

# CASQA-LIDI BIORETENTION DETAILS

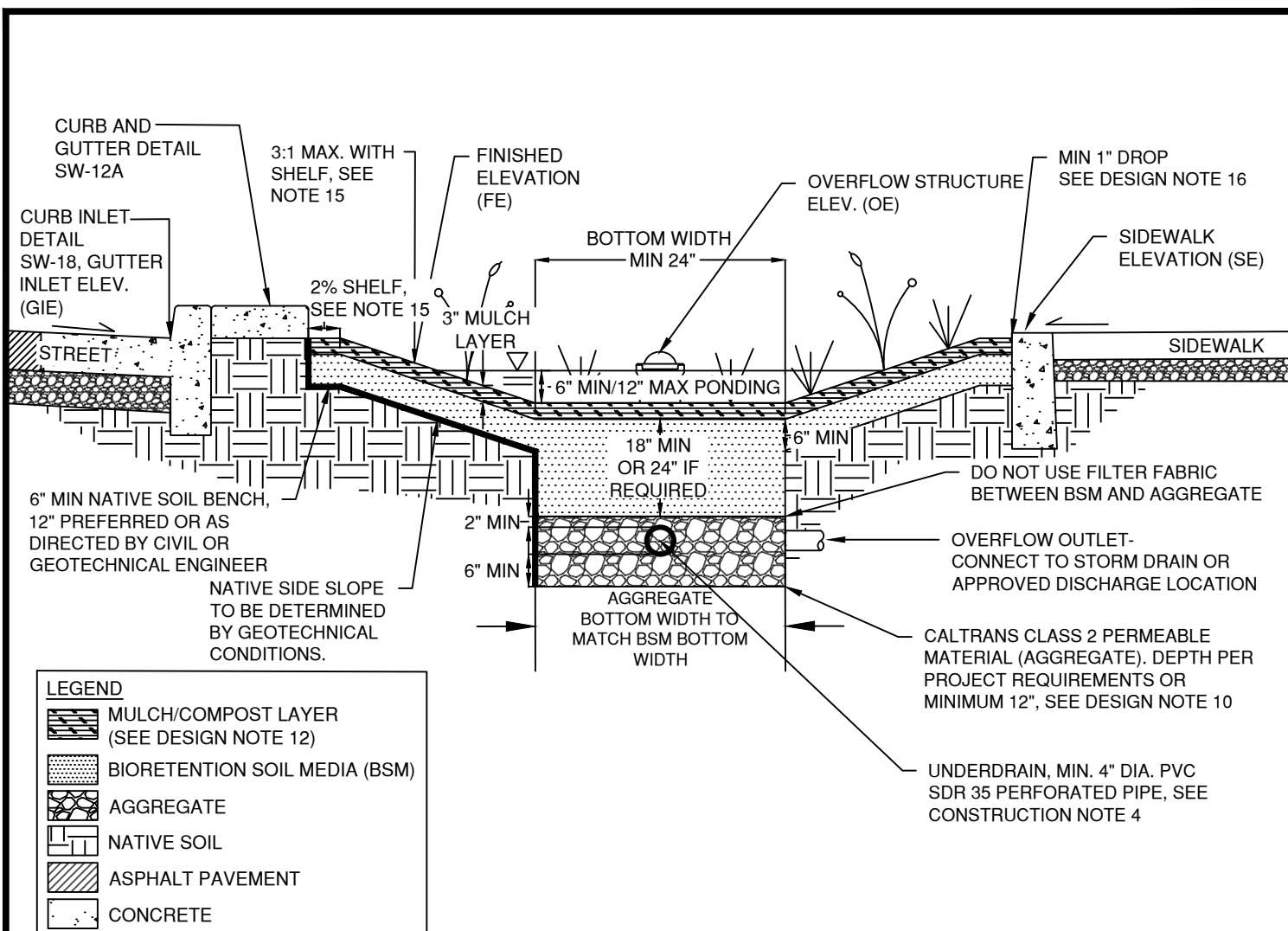
## TABLE OF CONTENTS

NAME	NO.
<b>STREET SIDE BIORETENTION (WITH PARKING)</b>	
STREET SLOPE-SIDED BIORETENTION, WITH PARKING, WITH UNDERDRAIN	SW-1
STREET SLOPE-SIDED BIORETENTION, WITH PARKING, NO UNDERDRAIN	SW-1A
STREET BIORETENTION PLANTER BOX, WITH PARKING, WITH UNDERDRAIN	SW-2
STREET BIORETENTION PLANTER BOX, WITH PARKING, NO UNDERDRAIN	SW-2A
<b>STREET SIDE BIORETENTION (NO PARKING)</b>	
STREET SLOPE-SIDED BIORETENTION, NO PARKING, WITH UNDERDRAIN	SW-3
STREET SLOPE-SIDED BIORETENTION, NO PARKING, NO UNDERDRAIN	SW-3A
STREET BIORETENTION PLANTER BOX, NO PARKING, WITH UNDERDRAIN	SW-4
STREET BIORETENTION PLANTER BOX, NO PARKING, NO UNDERDRAIN	SW-4A
STREET BIORETENTION BULB OUT, NO PARKING, NO UNDERDRAIN	SW-5
STREET BIORETENTION BULB OUT, MID BLOCK CROSSING PLAN VIEW	SW-5.1
<b>PARKING LOT BIORETENTION</b>	
PARKING LOT SLOPE-SIDED BIORETENTION, WITH UNDERDRAIN	SW-6
PARKING LOT SLOPE-SIDED BIORETENTION, NO UNDERDRAIN	SW-6A
PARKING LOT BIORETENTION PLANTER BOX, WITH UNDERDRAIN	SW-7
PARKING LOT BIORETENTION PLANTER BOX, NO UNDERDRAIN	SW-7A
<b>BIOFILTRATION PLANTER BOX (NO PARKING)</b>	
PLANTER BOX, NO PARKING	SW-9
<b>APPURTENANT STRUCTURES</b>	
CURB AND GUTTER	SW-12
CURB AND GUTTER	SW-12A
DEEP CURB	SW-13
THICKENED EDGE SIDEWALK	SW-14
FLUSH CURB AT SIDEWALK	SW-15
PARKING LOT EDGE OPTIONS	SW-16
CURB CUT INLET FOR PLANTERS	SW-17
CURB CUT INLET FOR SLOPE SIDED BIORETENTION FACILITY	SW-18
INLET WITH GRATE	SW-19
GRAVEL CHECK DAM	SW-20
CONCRETE CHECK DAM	SW-21
OVERFLOW STRUCTURE WITH BEEHIVE GRATE	SW-22
OVERFLOW STRUCTURE COLLAR	SW-22A

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## TABLE OF CONTENTS

NAME	NO.
OVERFLOW STRUCTURE WITH SQUARE GRATE	SW-23
IMPERMEABLE LINER CONNECTION	SW-24
OTHER	
PERVIOUS PAVEMENT	SW-25
PLANTING INUNDATION ZONES & BIORETENTION PLANT LIST	SW-26
DRYWELL STORMWATER BMP	SW-27
SPECIFICATIONS	



#### CONSTRUCTION NOTES

1. MAINTAIN UNDISTURBED NATIVE SOIL BENCH TO SUPPORT ADJACENT SIDEWALK/ROAD. SEQUENCE WORK TO CONSTRUCT CURBS BEFORE EXCAVATING BIORETENTION AREA FOR AGGREGATE AND BSM.
2. SCARIFY SUBGRADE BEFORE INSTALLING BIORETENTION AREA AGGREGATE AND BSM.
3. FACILITY EXCAVATION TO ALLOW FOR SPECIFIED AGGREGATE, BSM, AND MULCH DEPTHS TO ACHIEVE FINISHED ELEVATIONS ON CIVIL PLANS.
4. INSTALL UNDERDRAIN WITH HOLES FACING DOWN. TOP OF UNDERDRAIN 6" BELOW TOP OF AGGREGATE LAYER. UNDERDRAIN SLOPE MAY BE FLAT.
5. PLACE BSM IN 6" LIFTS. COMPACT EACH 6" LIFT OF BSM WITH LANDSCAPE ROLLER OR BY LIGHTLY WETTING. IF WETTING, LET DRY OVERNIGHT BEFORE PLANTING.
6. DO NOT WORK WITHIN BIORETENTION AREA DURING RAIN OR UNDER WET CONDITIONS.
7. KEEP HEAVY MACHINERY OUTSIDE BIORETENTION AREA LIMITS.
8. STORMWATER SHOULD BE DIRECTED AWAY FROM BIORETENTION UNTIL CONSTRUCTION IS COMPLETE AND DRAINAGE AREA VEGETATION IS STABILIZED.

#### LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT STANDARD DETAILS



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STREET SLOPE-SIDED BIORETENTION WITH PARKING, WITH UNDERDRAIN

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

STANDARD PLAN NO.

SW-1

SHEET 1 OF 2

#### DESIGN NOTES

1. BIORETENTION FACILITY DESIGN SHOULD OPTIMIZE THE FLAT BOTTOM DIMENSIONS (I.E., WIDTH, LENGTH) TO MAXIMIZE THE FUNCTIONAL AREA OF THE FACILITY.
2. CAPTURE AND CONVEY OVERFLOW TO STORM DRAIN SYSTEM (DETAIL SW-22, SW-23). ALTERNATIVELY, CONVEY OVERFLOW TO APPROVED DISCHARGE LOCATION THROUGH OTHER OVERLAND METHODS (IE. CURB CUTS, SIDEWALK UNDERDRAIN, WEIR, ETC.).
3. PROVIDE SPOT ELEVATIONS AT INLETS AND OVERFLOW STRUCTURES ON CIVIL PLANS (FE, OE, GIE, SIE), PER DETAIL SW-18.
4. DUE TO SITE VARIABILITY, TO ENSURE THE LONG-TERM STRUCTURAL STABILITY OF THE BIORETENTION FACILITY AND ANY ADJACENT INFRASTRUCTURE CONSULT WITH A GEOTECHNICAL ENGINEER.
5. A VERTICAL LINER MAY BE USED FOR BIORETENTION FACILITIES TO PREVENT LATERAL FLOW AND TO SEPARATE THE NATIVE SOIL FROM THE BSM AND THE AGGREGATE, HOWEVER A HORIZONTAL LINER SHALL NOT BE USED.
6. DO NOT USE FILTER FABRIC BETWEEN BSM AND AGGREGATE.
7. PROVIDE CAPPED, THREADED PVC CLEANOUT FOR UNDERDRAIN, 4" MIN. DIA. WITH SWEEP BEND.
8. PROVIDE A CLEAN-OUT/OBSERVATION PORT IN EACH FACILITY, PER BIORETENTION TECHNICAL SPECIFICATIONS.
9. ON LONGITUDINAL SLOPE, USE CHECK DAMS (DETAILS SW-20, SW-21)
10. DEPTH OF AGGREGATE DETERMINED BY FACILITY SIZING. IF CALTRANS CLASS 2 PERMEABLE IS NOT AVAILABLE, SUBSTITUTE CLASS 3 PERMEABLE WITH AN OVERLYING 3" DEEP CHOKING LAYER OF EITHER CALTRANS COURSE AGGREGATE 1/2" (NO. 4) OR 3/4" X (NO.4) OPEN-GRADED AGGREGATE.
11. BIORETENTION SOIL MEDIA (BSM) SPECIFICATION PER BIORETENTION TECHNICAL SPECIFICATIONS.
12. PLANT SELECTION PER BIORETENTION TECHNICAL SPECIFICATIONS.
13. MULCH PER BIORETENTION TECHNICAL SPECIFICATIONS.
14. LOCATE ENERGY DISSIPATION AS SPECIFIED IN INLET DETAILS.
15. NATIVE SIDE SLOPE 4:1 (H:V) PREFERRED, 3:1 WITH SHELF. 6" MINIMUM SHELF WITH 2% SLOPE TOWARDS FACILITY ADJACENT TO PEDESTRIAN USE OR CURB UNLESS 4:1 SLOPE PROVIDED.
16. INCLUDE AT LEAST 1" DROP FROM CURB ABOVE MULCH LAYER.
17. AVOID DECORATIVE USE OF COBBLE THAT CAN INTERFERE WITH WITH INFILTRATION.

