrete slope protection is required on the banks and levees of stormwater facilities where any development is proposed within 300 feet of the stormwater facilities, is at risk from inundation or erosion from failure of the facilities, or as directed by CVWD. The slope protection consists of a concrete revetment extending from the top of the channel bank or levee to the elevation of the lowest point of the channel bed (based on the original channel design); with a cutoff wall extending from that point to the maximum scour depth or minimum scour elevation (Guideline K-3). In some cases, where hydraulic conditions are appropriate, the concrete revetment can be combined with, or replaced by reinforced turf or other grass and soil combinations. This requirement may be waived for a proposed development that will have buildings and/or structures 300 or more feet from the top edge of incised channels. This waiver does not apply to proposed developments adjacent to stormwater facilities where there is a risk of inundation or erosion from failure of the facilities. Guideline K-2 provides details for design of the slope protection and Guideline K-3 discusses scour and the other elevations required for design of the protective works.

8.4.3.2 Utility crossings of CVWD stormwater facilities

Crossings are only allowed in special circumstances after review and approval of engineering plans and specifications. The general standards below are applicable for crossing both “soft-bottom” or earthen channels and concrete-bottom channels (see Table 8-1):

- Utility crossings should be perpendicular to the channel.
- The maximum elevation of the utility within CVWD’s stormwater facility shall be:
 - 2 feet below the concrete bottom or toe of the concrete slope lining cut-off wall in the reach or below the anticipated minimum scour elevation for the design flood
 - 10 feet below the channel design invert (if no concrete slope protection) or below the anticipated minimum scour elevation for the design flood
- Utility crossings shall be installed using horizontal and/or directional boring unless otherwise approved by CVWD.

Guideline K-3 provides further details on scour calculations. Guideline K-2 provides details on planning and design of slope protection, and Guideline K-1 on report submissions.

8.4.3.3 Bridge and/or Low Flow Crossings of CVWD stormwater facilities

Bridges or other crossings shall be designed to pass the design flood with adequate freeboard and no increase of upstream water levels. CVWD may relax the “no rise” standard for projects with a substantial upstream freeboard. The design shall also protect stream banks and the channel bed from erosion or scour resulting from flows around piers or abutments or through the bridge opening. Any post project alteration of upstream and downstream conditions must be fully mitigated. Section 8.4.2 discusses hydraulic standards and information sources. Also, proposed bridges should integrate utility corridors in their design.

Guidance for calculating hydraulic conditions and local and general scour at bridges is provided in US Federal Highways and Waterways Administration, Hydraulic Engineering Circular 18 Fifth Edition (Arneson et al. 2012). Bank protection designs are described in more detail in Guideline K-2 and scour calculations in Guideline K-3.

8.4.3.4 Storm Drains discharging into CVWD stormwater facilities

Storm drain outlets discharging into CVWD stormwater facilities shall provide adequate protection within the outlet system to prevent scour and erosion in “soft-bottom” channels (e.g. WWRSC/CVSC, Thousand Palms Stormwater Channel, La Quinta Evacuation Channel, etc.), meet design standards for concrete-bottomed channels (e.g. Palm Valley Channel, West Magnesia Channel, etc.), box culverts and pipes.

Where storm drain outlets are proposed to discharge into concrete-bottomed channels, box culverts or pipes, the developer/engineer should consult with CVWD to determine if the discharge is feasible, given capacity constraints and the highly-engineered hydraulic design of these channels. The outlet protection works will be designed in accordance with guidelines appropriate for the particular site. Guideline K-4 provides details.

See section 8.2.4 for information on compliance with the MS4 Permit.

8.4.3.5 Modification, Repair or Construction of a Levee

All levee design and construction shall at a minimum meet FEMA requirements as stipulated in Title 44, Code of Federal Regulations, Chapter 1, Section 65.10 (44CFR65.10) and all current engineering manuals and engineering technical letters of the USACE related to levee design and construction that are referred to in the Federal Code. In general, ownership and maintenance of levees is a CVWD responsibility.

Private ownership and maintenance of levee facilities is not allowed. Development projects that include modification and/or construction of levees, berms, floodwalls, training dikes, etc., as part of a flood control scheme should consult with CVWD prior to designing such a project, as the studies and requirements are typically very onerous.

Construction plans that involve modification of or encroachment on a United States Bureau of Reclamation (USBR) dike (levee) will require review and approval by the USBR following review and approval of design and flood management plans by CVWD.

8.5 Development Projects within CVWD Stormwater Unit Boundary

Within the Stormwater Unit Boundary, CVWD is responsible for ensuring that developers adequately describe regional flood hazards at project sites and mitigate these hazards to meet CVWD, Riverside County and City Floodplain Ordinances, and State and Federal requirements.