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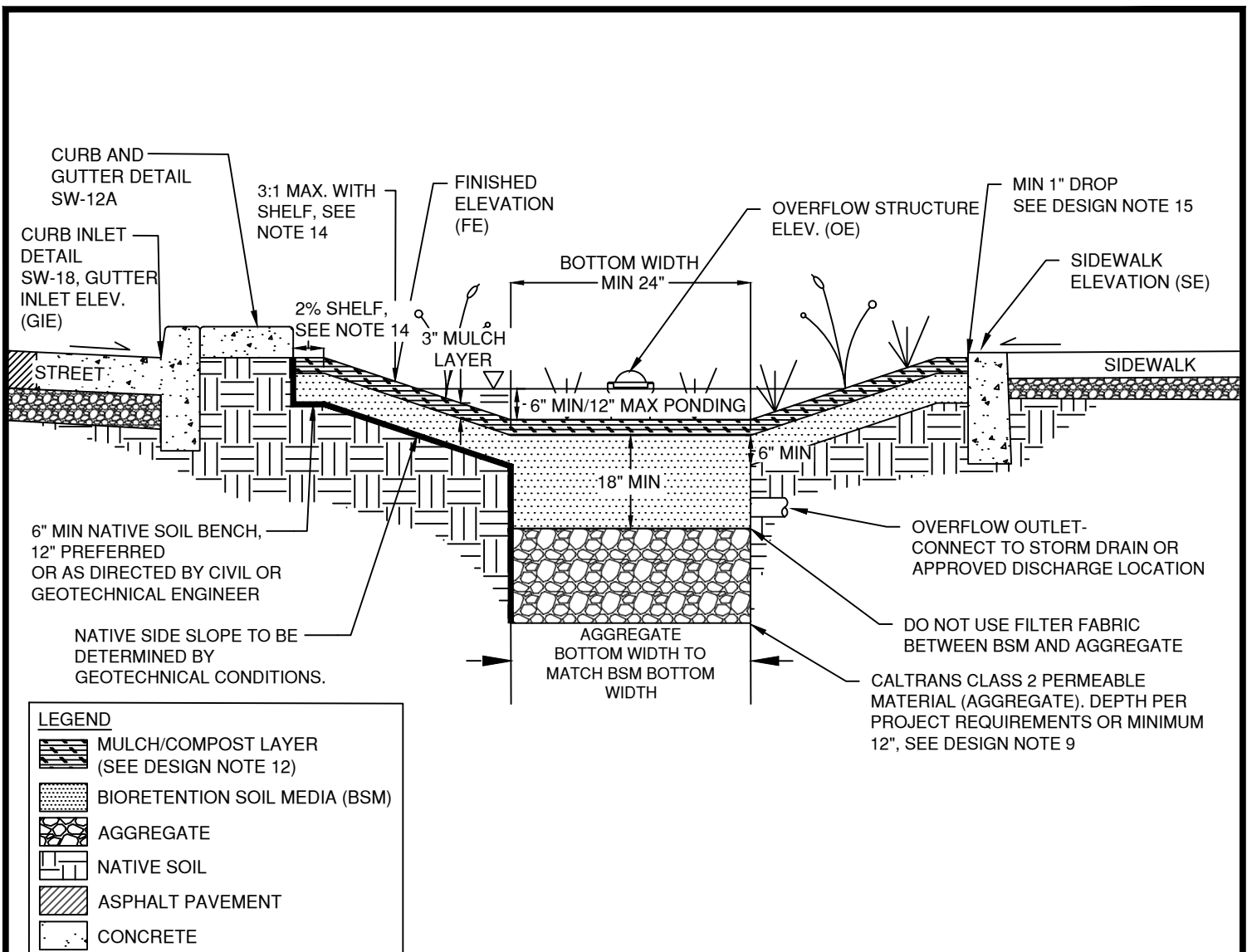
**STREET SLOPE-SIDED BIORETENTION WITH  
PARKING, WITH UNDERDRAIN**

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

STANDARD PLAN NO.

**SW-1**

SHEET 2 OF 2



#### CONSTRUCTION NOTES

1. MAINTAIN UNDISTURBED NATIVE SOIL BENCH TO SUPPORT ADJACENT SIDEWALK/ROAD. SEQUENCE WORK TO CONSTRUCT CURBS BEFORE EXCAVATING BIORETENTION AREA FOR AGGREGATE AND BSM.
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#### LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT STANDARD DETAILS



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STREET SLOPE-SIDED BIORETENTION, WITH  
PARKING, NO UNDERDRAIN

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

STANDARD PLAN NO.

SW-1A

SHEET 1 OF 2

#### DESIGN NOTES

1. BIORETENTION FACILITY DESIGN SHOULD OPTIMIZE THE FLAT BOTTOM DIMENSIONS (I.E., WIDTH, LENGTH) TO MAXIMIZE THE FUNCTIONAL AREA OF THE FACILITY.
2. CAPTURE AND CONVEY OVERFLOW TO STORM DRAIN SYSTEM (DETAIL SW-22, SW-23). ALTERNATIVELY, CONVEY OVERFLOW TO APPROVED DISCHARGE LOCATION THROUGH OTHER OVERLAND METHODS (IE. CURB CUTS, SIDEWALK UNDERDRAIN, WEIR, ETC.).
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4. DUE TO SITE VARIABILITY, TO ENSURE THE LONG-TERM STRUCTURAL STABILITY OF THE BIORETENTION FACILITY AND ANY ADJACENT INFRASTRUCTURE CONSULT WITH A GEOTECHNICAL ENGINEER.
5. A VERTICAL LINER MAY BE USED FOR BIORETENTION FACILITIES TO PREVENT LATERAL FLOW AND TO SEPARATE THE NATIVE SOIL FROM THE BSM AND THE AGGREGATE, HOWEVER A HORIZONTAL LINER SHALL NOT BE USED.
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12. MULCH PER BIORETENTION TECHNICAL SPECIFICATIONS.
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15. INCLUDE AT LEAST 1" DROP FROM CURB ABOVE MULCH LAYER.
16. AVOID DECORATIVE USE OF COBBLE THAT CAN INTERFERE WITH WITH INFILTRATION.

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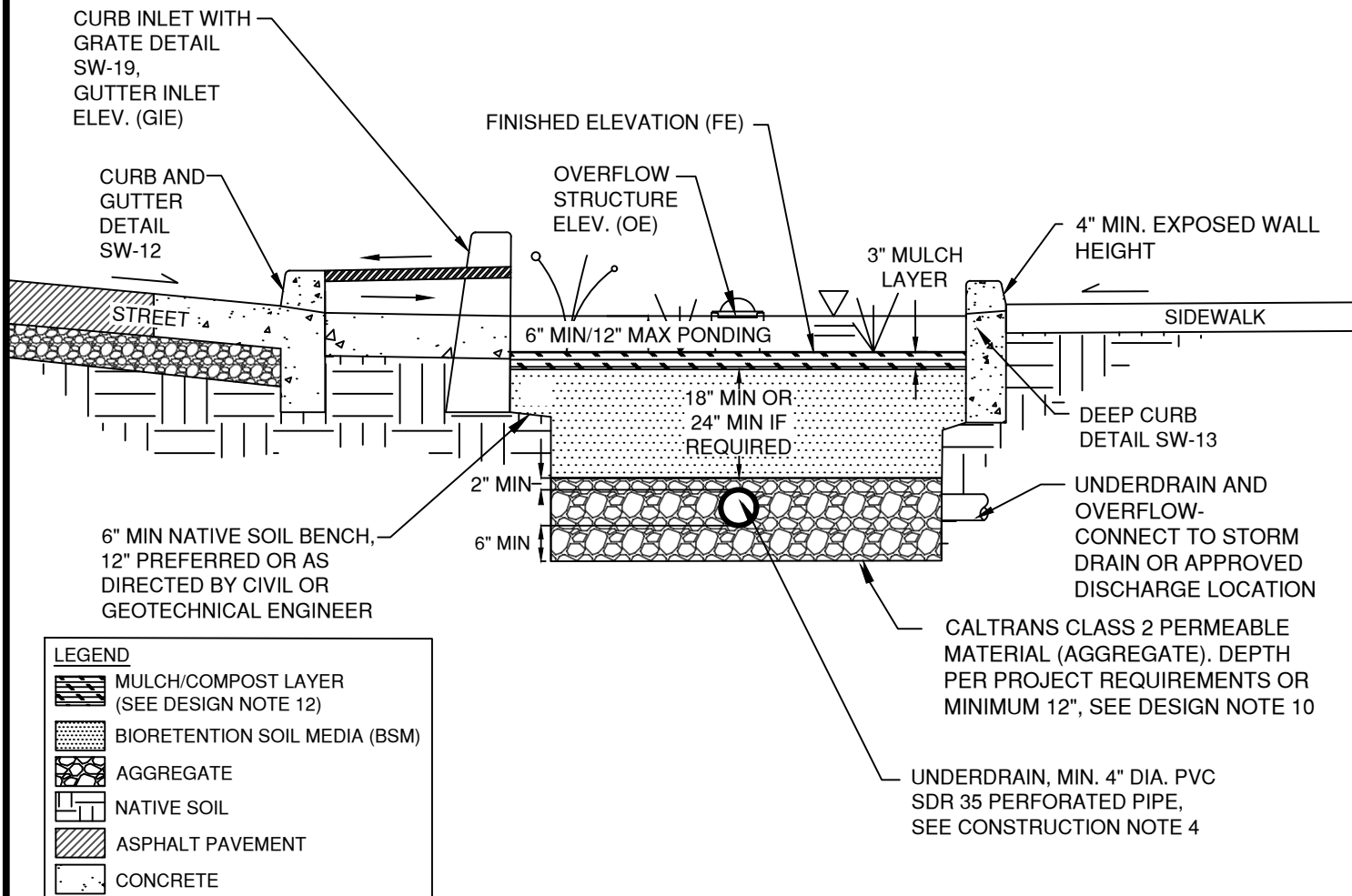
**STREET SLOPE-SIDED BIORETENTION, WITH  
PARKING, NO UNDERDRAIN**

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

STANDARD PLAN NO.

**SW-1A**

SHEET 2 OF 2



#### CONSTRUCTION NOTES

1. MAINTAIN UNDISTURBED NATIVE SOIL BENCH TO SUPPORT ADJACENT SIDEWALK/ROAD. SEQUENCE WORK TO CONSTRUCT CURBS BEFORE EXCAVATING BIORETENTION AREA FOR AGGREGATE AND BSM.
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6. DO NOT WORK WITHIN BIORETENTION AREA DURING RAIN OR UNDER WET CONDITIONS.
7. KEEP HEAVY MACHINERY OUTSIDE BIORETENTION AREA LIMITS.
8. STORMWATER SHOULD BE DIRECTED AWAY FROM BIORETENTION UNTIL CONSTRUCTION IS COMPLETE AND DRAINAGE AREA VEGETATION IS STABILIZED.

#### LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT STANDARD DETAILS



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STREET BIORETENTION PLANTER BOX,  
WITH PARKING, WITH UNDERDRAIN

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

STANDARD PLAN NO.