Land development may also alter runoff or modify local drainage systems, resulting in greater peak flows, runoff volumes, water surface elevations, velocities, or sediment transport load that may impact adjacent properties. If it does, mitigation or stormwater management plans are required. Hydrologic, hydraulic, flood hazard assessment and stormwater management reports shall be submitted for all development projects subject to regional flooding. The design standard for peak flow is based on Ordinance 1234.1 (Guideline K-6).

The following sections provide standards for identifying flood hazards, quantifying, mapping and mitigating on-site hazards, and managing stormwater. Guideline K-5 provides a standard outline for reports submitted to CVWD.

8.5.1 Existing Hazard Studies and Maps

CVWD recognizes that there are flood hazard areas not shown on FEMA County-wide Flood Insurance Rate Maps (FIRM); therefore the current FIRMs may not fully reflect the flood hazard risk. Project sites in such areas are subject to regulation and developers will be required to carry out studies to define the specific hazards on their property.

8.5.2 Flood Hazards

The following specific flood hazards occur within CVWD's Stormwater Unit Boundary:

- Riverine hazards, including high in-channel velocities, overtopping or eroding of banks and spreading of floodwaters across the floodplain.
- Alluvial fan hazards, including unpredictable flow paths, a broad extent of flooding and erosion that may undermine structures. "Alluvial Fan Flooding", prepared by the Committee on Alluvial Fan Flooding (1996) and Appendix G of the FEMA Guideline and Specifications for Flood Hazard Mapping Partners further describe these processes (FEMA 2003).

- Sheet flow and channelized flow near the toe of alluvial fans and on the floor of the Coachella Valley from floodwaters crossing alluvial fans, runoff on the valley floor, or runoff arriving from upstream existing developments.
- Coastal or lakeshore hazards relating to inundation from the Salton Sea, including wave erosion and other coastal hazards as described in various FEMA publications.

8.5.3 Flood Hazard Identification

The following paragraphs briefly summarize the procedures for identifying and studying the flood hazards described in Section 8.5.2. These sections provide standards and guidance for hydrologic, hydraulic and sediment studies. Guideline K-5 provides further details on reporting requirements for development projects.

8.5.3.1 Riverine Hazard Studies

Riverine flood hazards mostly occur along or adjacent to stormwater channels on the floor of the Coachella Valley, such as along the WWRSC/CVSC. Many of these stormwater channels either contain the 100-year and SPF floods or have accredited levees that provide protection to the floodplain. However, overtopping of banks and levees could occur in the CVSC downstream of Monroe Street Drop Structure.

CVWD is studying and updating flood hazards along the WWRSC/CVSC and other stormwater channels and developers or their engineers should contact CVWD to obtain the most recent hydraulic models and flood hazard assessments.

8.5.3.2 Alluvial Fan and Other Hazard Studies

Hazard studies for properties or sites that may be on or adjacent to an alluvial fan follow the *Guidelines and Specifications for Flood Hazard Mapping Partners; Appendix G: Guidance for Alluvial Fan Flooding Analyses and Mapping* (FEMA 2003 App. "G"). This document recommends a three stage process to study these hazards: Stage 1-identify alluvial fan landform boundaries, Stage 2-identify active and inactive areas on the fan and Stage 3-flood hazard analyses.

Stage 1 analysis determines whether the property lies on or off the alluvial fan. Note that those properties that lie off the toe of alluvial fans and on the floor of the Coachella Valley will also require detailed analyses, as described below.

Stage 2 identifies active and inactive areas on the fan surfaces. This includes analyses of topographic, soils and surficial geology maps, review and analysis of historical air photos, review of historical records or observations of flooding, and followed by field studies/inspection to confirm active and inactive boundaries on the fan. On many fans, geomorphic studies that evaluate the relative ages of different fan

surfaces are invaluable in defining inactive and active fan areas. Similar analyses are required to identify the potential for channelized flow or to document the general nature and extent of sheet flow inundation at project sites that lie off the toe of a fan. CVWD requires extensive and thorough analysis to identify potentially inactive fan surfaces.

Once the nature and extent of the hazards are determined, they are quantified and classified by detailed geomorphic, hydrologic and hydraulic studies in Stage 3. Given the complexity of flows and channels on active alluvial fans and the impact of human development on flow paths on some fans, hydraulic studies often require extensive LiDAR (Light Detection and Ranging) or other topographic surveys of the fan and valley floor.