SW-2

SHEET 1 OF 2

#### DESIGN NOTES

1. BIORETENTION FACILITY DESIGN SHOULD OPTIMIZE THE FLAT BOTTOM DIMENSIONS (I.E., WIDTH, LENGTH) TO MAXIMIZE THE FUNCTIONAL AREA OF THE FACILITY.
2. CAPTURE AND CONVEY OVERFLOW TO STORM DRAIN SYSTEM (DETAIL SW-22, SW-23). ALTERNATIVELY, CONVEY OVERFLOW TO APPROVED DISCHARGE LOCATION THROUGH OTHER OVERLAND METHODS (IE. CURB CUTS, SIDEWALK UNDERDRAIN, WEIR, ETC.).
3. PROVIDE SPOT ELEVATIONS AT INLETS AND OVERFLOW STRUCTURES ON CIVIL PLANS (FE, OE, GIE, SIE), PER DETAIL SW-18.
4. DUE TO SITE VARIABILITY, TO ENSURE THE LONG-TERM STRUCTURAL STABILITY OF THE BIORETENTION FACILITY AND ANY ADJACENT INFRASTRUCTURE CONSULT WITH A GEOTECHNICAL ENGINEER.
5. A VERTICAL LINER MAY BE USED FOR BIORETENTION FACILITIES TO PREVENT LATERAL FLOW AND TO SEPARATE THE NATIVE SOIL FROM THE BSM AND THE AGGREGATE, HOWEVER A HORIZONTAL LINER SHALL NOT BE USED.
6. DO NOT USE FILTER FABRIC BETWEEN BSM AND AGGREGATE.
7. PROVIDE CAPPED, THREADED PVC CLEANOUT FOR UNDERDRAIN, 4" MIN. DIA. WITH SWEEP BEND.
8. PROVIDE A CLEAN-OUT/OBSERVATION PORT IN EACH FACILITY, PER BIORETENTION TECHNICAL SPECIFICATIONS.
9. ON LONGITUDINAL SLOPE, USE CHECK DAMS (DETAILS SW-20, SW-21)
10. USE AND DEPTH OF AGGREGATE DETERMINED BY FACILITY SIZING. IF CALTRANS CLASS 2 PERMEABLE IS NOT AVAILABLE, SUBSTITUTE CLASS 3 PERMEABLE WITH AN OVERLYING 3" DEEP CHOKING LAYER OF EITHER CALTRANS COURSE AGGREGATE 1/2" (NO. 4) OR 3/4" X (NO. 4) OPEN-GRADED AGGREGATE.
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12. PLANT SELECTION PER BIORETENTION TECHNICAL SPECIFICATIONS.
13. MULCH PER BIORETENTION TECHNICAL SPECIFICATIONS.
14. LOCATE ENERGY DISSIPATION AS SPECIFIED IN INLET DETAILS.
15. AVOID DECORATIVE USE OF COBBLE THAT CAN INTERFERE WITH INFILTRATION.

#### LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT STANDARD DETAILS



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**STREET BIORETENTION PLANTER BOX,  
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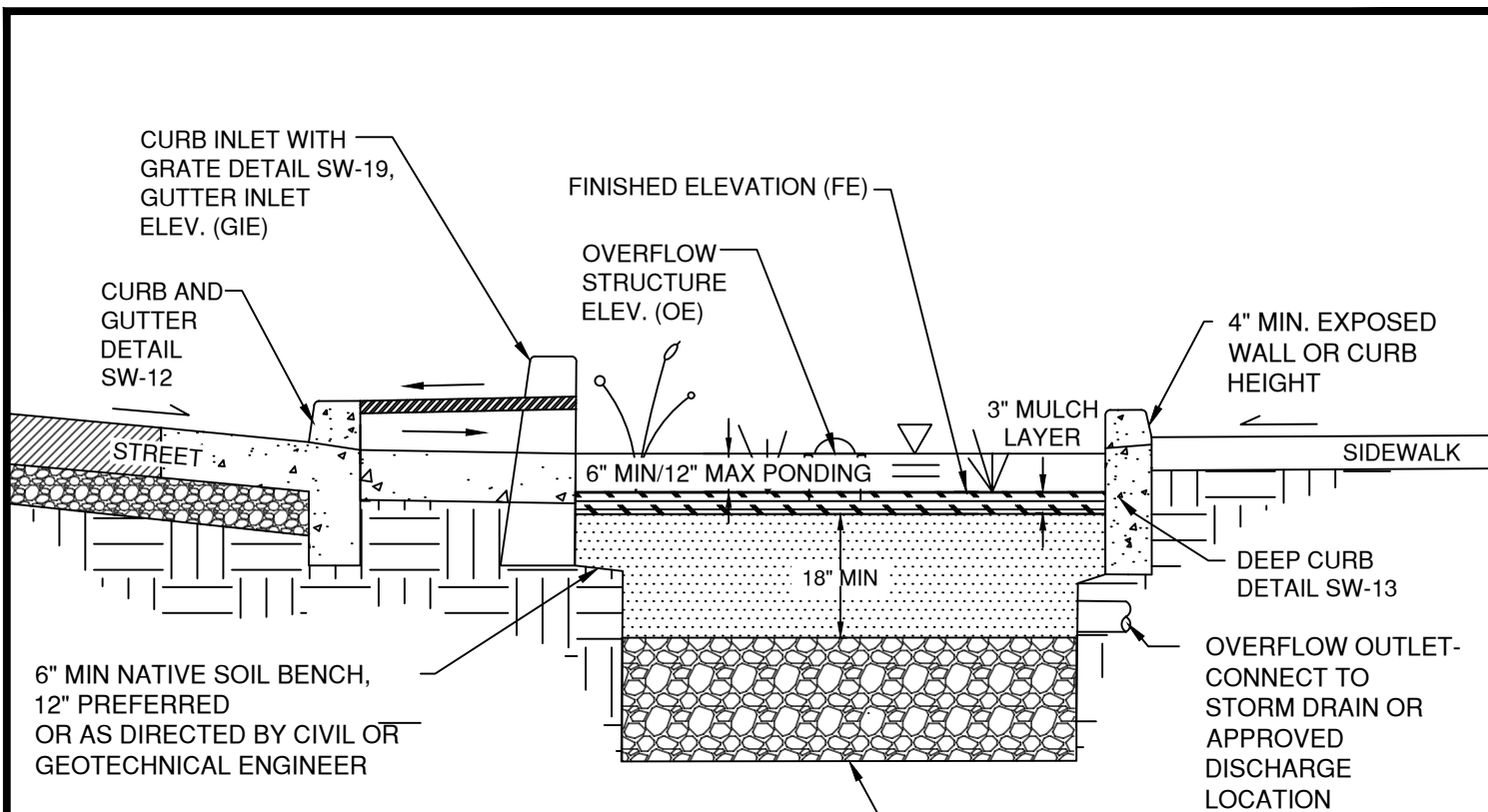
USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

STANDARD PLAN NO.

**SW-2**

SHEET 2 OF 2





LEGEND	
	MULCH/COMPOST LAYER (SEE DESIGN NOTE 12)
	BIORETENTION SOIL MEDIA (BSM)
	AGGREGATE
	NATIVE SOIL
	ASPHALT PAVEMENT
	CONCRETE

#### CONSTRUCTION NOTES

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4. COMPACT EACH 6" LIFT OF BSM WITH LANDSCAPE ROLLER OR BY LIGHTLY WETTING. IF WETTING, LET DRY OVERNIGHT BEFORE PLANTING.
5. DO NOT WORK WITHIN BIORETENTION AREA DURING RAIN OR UNDER WET CONDITIONS.
6. KEEP HEAVY MACHINERY OUTSIDE BIORETENTION AREA LIMITS.
7. STORMWATER SHOULD BE DIRECTED AWAY FROM BIORETENTION UNTIL CONSTRUCTION IS COMPLETE AND DRAINAGE AREA VEGETATION IS STABILIZED.

#### LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT STANDARD DETAILS



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STREET BIORETENTION PLANTER BOX,  
WITH PARKING, NO UNDERDRAIN

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

STANDARD PLAN NO.

**SW-2A**

SHEET 1 OF 2

#### DESIGN NOTES

1. BIORETENTION FACILITY DESIGN SHOULD OPTIMIZE THE FLAT BOTTOM DIMENSIONS (I.E., WIDTH, LENGTH) TO MAXIMIZE THE FUNCTIONAL AREA OF THE FACILITY.
2. CAPTURE AND CONVEY OVERFLOW TO STORM DRAIN SYSTEM (DETAIL SW-22, SW-23). ALTERNATIVELY, CONVEY OVERFLOW TO APPROVED DISCHARGE LOCATION THROUGH OTHER OVERLAND METHODS (IE. CURB CUTS, SIDEWALK UNDERDRAIN, WEIR, ETC.).
3. PROVIDE SPOT ELEVATIONS AT INLETS AND OVERFLOW STRUCTURES ON CIVIL PLANS (FE, OE, GIE, SIE), PER DETAIL SW-18.
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5. A VERTICAL LINER MAY BE USED FOR BIORETENTION FACILITIES TO PREVENT LATERAL FLOW AND TO SEPARATE THE NATIVE SOIL FROM THE BSM AND THE AGGREGATE, HOWEVER A HORIZONTAL LINER SHALL NOT BE USED.
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8. ON LONGITUDINAL SLOPE, USE CHECK DAMS (DETAILS SW-20, SW-21)
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14. AVOID DECORATIVE USE OF COBBLE THAT CAN INTERFERE WITH WITH INFILTRATION.

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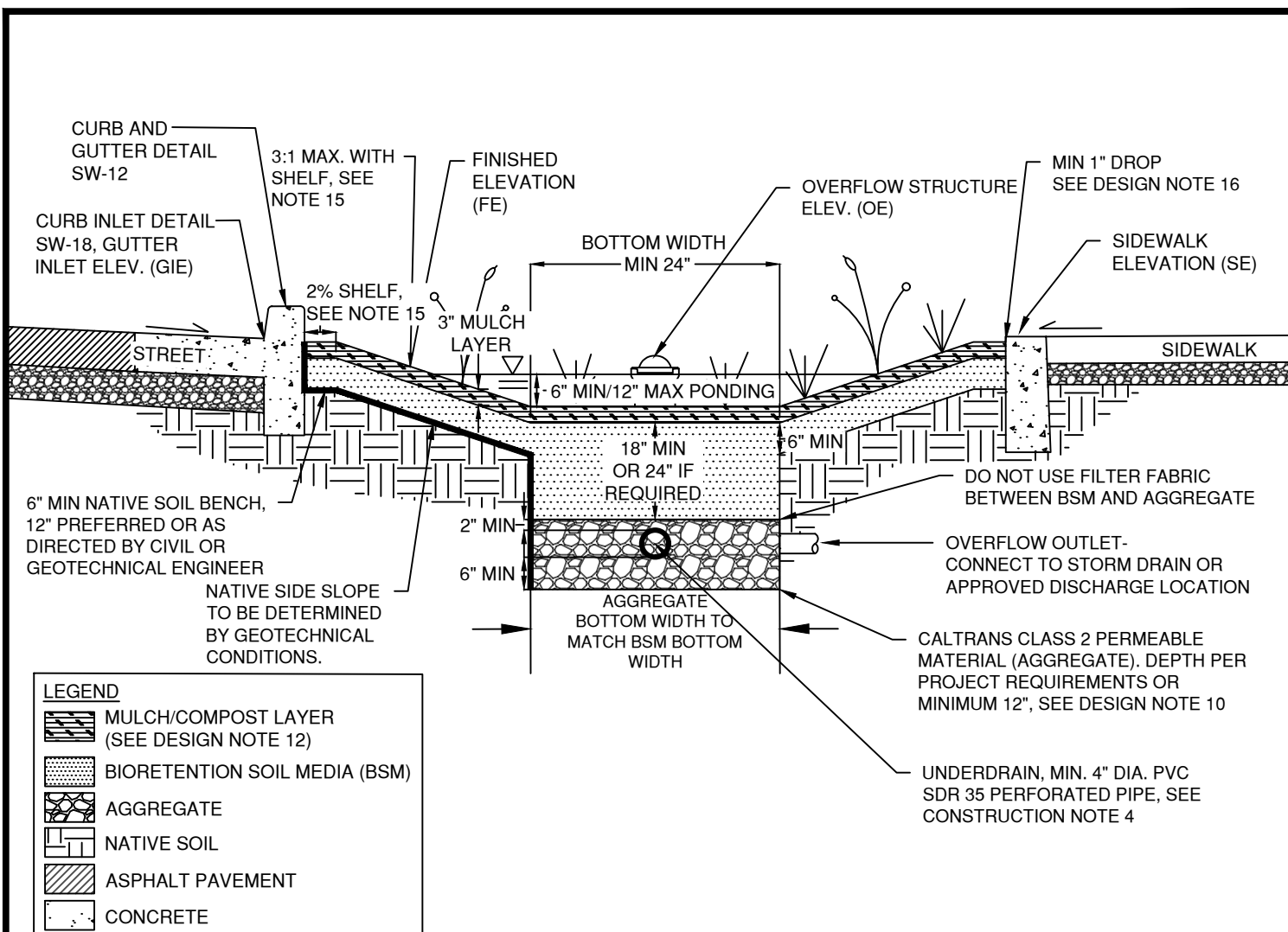
**STREET BIORETENTION PLANTER BOX,  
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USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

STANDARD PLAN NO.

**SW-2A**

SHEET 2 OF 2



#### CONSTRUCTION NOTES

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STREET SLOPE-SIDED BIORETENTION, NO PARKING, WITH UNDERDRAIN

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

STANDARD PLAN NO.

SW-3

SHEET 1 OF 2

#### DESIGN NOTES

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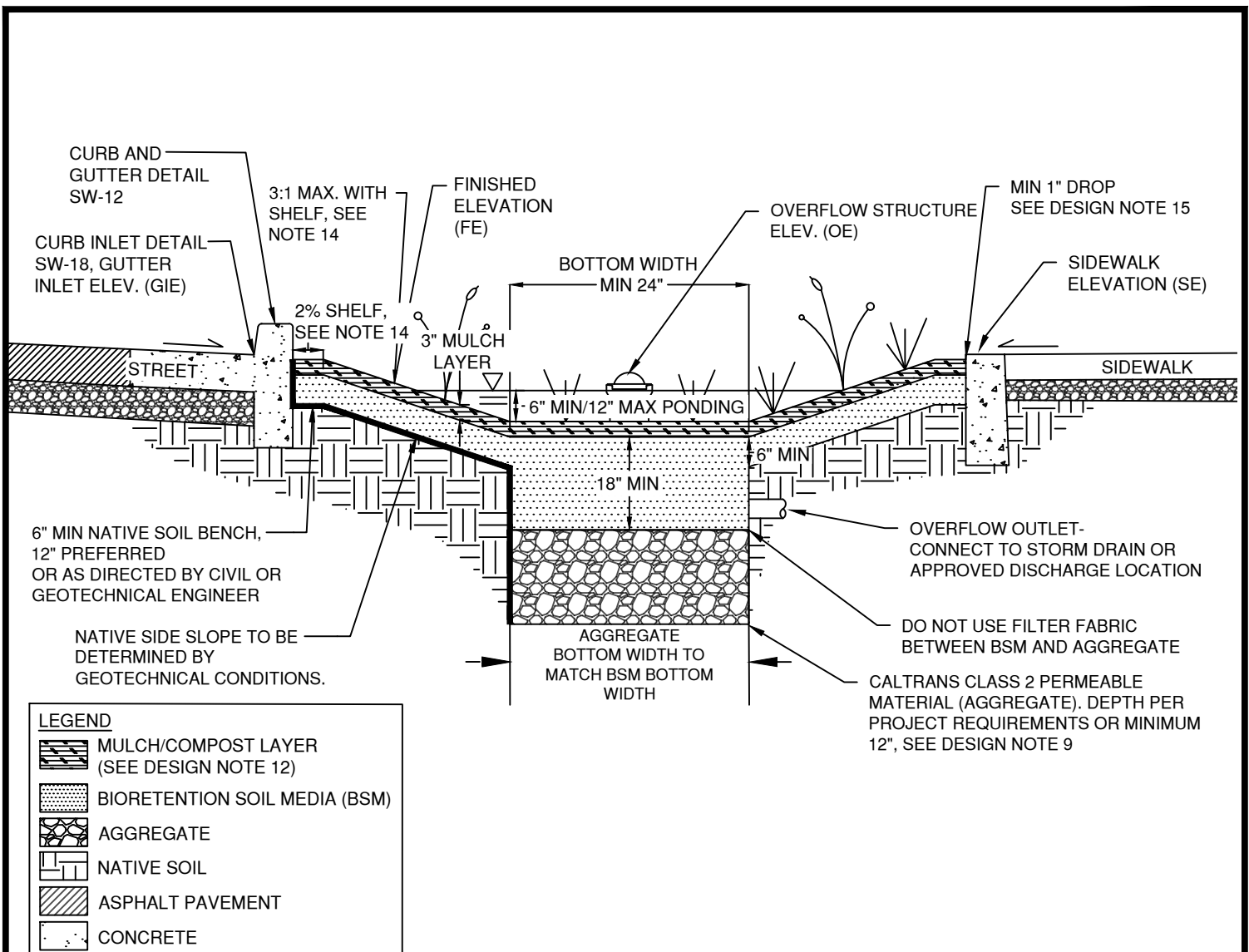
STREET SLOPE-SIDED BIORETENTION, NO  
PARKING, WITH UNDERDRAIN

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

STANDARD PLAN NO.

SW-3

SHEET 2 OF 2



#### CONSTRUCTION NOTES

1. MAINTAIN UNDISTURBED NATIVE SOIL BENCH TO SUPPORT ADJACENT SIDEWALK/ROAD. SEQUENCE WORK TO CONSTRUCT CURBS BEFORE EXCAVATING BIORETENTION AREA FOR AGGREGATE AND BSM.
2. SCARIFY SUBGRADE BEFORE INSTALLING BIORETENTION AREA AGGREGATE AND BSM.
3. FACILITY EXCAVATION TO ALLOW FOR SPECIFIED AGGREGATE, BSM, AND MULCH DEPTHS TO ACHIEVE FINISHED ELEVATIONS ON CIVIL PLANS.
4. PLACE BSM IN 6" LIFTS. COMPACT EACH 6" LIFT OF BSM WITH LANDSCAPE ROLLER OR BY LIGHTLY WETTING. IF WETTING, LET DRY OVERNIGHT BEFORE PLANTING.
5. DO NOT WORK WITHIN BIORETENTION AREA DURING RAIN OR UNDER WET CONDITIONS.
6. KEEP HEAVY MACHINERY OUTSIDE BIORETENTION AREA LIMITS.
7. STORMWATER SHOULD BE DIRECTED AWAY FROM BIORETENTION UNTIL CONSTRUCTION IS COMPLETE AND DRAINAGE AREA VEGETATION IS STABILIZED.

#### LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT STANDARD DETAILS



DEVELOPED UNDER PROP. 84 GRANT

APPROVED BY:

VERSION:  
08/31/2017

STREET SLOPE-SIDED BIORETENTION,  
NO PARKING, NO UNDERDRAIN

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

STANDARD PLAN NO.

**SW-3A**

SHEET 1 OF 2

#### DESIGN NOTES

1. BIORETENTION FACILITY DESIGN SHOULD OPTIMIZE THE FLAT BOTTOM DIMENSIONS (I.E., WIDTH, LENGTH) TO MAXIMIZE THE FUNCTIONAL AREA OF THE FACILITY.
2. CAPTURE AND CONVEY OVERFLOW TO STORM DRAIN SYSTEM (DETAIL SW-22, SW-23). ALTERNATIVELY, CONVEY OVERFLOW TO APPROVED DISCHARGE LOCATION THROUGH OTHER OVERLAND METHODS (IE. CURB CUTS, SIDEWALK UNDERDRAIN, WEIR, ETC.).
3. PROVIDE SPOT ELEVATIONS AT INLETS AND OVERFLOW STRUCTURES ON CIVIL PLANS (FE, OE, GIE, SIE), PER DETAIL SW-18.
4. DUE TO SITE VARIABILITY, TO ENSURE THE LONG-TERM STRUCTURAL STABILITY OF THE BIORETENTION FACILITY AND ANY ADJACENT INFRASTRUCTURE CONSULT WITH A GEOTECHNICAL ENGINEER.
5. A VERTICAL LINER MAY BE USED FOR BIORETENTION FACILITIES TO PREVENT LATERAL FLOW AND TO SEPARATE THE NATIVE SOIL FROM THE BSM AND THE AGGREGATE, HOWEVER A HORIZONTAL LINER SHALL NOT BE USED.
6. DO NOT USE FILTER FABRIC BETWEEN BSM AND AGGREGATE.
7. PROVIDE A CLEAN-OUT/OBSERVATION PORT IN EACH FACILITY, PER BIORETENTION TECHNICAL SPECIFICATIONS.
8. ON LONGITUDINAL SLOPE, USE CHECK DAMS (DETAILS SW-20, SW-21)
9. USE AND DEPTH OF AGGREGATE DETERMINED BY FACILITY SIZING. IF CALTRANS CLASS 2 PERMEABLE IS NOT AVAILABLE, SUBSTITUTE CLASS 3 PERMEABLE WITH AN OVERLYING 3" DEEP CHOKING LAYER OF EITHER CALTRANS COURSE AGGREGATE 1/2" (NO. 4) OR 3/4" X (NO. 4) OPEN-GRADED AGGREGATE.
10. BIORETENTION SOIL MEDIA (BSM) SPECIFICATION PER BIORETENTION TECHNICAL SPECIFICATIONS.
11. PLANT SELECTION PER BIORETENTION TECHNICAL SPECIFICATIONS.
12. MULCH PER BIORETENTION TECHNICAL SPECIFICATIONS.
13. LOCATE ENERGY DISSIPATION AS SPECIFIED IN INLET DETAILS.
14. NATIVE SIDE SLOPE 4:1 (H:V) PREFERRED, 3:1 WITH SHELF. 6" MINIMUM SHELF WITH 2% SLOPE TOWARDS FACILITY ADJACENT TO PEDESTRIAN USE OR CURB UNLESS 4:1 SLOPE PROVIDED.
15. INCLUDE AT LEAST 1" DROP FROM CURB ABOVE MULCH LAYER.
16. AVOID DECORATIVE USE OF COBBLE THAT CAN INTERFERE WITH WITH INFILTRATION.

#### LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT STANDARD DETAILS



DEVELOPED UNDER PROP. 84 GRANT



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08/31/2017

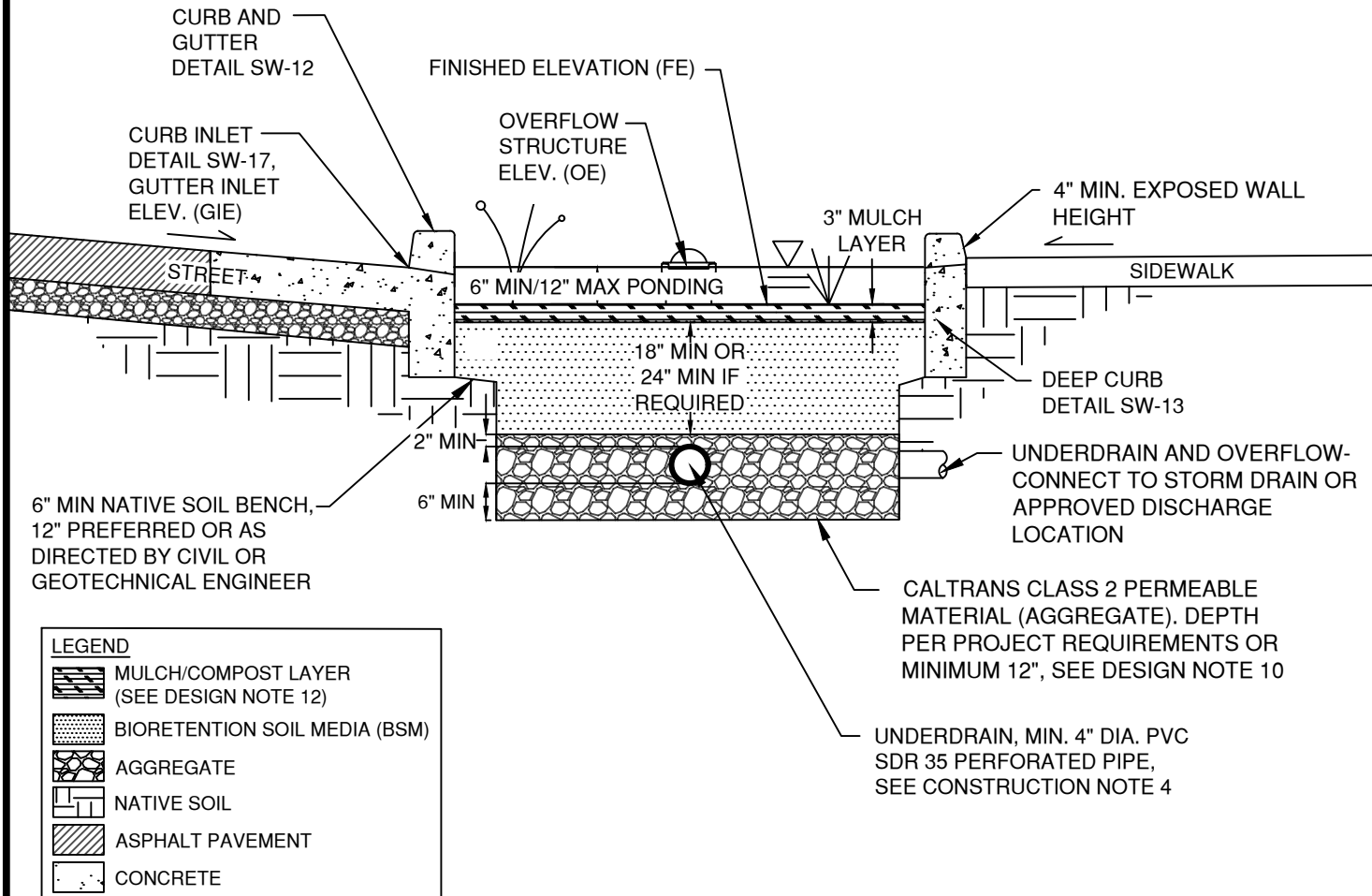
**STREET SLOPE-SIDED BIORETENTION, NO  
PARKING, NO UNDERDRAIN**

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

STANDARD PLAN NO.

**SW-3A**

SHEET 2 OF 2



#### CONSTRUCTION NOTES

1. MAINTAIN UNDISTURBED NATIVE SOIL BENCH TO SUPPORT ADJACENT SIDEWALK/ROAD. SEQUENCE WORK TO CONSTRUCT CURBS BEFORE EXCAVATING BIORETENTION AREA FOR AGGREGATE AND BSM.
2. SCARIFY SUBGRADE BEFORE INSTALLING BIORETENTION AREA AGGREGATE AND BSM.
3. FACILITY EXCAVATION TO ALLOW FOR SPECIFIED AGGREGATE, BSM, AND MULCH DEPTHS TO ACHIEVE FINISHED ELEVATIONS ON CIVIL PLANS.
4. INSTALL UNDERDRAIN WITH HOLES FACING DOWN. TOP OF UNDERDRAIN 6" BELOW TOP OF AGGREGATE LAYER. UNDERDRAIN SLOPE MAY BE FLAT.
5. COMPACT EACH 6" LIFT OF BSM WITH LANDSCAPE ROLLER OR BY LIGHTLY WETTING. IF WETTING, LET DRY OVERNIGHT BEFORE PLANTING.
6. DO NOT WORK WITHIN BIORETENTION AREA DURING RAIN OR UNDER WET CONDITIONS.
7. KEEP HEAVY MACHINERY OUTSIDE BIORETENTION AREA LIMITS.
8. STORMWATER SHOULD BE DIRECTED AWAY FROM BIORETENTION UNTIL CONSTRUCTION IS COMPLETE AND DRAINAGE AREA VEGETATION IS STABILIZED.

#### LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT STANDARD DETAILS



DEVELOPED UNDER PROP. 84 GRANT

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08/31/2017

STREET BIORETENTION PLANTER BOX, NO  
PARKING, WITH UNDERDRAIN

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

STANDARD PLAN NO.

SW-4

SHEET 1 OF 2



#### DESIGN NOTES

1. BIORETENTION FACILITY DESIGN SHOULD OPTIMIZE THE FLAT BOTTOM DIMENSIONS (I.E., WIDTH, LENGTH) TO MAXIMIZE THE FUNCTIONAL AREA OF THE FACILITY.
2. CAPTURE AND CONVEY OVERFLOW TO STORM DRAIN SYSTEM (DETAIL SW-22, SW-23). ALTERNATIVELY, CONVEY OVERFLOW TO APPROVED DISCHARGE LOCATION THROUGH OTHER OVERLAND METHODS (IE. CURB CUTS, SIDEWALK UNDERDRAIN, WEIR, ETC.).
3. PROVIDE SPOT ELEVATIONS AT INLETS AND OVERFLOW STRUCTURES ON CIVIL PLANS (FE, OE, GIE, SIE), PER DETAIL SW-18.
4. DUE TO SITE VARIABILITY, TO ENSURE THE LONG-TERM STRUCTURAL STABILITY OF THE BIORETENTION FACILITY AND ANY ADJACENT INFRASTRUCTURE CONSULT WITH A GEOTECHNICAL ENGINEER.
5. A VERTICAL LINER MAY BE USED FOR BIORETENTION FACILITIES TO PREVENT LATERAL FLOW AND TO SEPARATE THE NATIVE SOIL FROM THE BSM AND THE AGGREGATE, HOWEVER A HORIZONTAL LINER SHALL NOT BE USED.
6. DO NOT USE FILTER FABRIC BETWEEN BSM AND AGGREGATE.
7. PROVIDE CAPPED, THREADED PVC CLEANOUT FOR UNDERDRAIN, 4" MIN. DIA. WITH SWEEP BEND.
8. PROVIDE A CLEAN-OUT/OBSERVATION PORT IN EACH FACILITY, PER BIORETENTION TECHNICAL SPECIFICATIONS.
9. ON LONGITUDINAL SLOPE, USE CHECK DAMS (DETAILS SW-20, SW-21)
10. USE AND DEPTH OF AGGREGATE DETERMINED BY FACILITY SIZING. IF CALTRANS CLASS 2 PERMEABLE IS NOT AVAILABLE, SUBSTITUTE CLASS 3 PERMEABLE WITH AN OVERLYING 3" DEEP CHOKING LAYER OF EITHER CALTRANS COURSE AGGREGATE 1/2" (NO. 4) OR 3/4" X (NO. 4) OPEN-GRADED AGGREGATE.
11. BIORETENTION SOIL MEDIA (BSM) SPECIFICATION PER BIORETENTION TECHNICAL SPECIFICATIONS.
12. PLANT SELECTION PER BIORETENTION TECHNICAL SPECIFICATIONS.
13. MULCH PER BIORETENTION TECHNICAL SPECIFICATIONS.
14. LOCATE ENERGY DISSIPATION AS SPECIFIED IN INLET DETAILS.
15. AVOID DECORATIVE USE OF COBBLE THAT CAN INTERFERE WITH INFILTRATION.

#### LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT STANDARD DETAILS



DEVELOPED UNDER PROP. 84 GRANT



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VERSION:

08/31/2017

STREET BIORETENTION PLANTER BOX, NO  
PARKING, WITH UNDERDRAIN

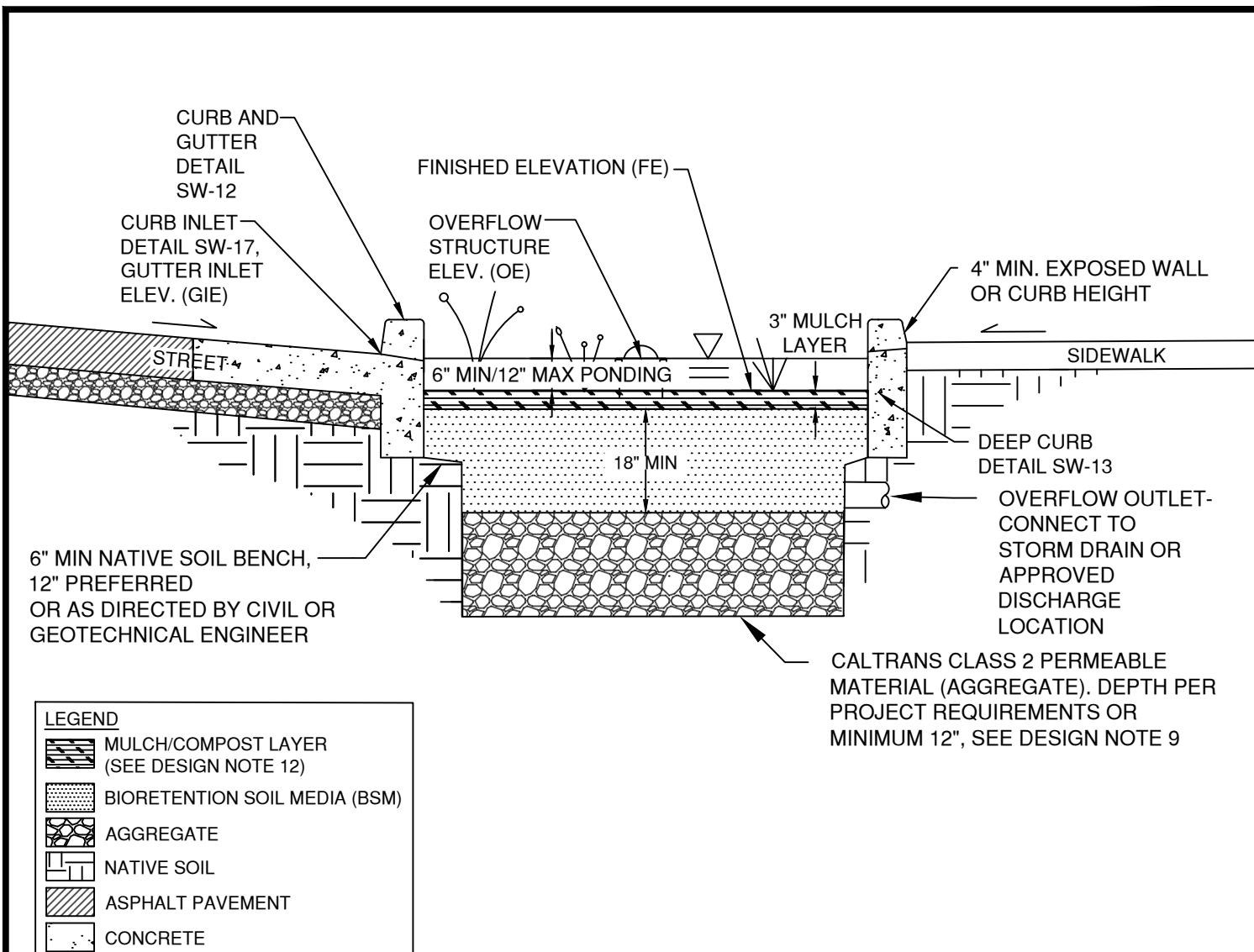
USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

STANDARD PLAN NO.