8.5.3.3 Coastal or Lakeshore Hazard Studies

Coastal or lakeshore hazards related to the Salton Sea have not been studied nor have the extent of these hazards been mapped. CVWD may require developers of properties adjacent to the Salton Sea to complete specific studies of these hazards that follow applicable FEMA Guidelines.

8.5.4 Hydrologic Analysis

In general, the following hierarchy of hydrologic analysis methods or approaches is recommended to estimate these flood flows for design:

- SPF peak flows calculated in previous studies that have been adopted by CVWD, such as USACE (1980), or other studies adopted by CVWD.
- 100-Year peak flows calculated in previous studies such as Bechtel (1997), or Bechtel Corporation (2003; Draft FIS for the Oasis Area of the Coachella Valley). CVWD may require the developer to update these estimates to reflect NOAA Atlas 14 rainfall storms, as was discussed in Section 8.4.
- Where there are no previous studies or where CVWD deems that these studies are out-of-date, SPF can be calculated from the standard project storm and the 100-Year Flood calculated from NOAA Atlas 14 rainfall, Guideline K-6.

Peak flow design calculations for hazard assessment of developments on the Coachella Valley floor require consideration of the timing of peak flows from the various contributing areas such as fan apices, tributary inactive fans and valley floor areas to the development (Please refer to Ordinance 1234.1).

8.5.5 Hydraulic Analysis

The purposes of the hydraulic analyses are to define existing (pre-project) and developed (post-project) flow characteristics such as depths, velocities, etc. to evaluate potential impacts of the development on adjacent properties or for “on-site” stormwater management and mitigation.

Hydraulic standards for projects adjacent to the regional stormwater system are described in Section 8.4.2. CVWD recommends the following hierarchy of hydraulic methods or models to calculate existing conditions and post-project conditions when the project is distant from the regional stormwater system and on an alluvial fan:

- If the development is on the active portion of a fan, a two-dimensional model will often be used to route the flows to the development site and, if necessary, downstream to a CVWD regional stormwater facility. Generally, multiple scenarios are recommended to define the hydraulic conditions at the development site. Two-dimensional modeling requires detailed topography on the active portion of the fan.
- If the development is on the inactive portion of the fan, a one-dimensional model may be utilized to define the design hydraulics if confined and stable channels cross the inactive surface. Here, uncertainty with regard to flow paths may be disregarded. The one-dimensional models may require a more detailed hydraulic analysis at the fan head to determine the distribution of the design flood over the various channels and surfaces on the fan. Hydraulic analysis will also be required for sheet flow potentially generated by rainfall on the inactive fan surface.
- If the development is in an area of low topographic relief or on a low gradient surface where there is no evidence of channelized flow, sheet flow may be the dominant flood hazard. Such conditions are not common in the CVWD Stormwater Unit Boundary; however, where they occur, hydraulic conditions may be calculated by the methods described in FEMA 2003, App. "G" or in other similar documents.

Where the development is off the toe of an alluvial fan or on the floor of the Coachella Valley and is potentially exposed to flooding, the following hierarchy of hydraulic models or methods is recommended. As above, these are used to calculate both existing and post-project conditions at the site and upstream and downstream of the project:

- Where the site is exposed to flows crossing an active alluvial fan, a 2-dimensional hydraulic model is extended from the apex of the active fan, or other suitable points, to include the development area. Such a model will route the appropriate flood from the upper watershed across the fan, onto the valley bottom, and to a downstream stormwater facility, if appropriate. The model will include inflows from the valley bottom tributary area and inactive fan surface. At the approval of CVWD, such models may account for infiltration of surface flows into the lower fan and valley floor surface. CVWD does not presently have standards or guidance for incorporating infiltration but will provide a detailed review of proposals from developers and their engineers.

- Where the development site is distant from a fan and is only exposed to flows from the valley floor and it includes channels or other evidence of channelized flows, hydraulic conditions resulting from flows crossing the toe of an alluvial fan or from the valley floor may be calculated from one-dimensional hydraulic models or uniform flow calculations, where these are appropriate. Flood hazards from overflow of the WWRSC/CVSC or other stormwater channels will be defined by detailed studies by CVWD or by the developer, where required.
- If the valley floor at the development site shows no evidence of channels and is not exposed to flood hazards from overtopping of a stormwater channel, sheet flow may be the dominant flood hazard and existing hydraulic conditions can be determined by the methods described in FEMA 2003, App. "G".

CVWD will consider other hydraulic models or approaches where they are appropriate for the site conditions and provide results that are consistent with the above approaches.