**SW-4**

SHEET 2 OF 2





#### CONSTRUCTION NOTES

1. MAINTAIN UNDISTURBED NATIVE SOIL BENCH TO SUPPORT ADJACENT SIDEWALK/ROAD. SEQUENCE WORK TO CONSTRUCT CURBS BEFORE EXCAVATING BIORETENTION AREA FOR AGGREGATE AND BSM.
2. SCARIFY SUBGRADE BEFORE INSTALLING BIORETENTION AREA AGGREGATE AND BSM.
3. FACILITY EXCAVATION TO ALLOW FOR SPECIFIED AGGREGATE, BSM, AND MULCH DEPTHS TO ACHIEVE FINISHED ELEVATIONS ON CIVIL PLANS.
4. COMPACT EACH 6" LIFT OF BSM WITH LANDSCAPE ROLLER OR BY LIGHTLY WETTING. IF WETTING, LET DRY OVERNIGHT BEFORE PLANTING.
5. DO NOT WORK WITHIN BIORETENTION AREA DURING RAIN OR UNDER WET CONDITIONS.
6. KEEP HEAVY MACHINERY OUTSIDE BIORETENTION AREA LIMITS.
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#### LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT STANDARD DETAILS



DEVELOPED UNDER PROP. 84 GRANT

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STREET BIORETENTION PLANTER BOX, NO PARKING, NO UNDERDRAIN

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

STANDARD PLAN NO.

SW-4A

SHEET 1 OF 2

#### DESIGN NOTES

1. BIORETENTION FACILITY DESIGN SHOULD OPTIMIZE THE FLAT BOTTOM DIMENSIONS (I.E., WIDTH, LENGTH) TO MAXIMIZE THE FUNCTIONAL AREA OF THE FACILITY.
2. CAPTURE AND CONVEY OVERFLOW TO STORM DRAIN SYSTEM (DETAIL SW-22, SW-23). ALTERNATIVELY, CONVEY OVERFLOW TO APPROVED DISCHARGE LOCATION THROUGH OTHER OVERLAND METHODS (IE. CURB CUTS, SIDEWALK UNDERDRAIN, WEIR, ETC.).
3. PROVIDE SPOT ELEVATIONS AT INLETS AND OVERFLOW STRUCTURES ON CIVIL PLANS (FE, OE, GIE, SIE), PER DETAIL SW-18.
4. DUE TO SITE VARIABILITY, TO ENSURE THE LONG-TERM STRUCTURAL STABILITY OF THE BIORETENTION FACILITY AND ANY ADJACENT INFRASTRUCTURE CONSULT WITH A GEOTECHNICAL ENGINEER.
5. A VERTICAL LINER MAY BE USED FOR BIORETENTION FACILITIES TO PREVENT LATERAL FLOW AND TO SEPARATE THE NATIVE SOIL FROM THE BSM AND THE AGGREGATE, HOWEVER A HORIZONTAL LINER SHALL NOT BE USED.
6. DO NOT USE FILTER FABRIC BETWEEN BSM AND AGGREGATE.
7. PROVIDE A CLEAN-OUT/OBSERVATION PORT IN EACH FACILITY, PER BIORETENTION TECHNICAL SPECIFICATIONS.
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11. PLANT SELECTION PER BIORETENTION TECHNICAL SPECIFICATIONS.
12. MULCH PER BIORETENTION TECHNICAL SPECIFICATIONS.
13. LOCATE ENERGY DISSIPATION AS SPECIFIED IN INLET DETAILS.
14. AVOID DECORATIVE USE OF COBBLE THAT CAN INTERFERE WITH WITH INFILTRATION.

#### LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT STANDARD DETAILS



DEVELOPED UNDER PROP. 84 GRANT



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VERSION:  
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STREET BIORETENTION PLANTER BOX, NO  
PARKING, NO UNDERDRAIN

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

STANDARD PLAN NO.

**SW-4A**

SHEET 2 OF 2



## DESIGN NOTES

1. BIORETENTION FACILITY DESIGN SHOULD OPTIMIZE THE FLAT BOTTOM DIMENSIONS (I.E., WIDTH, LENGTH) TO MAXIMIZE THE FUNCTIONAL AREA OF THE FACILITY.
2. CAPTURE AND CONVEY OVERFLOW TO STORM DRAIN SYSTEM (DETAIL SW-22, SW-23). ALTERNATIVELY, CONVEY OVERFLOW TO APPROVED DISCHARGE LOCATION THROUGH OTHER OVERLAND METHODS (IE. CURB CUTS, SIDEWALK UNDERDRAIN, WEIR, ETC.).
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12. MULCH PER BIORETENTION TECHNICAL SPECIFICATIONS.
13. LOCATE ENERGY DISSIPATION AS SPECIFIED IN INLET DETAILS.
14. NATIVE SIDE SLOPE 4:1 (H:V) PREFERRED, 3:1 WITH SHELF. 6" MINIMUM SHELF WITH 2% SLOPE TOWARDS FACILITY ADJACENT TO PEDESTRIAN USE OR CURB UNLESS 4:1 SLOPE PROVIDED.
15. INCLUDE AT LEAST 1" DROP FROM CURB ABOVE MULCH LAYER.
16. AVOID DECORATIVE USE OF COBBLE THAT CAN INTERFERE WITH WITH INFILTRATION.

## LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT STANDARD DETAILS



DEVELOPED UNDER PROP. 84 GRANT



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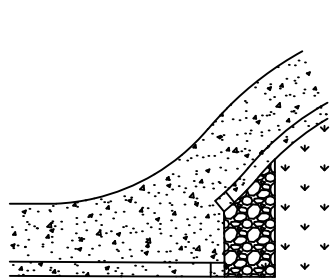
STREET BIORETENTION BULB OUT, NO  
PARKING, NO UNDERDRAIN, SINGLE SLOPE

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

STANDARD PLAN NO.

**SW-5**

SHEET 2 OF 2



CURB CUT INLET

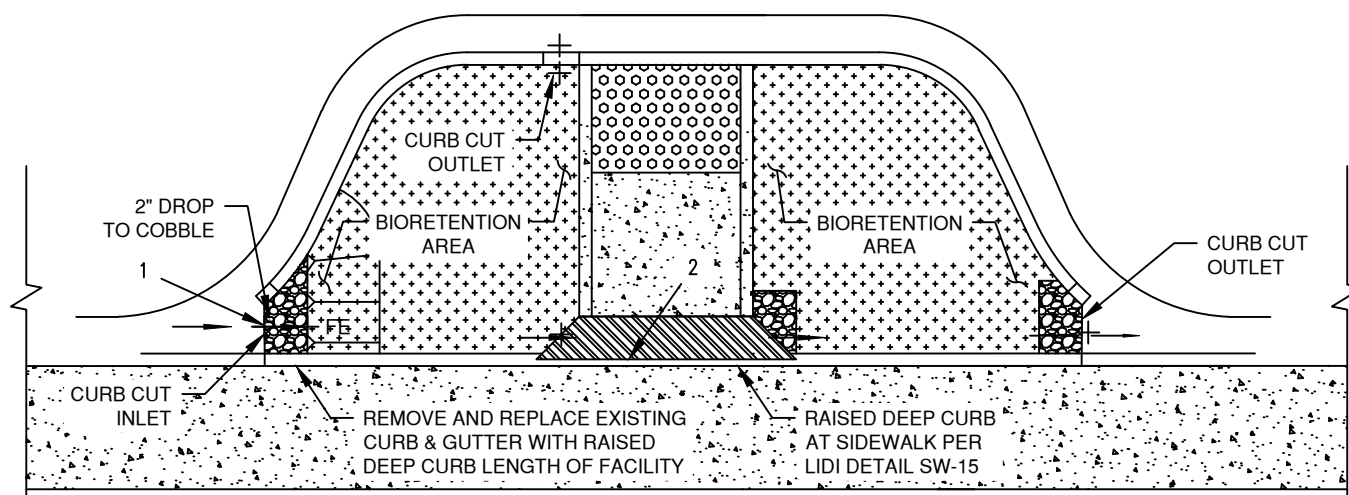
1

1/4" ALLEN WRENCH BOLTS,  
FLUSH



GRATE & FRAME

2



#### CONSTRUCTION NOTES:

1. INSTALL GRAVEL BAGS AT CURB CUTS TO BLOCK FLOW FROM ENTERING BIORETENTION AREA. CITY TO REMOVE GRAVEL BAGS AT A TIME FOLLOWING CONSTRUCTION COMPLETION.

#### DESIGN NOTE:

1. THIS STANDARD DETAIL ASSUMES GRADUAL LONGITUDINAL AND CROSS SLOPES OF THE ROADWAY. STEEPER SLOPES IN EITHER DIRECTION WILL IMPACT CONVEYANCE AND ELEVATION DIFFERENCES BETWEEN THE FACILITY AND ADJACENT ROADWAY, CURB, AND SIDEWALK SURFACES. RETROFIT PROJECTS WILL FACE GREATER CONSTRAINTS THAN NEW CONSTRUCTION. SITE SPECIFIC DESIGN IS CRITICAL TO AVOID GRADE CONFLICTS AND MAXIMIZING PONDING AREA. GRADING PLANS THAT PROVIDE SPOT ELEVATIONS ACROSS THE ENTIRE FACILITY AND ALONG ADJACENT SURFACES ARE NECESSARY.

### LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT STANDARD DETAILS



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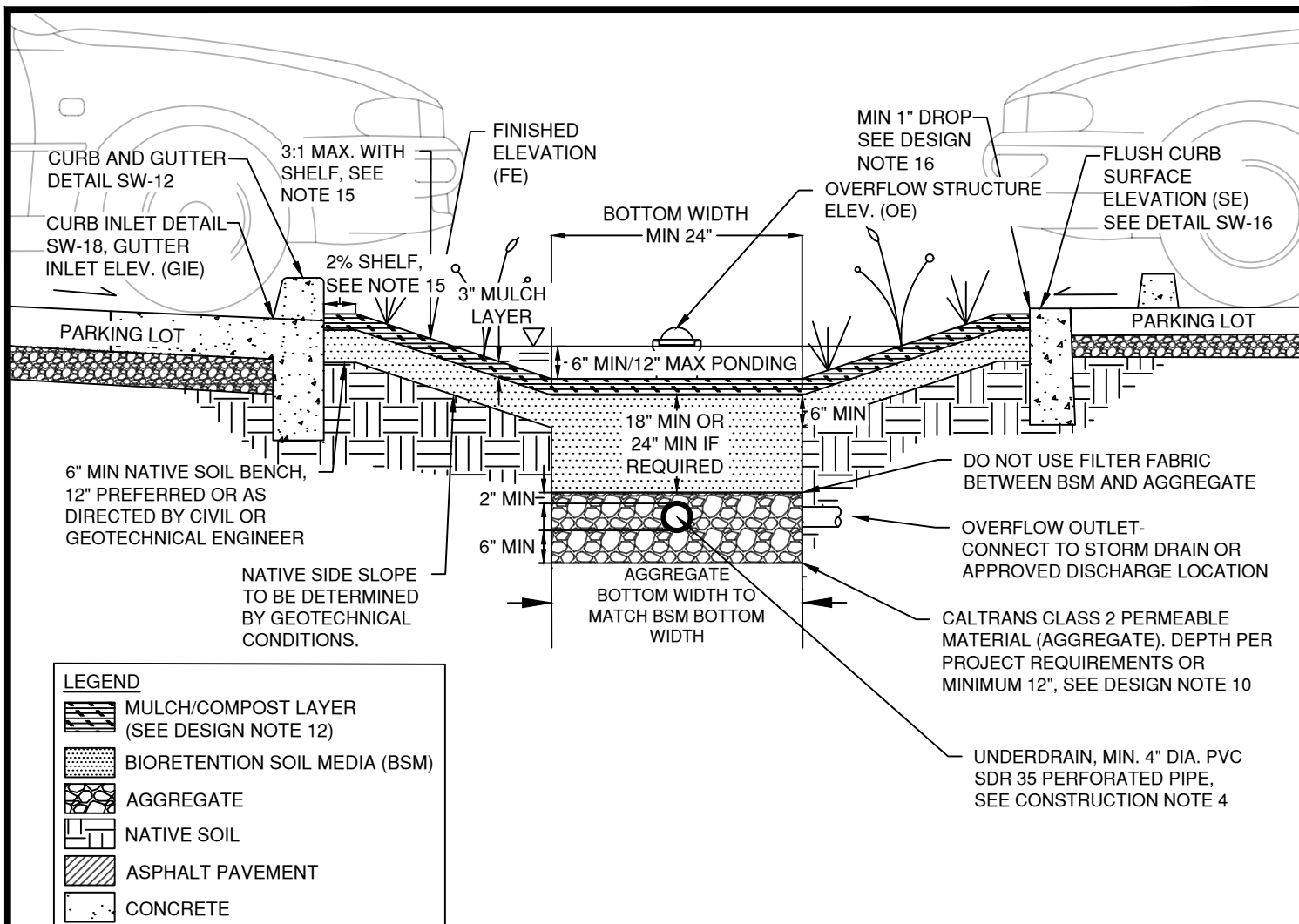
STREET BIORETENTION BULB OUT, MID  
BLOCK CROSSING

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

STANDARD PLAN NO.