8.5.6 Flood Hazard Zoning

Developers/engineers shall prepare flood hazard or flood insurance zone maps and other information suitable for a Letter of Map Revision (LOMR) at the development site. The zones are defined from the depths and velocities calculated at the development site for the design flood.

There are often considerable uncertainties in the calculated hydraulic conditions at a particular site because of uncertainties in the design flood, in the distribution of flows on the fan and the valley floor as a result of channel erosion or sedimentation, and the routing of flows because of development, roads and other features on fans. For sites on the active fan and those distant from the fan apex, a range of flow input distributions into the model should be utilized to predict the design hydraulic conditions at the site. Each scenario then represents a potential hydraulic design condition that might occur at the development site.

Flood insurance zones shall be determined at the development site by overlaying the results of the model scenarios and selecting the worst case depths and velocities at the project site.

8.5.7 Flood Hazard Mitigation

The basic standard for stormwater management on the development site is to protect it from flooding while conveying water through the site in such a manner that flood hazards are not modified for adjacent properties. To help meet this goal, the disturbance of natural watercourses on the site shall be minimized and the points where channels or runoff historically have entered or exited a property shall be maintained (California Drainage Law).

The recommended approach for evaluating potential impacts of development on adjacent properties is to repeat the hydraulic analysis or modeling for existing conditions with the development and the proposed flood hazard mitigation in place. The existing and post-development hydraulic conditions are then compared for upstream, downstream and adjacent to the development site. Where the post-project changes to water levels, velocities, or other hydraulic parameters may be detrimental to adjacent properties or channels, either the flood hazard mitigation works are modified to eliminate these changes or suitable protective works are developed for the adjacent channels and properties.

Where the flood mitigation plan proposes to collect sheet flow, combine multiple channels in a braided wash into one channel, construct flood channels, or otherwise divert or re-route floods, more stringent standards apply. In these circumstances, the safety of the developments and of upstream and downstream properties depends on the continued functioning of the flood control channels. Design and construction of the flood control works generally will meet the standards of the USACE, as expressed in their Engineering Manuals 1110-2-1601 (Hydraulic Design of Flood Control Channels) and 1110-2-1418 (Channel Stability Assessment for Flood Control Projects) or other manuals appropriate for the particular flood channel concept. Such design studies require sediment transport assessment and detailed consideration of upstream and downstream channel response. This is described further in the next section.

8.5.8 Sediment Analysis and Sediment Hazard Mitigation

CVWD requires an assessment of existing conditions (pre-project) sediment hazards as well as developed conditions (post-project). This analysis will compare conditions and evaluate changes in sediment transport, the potential for channel filling or erosion, and the potential impacts on neighboring properties or on the regional stormwater facilities. Where channel adjustments seem likely to occur as a result of the project design, appropriate mitigation measures are to be included in the flood hazard design. These measures will be appropriate for the site and the likely channel response and may include channel lining or stabilization, bank protection, sediment trapping, or other suitable measures.

Also, where the flood mitigation plan re-routes or channelizes flood flows within the development, an assessment of potential erosion and sedimentation within the flood control channel is required. Where erosion might potentially occur, suitable channel linings or protection will be provided in the mitigation plan. Where sedimentation might potentially occur, a suitable mitigation plan is also required, consisting of sediment trapping or sediment removal as part of maintenance.

Given the complexity of the sediment analysis, it is recommended the proposed analytic and mitigation methods be discussed with CVWD during the early stages of the design.

8.5.9 Long Term and Post Storm Operation & Maintenance Plans

Operations and Maintenance (O&M) plans are required for proposed flood control facilities, whether the facilities are to be deeded to CVWD or owned by the development. O&M plans will include maintenance access easements through the development, equipment access routes in and out of facilities, disposal sites, vegetation management plans, and provide local, state and federal permits which allow long-term and post-storm repair and restoration activities. The O&M plans will provide detailed instructions and requirements for the long-term maintenance required to ensure performance and for post-storm maintenance and repairs to restore functioning.

Developers are required to submit long term and post storm O&M plans concurrently with each phase of design plans (conceptual to final). This will help ensure that an adequate O&M plan is provided as part of design and development plans.

8.5.10 Conditional Letter of Map Revision/ Letter of Map Revision

Development projects that may affect the hydrologic or hydraulic characteristics of a flooding source and thus result in the modification of the existing regulatory floodway, the effective Base Flood Elevations (BFEs), or the Special Flood Hazard Area (SFHA) are required to prepare a Conditional Letter of Map Revision (CLOMR) report for review and approval by CVWD for submittal to the FEMA. A CLOMR submittal to FEMA is based on proposed conditions and does not change the effective FEMA FIRMs. A CLOMR submittal should meet the minimum NFIP standards with respect to increases in the extent of the floodplain/floodway or the floodplain or floodway base flood elevations. Prior to grading work for proposed developments, developers shall:

- Obtain a Conditional Letter of Map Revision (CLOMR) through FEMA
- Execute an agreement with CVWD as outlined in CVWD Ordinance No. 1234.1.
- Submit to CVWD a Flood Control Facility Operations and Maintenance Manual for review and approval.
- Submit final construction plans for the proposed flood control facilities and a detailed hydrologic and hydraulic design report for review and approval.

Developments are also required to submit a Letter of Map Revision (LOMR) to revise the floodplain/floodway mapping based on as-built flood control facilities with detailed survey information along the floodplain and/or revision of 100-year peak flows used in the effective Flood Insurance Study (FIS). Following the completion of the construction of the flood control facilities, CVWD requires the developer to submit “as-built” topography, construction drawings and engineering analysis for review to verify that the design capacity is adequate. Similar to the CLOMR, the LOMR report shall be submitted to CVWD for review and approval which should reflect a change or

revision to the effective FIRM. The developer shall submit the report to FEMA to obtain a LOMR which removes the development from the special flood hazard area.

8.6 Technical Appendix

Further technical guidance and recommended report formats and contents are included in Appendix K to the Design Manual. This Appendix includes CVWD's Stormwater Unit Boundary Map and the following specific guidelines:

- Guideline K-1: Report Format and Contents for Projects Adjacent to CVWD Stormwater Facilities
- Guideline K-2: Slope Protection Design Guidance
- Guideline K-3: Scour Calculation Guidance
- Guideline K-4: Storm Outlet Design Guidance
- Guideline K-5: Report Format and Contents for Development Projects
- Guideline K-6: Framework for Hydrologic Modeling
- Guideline K-7: CVWD Ordinance No. 1234.1
- Guideline K-8: Stormwater Annexation Form

8.7 References

Arneson, L., L. Zevenbergen, P. Lagasse, and P. Clopper. 2012. Evaluating Scour at Bridges (5th Edition). US DOT Federal Highway Administration Hydraulic Engineering Circular No. 18. April.

Bechtel Corporation. 1997. "Without Project" Hydrology Report, Thousand Palms Area, Whitewater River Basin. Riverside and San Bernardino Counties, California. U.S. Army Corps of Engineers. Los Angeles District. March 20.

Bechtel Infrastructure Corporation. 2003. Flood Insurance Study for Oasis Area of Coachella Valley. Prepared for Coachella Valley Water District, Coachella, CA.

Committee on Alluvial Fan Flooding. 1996. Alluvial Fan Flooding. National Academy Press. Washington, D.C. 172 pp.

FEMA. 2003. Guidelines and Specifications for Flood Hazard Mapping Partners. Appendix G: Guidance for Alluvial Fan Flooding Analysis and Mapping. 33 pp. April.

USACE. 1980. Whitewater River Basin Feasibility Report for Flood Control and allied Purposes. San Bernardino and Riverside Counties, California. Appendix 1: Hydrology. Los Angeles District. May.

USACE. 1991 (with 1994 revisions). Hydraulic Design of Flood Control Channels. US Army Corps of Engineers Engineering Manual EM 1110-2-1601.

USACE. 1994. Channel Stability Assessment for Flood Control Projects. US Army Corps of Engineers Engineering Manual EM 1110-2-1418.

Section 9

Design Criteria

Non-Potable Water Facilities

9.1 Background

For the purposes of this section, non-potable water means reclaimed wastewater (recycled water), Colorado River water (canal water) or a blend of recycled water and canal water.

CVWD has provided non-potable water in the form of recycled water to golf courses and large greenscape areas since 1968 when it acquired Water Reclamation Plant No. 9 (WRP 9). Currently, CVWD has 16 water customers that use recycled water or a blend of recycled water and canal water from WRPs. Table 9.1 gives the statistics for the 3 WRPs that provide recycled water for non-potable water customers.

Table 9.1 Water Reclamation Plants (WRPs) and Non-Potable Water

Facility	Plant Capacity (mgd)	Tertiary Treatment Capacity (mgd)	Number of Non-potable Water Customers	Non-potable Pumping Capacity*
WRP-7 ²	5.0	2.5	2	6.62(mgd)
WRP-9 ¹	0.4	0.0	1	4.3(mgd)
WRP-10 ³	18.0	15.0		
High-Pressure			3	17.28 (mgd)
Low-Pressure			10	16.20 (mgd)
Total	33.4	17.5	16	

*Limited capacity based on existing demand

¹WRP-9 provides secondary treated wastewater to irrigate portions of the golf course at Palm Desert Country Club irrigation.