SW-5.1

SHEET 1 OF 1



## LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT STANDARD DETAILS



DEVELOPED UNDER PROP. 84 GRANT

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08/31/2017

PARKING LOT SLOPE-SIDED BIORETENTION,  
WITH UNDERDRAIN

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

STANDARD PLAN NO.

**SW-6**

SHEET 1 OF 2

#### DESIGN NOTES

1. BIORETENTION FACILITY DESIGN SHOULD OPTIMIZE THE FLAT BOTTOM DIMENSIONS (I.E., WIDTH, LENGTH) TO MAXIMIZE THE FUNCTIONAL AREA OF THE FACILITY.
2. CAPTURE AND CONVEY OVERFLOW TO STORM DRAIN SYSTEM (DETAIL SW-22, SW-23). ALTERNATIVELY, CONVEY OVERFLOW TO APPROVED DISCHARGE LOCATION THROUGH OTHER OVERLAND METHODS (IE. CURB CUTS, SIDEWALK UNDERDRAIN, WEIR, ETC.).
3. PROVIDE SPOT ELEVATIONS AT INLETS AND OVERFLOW STRUCTURES ON CIVIL PLANS (FE, OE, GIE, SIE), PER DETAIL SW-18.
4. DUE TO SITE VARIABILITY, TO ENSURE THE LONG-TERM STRUCTURAL STABILITY OF THE BIORETENTION FACILITY AND ANY ADJACENT INFRASTRUCTURE CONSULT WITH A GEOTECHNICAL ENGINEER.
5. A VERTICAL LINER MAY BE USED FOR BIORETENTION FACILITIES TO PREVENT LATERAL FLOW AND TO SEPARATE THE NATIVE SOIL FROM THE BSM AND THE AGGREGATE, HOWEVER A HORIZONTAL LINER SHALL NOT BE USED.
6. DO NOT USE FILTER FABRIC BETWEEN BSM AND AGGREGATE.
7. PROVIDE CAPPED, THREADED PVC CLEANOUT FOR UNDERDRAIN, 4" MIN. DIA. WITH SWEEP BEND.
8. PROVIDE A CLEAN-OUT/OBSERVATION PORT IN EACH FACILITY, PER BIORETENTION TECHNICAL SPECIFICATIONS.
9. ON LONGITUDINAL SLOPE, USE CHECK DAMS (DETAILS SW-20, SW-21)
10. DEPTH OF AGGREGATE DETERMINED BY FACILITY SIZING. IF CALTRANS CLASS 2 PERMEABLE IS NOT AVAILABLE, SUBSTITUTE CLASS 3 PERMEABLE WITH AN OVERLYING 3" DEEP CHOKING LAYER OF EITHER CALTRANS COURSE AGGREGATE 1/2" (NO. 4) OR 3/4" X (NO.4) OPEN-GRADED AGGREGATE.
11. BIORETENTION SOIL MEDIA (BSM) SPECIFICATION PER BIORETENTION TECHNICAL SPECIFICATIONS.
12. PLANT SELECTION PER BIORETENTION TECHNICAL SPECIFICATIONS.
13. MULCH PER BIORETENTION TECHNICAL SPECIFICATIONS.
14. LOCATE ENERGY DISSIPATION AS SPECIFIED IN INLET DETAILS.
15. NATIVE SIDE SLOPE 4:1 (H:V) PREFERRED, 3:1 WITH BENCH. 6" MINIMUM SHELF WITH 2% SLOPE TOWARDS FACILITY ADJACENT TO PEDESTRIAN USE OR CURB UNLESS 4:1 SLOPE PROVIDED.
16. INCLUDE AT LEAST 1" DROP FROM CURB ABOVE MULCH LAYER.
17. AVOID DECORATIVE USE OF COBBLE THAT CAN INTERFERE WITH WITH INFILTRATION.

#### LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT STANDARD DETAILS



DEVELOPED UNDER PROP. 84 GRANT



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VERSION:  
08/31/2017

PARKING LOT SLOPE-SIDED  
BIORETENTION, WITH UNDERDRAIN

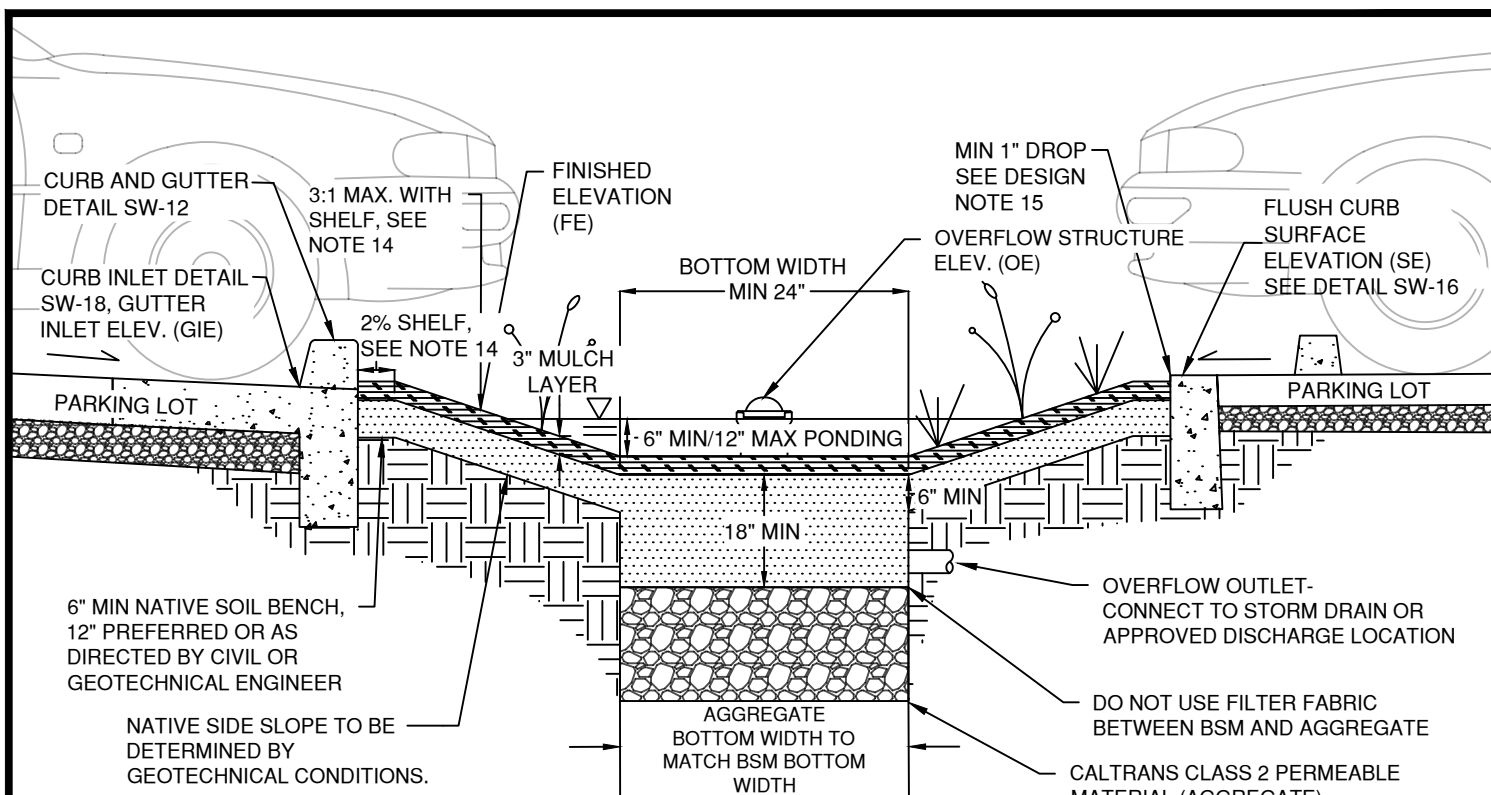
USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

STANDARD PLAN NO.

**SW-6**

SHEET 2 OF 2





#### LEGEND

	MULCH/COMPOST LAYER (SEE DESIGN NOTE 12)
	BIORETENTION SOIL MEDIA (BSM)
	AGGREGATE
	NATIVE SOIL
	ASPHALT PAVEMENT
	CONCRETE

#### CONSTRUCTION NOTES

1. MAINTAIN UNDISTURBED NATIVE SOIL BENCH TO SUPPORT ADJACENT SIDEWALK/ROAD. SEQUENCE WORK TO CONSTRUCT CURBS BEFORE EXCAVATING BIORETENTION AREA FOR AGGREGATE AND BSM.
2. SCARIFY SUBGRADE BEFORE INSTALLING BIORETENTION AREA AGGREGATE AND BSM.
3. FACILITY EXCAVATION TO ALLOW FOR SPECIFIED AGGREGATE, BSM, AND MULCH DEPTHS TO ACHIEVE FINISHED ELEVATIONS ON CIVIL PLANS.
4. PLACE BSM IN 6" LIFTS. COMPACT EACH 6" LIFT OF BSM WITH LANDSCAPE ROLLER OR BY LIGHTLY WETTING. IF WETTING, LET DRY OVERNIGHT BEFORE PLANTING.
5. DO NOT WORK WITHIN BIORETENTION AREA DURING RAIN OR UNDER WET CONDITIONS.
6. KEEP HEAVY MACHINERY OUTSIDE BIORETENTION AREA LIMITS.
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#### LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT STANDARD DETAILS



DEVELOPED UNDER PROP. 84 GRANT

APPROVED BY:

VERSION:

08/31/2017

PARKING LOT SLOPE-SIDED  
BIORETENTION, NO UNDERDRAIN

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

STANDARD PLAN NO.