²WRP-7 is located near the Coachella Canal and canal water is blended with tertiary treated wastewater to serve 3 golf courses.

³WRP-10 is the endpoint for the Mid-Valley pipeline where canal water is blended with disinfected tertiary recycled water to serve 10 golf courses.

CVWD also provides canal water to 28 golf courses in the East Valley via the Coachella Canal and associated Irrigation Distribution System. Requirements for golf course connection to the Irrigation Distribution System is defined in Section 7.

The Non-Potable Water System includes 4 pump stations and 26.5 miles of distribution system piping. Non-Potable Water System statistics can be found in the most recent edition of CVWD's Annual Report located in the inside pocket of this manual.

The Non-Potable Water System design/construction standards and regulations for service are governed by the following documents:

- Sanitation System Standard Specifications-Appendix I
- Section 6-Design Criteria-Sanitation Facilities
- California Regional Water Quality Control Board of Colorado River Basin Region Board Order No. 97-700, General waste discharge requirements for discharge of recycled water for golf course and landscape irrigation
- California Department of Public Health Statutes and Regulations Related to Recycled Water, including those found in Titles 17 and 22 of the California Code of Regulations, and excerpts from the Health and Safety Code and the Water Code
- Green Book
- AWWA Standards
- CVWD's Ordinance No. 1302.1 Landscape and Irrigation System Design Criteria
- State Water Resources Control Board Resolution No. 2009-0011 (Recycled Water Policy) and subsequent amendments to this policy.

9.2 Water Code Sections 32600 - 32603

Water Code Sections 32600 - 32603 declares that the use of potable water for non-potable uses in the CVWD service area is a waste and unreasonable use of water. If a suitable non-potable water source is available and complies with the conditions found in this section, then person or local public agency using the potable water may be ordered to use non-potable water or to cease using potable water. Non-potable water can be recycled water, canal water or a combination of both. A copy of Water Code Sections 32600 - 32603 is located in Appendix L. The provisions of Water Code Sections 32600 - 32603 are summarized below:

- Applies to cemeteries, parks, highway landscape areas, new industrial facilities (after 2010) and golf courses
- The CVWD Board will enforce the use of non-potable water when following conditions are met:
 - Non-potable source is of adequate quality for the proposed use
 - Non-potable water can be provided at a reasonable cost
 - Use of non-potable water will not adversely affect groundwater rights, degrade water quality or be injurious to plant life, fish and wildlife
- California Department of Public Health determines that non-potable use will not be detrimental to public health
- California Regional Water Quality Control Board determines that the non-potable source will comply with the water quality control plan

CVWD strongly supports Water Code Sections 32600 - 32603 and will work with developers to ensure compliance. CVWD is also supportive of dual water systems in which the landscape irrigation needs of the development are served by a separate non-potable water system.

9.3 Non-Potable Demand Criteria

In cases where developments are proposing dual piping systems (a potable water distribution system and a non-potable water distribution system), the on-site and off-site non-potable water infrastructure shall be sized to meet the Peak Daily Demand (PDD) of the proposed development in accordance with the following design criteria:

Pipelines: PDD + Fire Flow (if allowed)

Storage: PDD + Fire Flow (if allowed) + Emergency Storage

Pump Station: PDD + Fire Flow (if allowed)

CVWD is located in a hot desert environment and peak demands are significant. CVWD will work with the developer/engineer to establish a PDD allowance to ensure adequate service during the hot summer months. CVWD may adjust this factor depending on the location of the project, type of development and proposed landscaping. Non-potable water customers are required to maintain and have available a back up source of water equal to one hundred percent of its peak irrigation water demands, as the non-potable water delivery is an interruptible supply.

9.4 Non-Potable Pipeline Sizing Criteria

The Non-Potable Water Pipeline requirements will be the same as those for Domestic Water Pipelines, as presented in Section 5 with the following exceptions:

Table 9.2 provides the non-potable water pipeline exceptions to the domestic water design criteria to be utilized for all hydraulic analyses.

Table 9.2 Non-Potable Water Pipeline Design Criteria

Design Criteria	Standard
Maximum Velocity	
12 inch and smaller	7.5 ft/sec
Maximum Head loss	
18" and larger	7 ft /1,000 feet of pipeline

Pipelines shall be 12, 18, 24, 30, 36 or 42 inches in diameter. Pipelines larger than 30 inches in diameter may be required for projects with high demand requirements. No pipe smaller than 12 inches in diameter shall be permitted. A Hazen-Williams Coefficient (C) for new CML ductile iron shall be C = 120.

9.5 Connection to CVWD Non-Potable Water System

All connections to the existing CVWD non-potable water system will be made by CVWD at the Developer's expense. The Contractor may connect to an existing valve when approved by CVWD under CVWD inspection.

1. Obtain coverage under the general waste discharge requirements for discharge of recycled water for golf course and landscape irrigation Order No. 97-700 or equivalent version of this permit from the California Regional Water Quality Control Board of the Colorado River Basin Region (Regional Board) by submitting a Notice of Intent to the Regional Board and paying application/annual fees.
2. Enter into an agreement with CVWD for receiving non-potable water for golf course and landscape irrigation. The agreement between discharger and CVWD must be provided to the Regional Board within 90 days of receiving coverage under the permit referenced above in item #1.
3. Landscape and Irrigation system plans must meet regulatory requirements of Order 97-700 or equivalent version of this permit, the State Board's Recycled Water Policy, and California Department of Public Health (CDPH) Statutes and Regulations related to recycled water, such as the Health and Safety Code, the Water Code, Title 17 and Title 22 Code of Regulations. These requirements include but are not limited to the following:
 - An air-gap separation, a vertical measured distance between supply pipe and receiving vessel must be present and meet the required distance for the size of the supply pipe.
 - The appropriate type of backflow protection is to be installed for auxiliary water supplies and recycled water.
 - The required separation distance between recycled water lines and impoundments and application area; and domestic wells and water lines is maintained and approved by CDPH.
 - The design of the irrigation system shall not cause the occurrence of ponding anywhere in the reuse area, and overspray or mist around dwellings, outdoor eating areas and/or food handling facilities is eliminated. Irrigation runoff shall be confined to the recycled water use area unless authorized by CDPH.
 - Drinking fountains will be protected from spray, mist or runoff by use of a drinking fountain cover or shelter approved for this purpose.
 - Hose bibs are not allowed on portions of the recycled water systems accessible to the general public. Quick couplers that differ from those used on the potable water system are allowed.
 - Signs are posted in areas that the public has access to that are no less than 4 inches high by 8 inches wide and include "RECYCLED WATER – DO NOT DRINK" and the international do not drink symbol as indicated in CCR Title 22 Division 4 Chapter 3 Article 4 Section as figure 60310-A. The number and locations of these signs will be approved by CDPH.

- The recycled water irrigation system is able to be operated during a time of day that will minimize contact with the public.
 - All pipes installed above or below ground on or after June 1, 1993 designed to carry recycled water are to be colored purple or wrapped in purple tape.
 - Golf course pump houses utilizing recycled water are appropriately tagged with warning signs with proper wording of sufficient size to warn the public that recycled water is not safe for drinking. All new and replacement at grade valve boxes shall be purple or appropriately tagged for water reuse purposes. All other appurtenances and equipment used for recycled water must be identified as used for recycled water distribution per the recommendations of CDPH.
4. Prior to construction, landscape and irrigation system plans must be submitted for approval to the following agencies (please allow for a 30 day comment period):
 - Regional Board Water Quality Control Board
 - California Department of Public Health, and
 - CVWD.
 5. Upon approval from the Regional Board and CDPH, the discharger shall provide notification that recycled water will be used for irrigation to people who reside adjacent to the recycled water use area and to golf course patrons through a method approved by the Regional Board's Executive Officer and CDPH at least 30 days prior to use of recycled water.
 6. A Use Site Supervisor must be designated and his or her name and contact information must be provided in writing to CVWD and the Regional Board 30 days prior to discharge of recycled water. This person will be available to be contacted and receive periodic education and training on the uses and restrictions of recycled water.
 7. A cross-connection control test will be performed on the irrigation and domestic systems prior to the discharge of recycled water and at least once every four years thereafter. This test is to be conducted by an American Water Works Association (AWWA) certified cross-connection control program specialist or equivalent. The results of these tests are to be submitted to CVWD, CDPH, and the Regional Board within 30 days of test completion.
 8. "As-Built" plans and specifications showing the domestic and irrigation systems, location of all potable and recycled water connections and location of all on-site and nearby wells to CDPH, as per the CDPH requested time frame.

9.6 Booster Pump Stations and Pressure Reducing Valve (PRV) Stations

All Booster Pump Stations and Pressure Regulating Valves shall conform to the requirements in Section 5.8.

9.7 Emergency Standby Power Facilities

All Emergency Standby Power Facilities shall conform to the requirements in Section 5.9.

9.8 Services & Meters

Services and meters shall conform to the requirements in Section 5.13.

9.9 Pipe Material, Valves, Combination Air and Vacuum Relief Valves and Blow-off Assemblies

All materials must meet California Department of Public Health statutes and regulations related to the use of recycled water. Pipe Material, Valves, Combination Air and Vacuum Relief Valves and Blow-off Assemblies Pipe material shall conform to Sections 5.13, 5.14, 5.15 and 5.16, respectively. All above ground infrastructure shall be painted Pantone 512 and marked "Non-Potable Water Do Not Drink" with the universal symbol.

Non-Potable Water Pipeline Requirements will be the same as those for Domestic Water Pipelines as presented in Section 5 with the following exceptions:

- All piping shall be in accordance with the color-coding, and labeling requirements per Section 116815, California Health and Safety Code of Regulations.
- Separating distances shall be the same as Sewer Pipelines (See Section 6)

Please see documents in Appendix N for reference (Pipe Materials for Non-Pressurized Pipeline Projects and Pipe Materials for Pressurized Pipeline Projects).

Section 10

Design Criteria

Landscape/Irrigation

10.1 Landscape Water Conservation

As much as 80 percent of water use in the Coachella Valley occurs outdoors. CVWD considers it imperative that landscape irrigation be efficient. Accordingly, all new development projects within the CVWD service area must comply with CVWD Ordinance No. 1302.1 and submit landscape irrigation drawings for review and approval.

The requirements of Ordinance No. 1302.1 have proven to provide beautiful landscapes, excellent design flexibility, and landscapes that use relatively little water. The ordinance provides detailed requirements for landscape design, allowing flexibility and imagination, while reducing water use and avoiding runoff to the streets. It also addresses the design of the irrigation system with specifications for efficiency, including spray, rotor and drip irrigation systems.

To provide maximum design flexibility while reducing water use, the criteria rely on water use calculations. The calculations are based on plant water use classifications and irrigation system efficiencies. The estimated water use of the proposed landscape must be less than or equal to the maximum water allowance calculated for a “model” landscape of the same size.

All design criteria can be found in Ordinance No. 1302.1 Landscape and Irrigation System Design Criteria (see Appendix M). The Water Management Division is part of the Service Department. Water Management staff are available to assist in meeting the requirements of the Ordinance and preparing the drawing submittal.

10.2 Applicability

The provisions of Ordinance No. 1302.1 shall apply to all of the following landscape projects:

- New construction and rehabilitated landscapes for public agency projects and private development projects requiring a building or landscape permit, plan check or design review;
- New construction and rehabilitated landscapes which are developer-installed in single-family and multi-family projects requiring a building or landscape permit, plan check or design review; and
- New construction and rehabilitated landscapes which are homeowner-provided and/or homeowner-hired in single family and multi-family residential projects with a total project landscape area equal to or greater than 5,000 square feet requiring a building or landscape permit, plan check or design review.

These criteria do not apply to:

- Registered local, state or federal historical sites;
- Ecological restoration projects that do not require a permanent irrigation system;
- Mined-land reclamation projects that do not require a permanent irrigation system; or
- Plant collections, as part of botanical gardens and arboretums open to the public.

10.3 Landscape/Irrigation Submittal Package

Appendix A of Ordinance 1302.1 provides the format for the Landscape Document Package Checklist which includes the following key items:

1. Maximum Applied Water Allowance
2. Estimated Total Water Use by Hydrozone
3. $ETWU < MAWA$
4. Landscape Design Plan
5. Irrigation Design Plan
6. Grading Design Plan
7. Soil Management Report
8. General Project Information

Landscape/irrigation drawing requirements are included in Section 2-Drawing Format and Requirements. The Landscape and Irrigation Pre-Submittal Checklist is located in Appendix E.

Two copies of the landscape/irrigation submittal package shall be forwarded to the Water Management Division. See the Fees section for the most current landscape/irrigation plan check fees. The package will normally be returned to the applicant with comments if applicable within ten (10) days of receipt. After noted corrections have been made to the drawings, the applicant shall submit the original landscape and irrigation plans for final approval. A copy of the approved landscape package along with the approved plans will be released after the developer/applicant has provided all the post plan check documents (see Figure 1).

CVWD Water Management staff will inspect the landscaped area(s) for conformance with the approved landscape/irrigation package.

10.4 CVWD Easements

CVWD requires easements to ensure the ability to properly operate and maintain its facilities. Please see Section 2-Drawing Format and Requirements and Section 3-Right-of-Way for more details on easement width requirements and the detailed process for securing and dedicating easements to CVWD.