SW-6A

SHEET 1 OF 2



#### DESIGN NOTES

1. BIORETENTION FACILITY DESIGN SHOULD OPTIMIZE THE FLAT BOTTOM DIMENSIONS (I.E., WIDTH, LENGTH) TO MAXIMIZE THE FUNCTIONAL AREA OF THE FACILITY.
2. CAPTURE AND CONVEY OVERFLOW TO STORM DRAIN SYSTEM (DETAIL SW-22, SW-23). ALTERNATIVELY, CONVEY OVERFLOW TO APPROVED DISCHARGE LOCATION THROUGH OTHER OVERLAND METHODS (IE. CURB CUTS, SIDEWALK UNDERDRAIN, WEIR, ETC.).
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#### LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT STANDARD DETAILS



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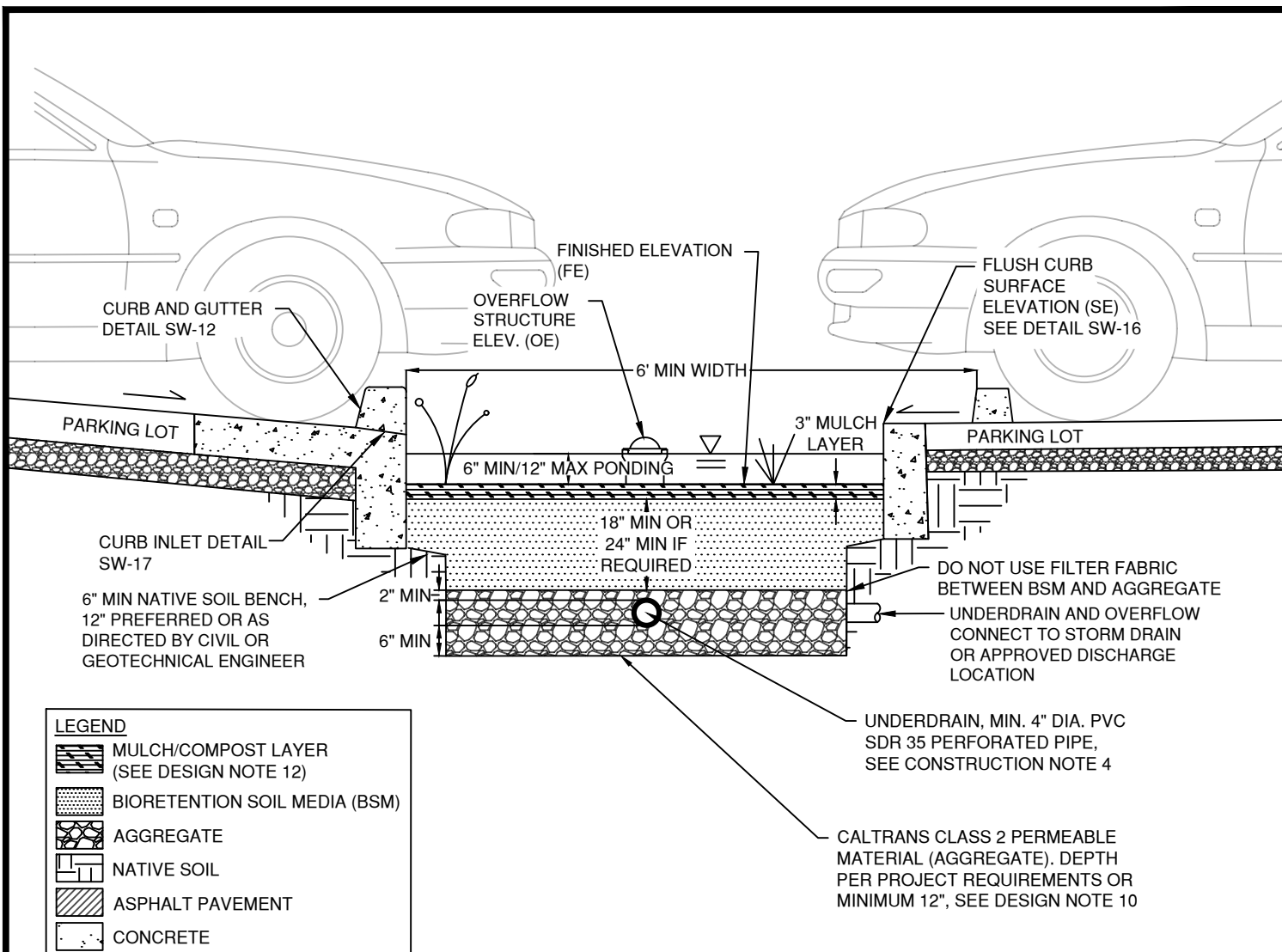
PARKING LOT SLOPE-SIDED  
BIORETENTION, NO UNDERDRAIN

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

STANDARD PLAN NO.

**SW-6A**

SHEET 2 OF 2



# LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT STANDARD DETAILS



DEVELOPED UNDER PROP. 84 GRANT

APPROVED BY:

VERSION:

08/31/2017

## PARKING LOT BIORETENTION PLANTER BOX, WITH UNDERDRAIN

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

STANDARD PLAN NO.

SW-7

SHEET 1 OF 2

#### DESIGN NOTES

1. BIORETENTION FACILITY DESIGN SHOULD OPTIMIZE THE FLAT BOTTOM DIMENSIONS (I.E., WIDTH, LENGTH) TO MAXIMIZE THE FUNCTIONAL AREA OF THE FACILITY.
2. CAPTURE AND CONVEY OVERFLOW TO STORM DRAIN SYSTEM (DETAIL SW-22, SW-23). ALTERNATIVELY, CONVEY OVERFLOW TO APPROVED DISCHARGE LOCATION THROUGH OTHER OVERLAND METHODS (IE. CURB CUTS, SIDEWALK UNDERDRAIN, WEIR, ETC.).
3. PROVIDE SPOT ELEVATIONS AT INLETS AND OVERFLOW STRUCTURES ON CIVIL PLANS (FE, OE, GIE, SIE), PER DETAIL SW-18.
4. DUE TO SITE VARIABILITY, TO ENSURE THE LONG-TERM STRUCTURAL STABILITY OF THE BIORETENTION FACILITY AND ANY ADJACENT INFRASTRUCTURE CONSULT WITH A GEOTECHNICAL ENGINEER.
5. A VERTICAL LINER MAY BE USED FOR BIORETENTION FACILITIES TO PREVENT LATERAL FLOW AND TO SEPARATE THE NATIVE SOIL FROM THE BSM AND THE AGGREGATE, HOWEVER A HORIZONTAL LINER SHALL NOT BE USED.
6. DO NOT USE FILTER FABRIC BETWEEN BSM AND AGGREGATE.
7. PROVIDE CAPPED, THREADED PVC CLEANOUT FOR UNDERDRAIN, 4" MIN. DIA. WITH SWEEP BEND.
8. PROVIDE A CLEAN-OUT/OBSERVATION PORT IN EACH FACILITY, PER BIORETENTION TECHNICAL SPECIFICATIONS.
9. ON LONGITUDINAL SLOPE, USE CHECK DAMS (DETAILS SW-20, SW-21)
10. USE AND DEPTH OF AGGREGATE DETERMINED BY FACILITY SIZING. IF CALTRANS CLASS 2 PERMEABLE IS NOT AVAILABLE, SUBSTITUTE CLASS 3 PERMEABLE WITH AN OVERLYING 3" DEEP CHOKING LAYER OF EITHER CALTRANS COURSE AGGREGATE 1/2" (NO. 4) OR 3/4" X (NO. 4) OPEN-GRADED AGGREGATE.
11. BIORETENTION SOIL MEDIA (BSM) SPECIFICATION PER BIORETENTION TECHNICAL SPECIFICATIONS.
12. PLANT SELECTION PER BIORETENTION TECHNICAL SPECIFICATIONS.
13. MULCH PER BIORETENTION TECHNICAL SPECIFICATIONS.
14. LOCATE ENERGY DISSIPATION AS SPECIFIED IN INLET DETAILS.
15. AVOID DECORATIVE USE OF COBBLE THAT CAN INTERFERE WITH WITH INFILTRATION.

#### LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT STANDARD DETAILS



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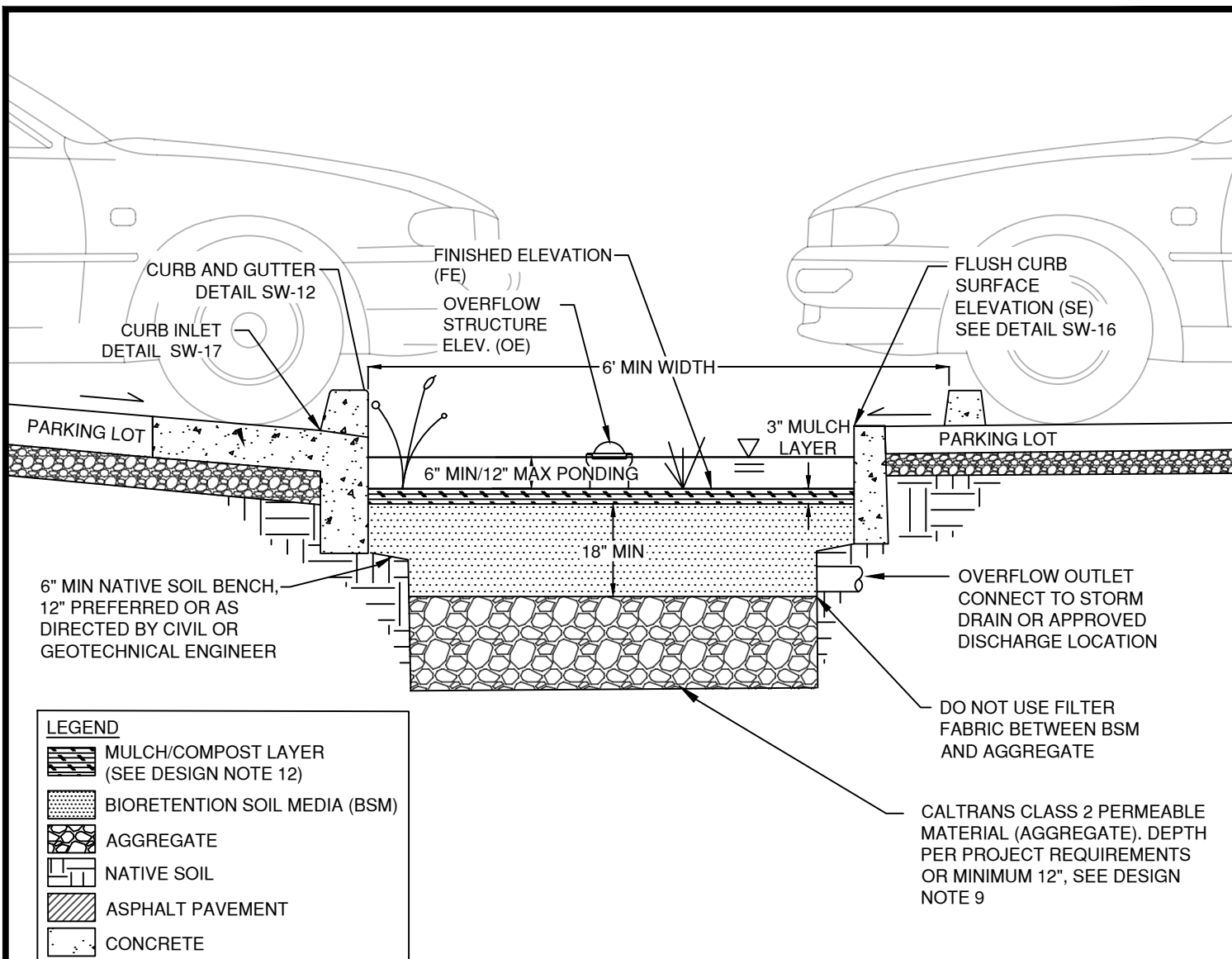
#### PARKING LOT BIORETENTION PLANTER BOX, WITH UNDERDRAIN

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

STANDARD PLAN NO.

**SW-7**

SHEET 2 OF 2



## LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT STANDARD DETAILS



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### PARKING LOT BIORETENTION PLANTER BOX, NO UNDERDRAIN

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

STANDARD PLAN NO.

**SW-7A**

SHEET 1 OF 2

#### DESIGN NOTES

1. BIORETENTION FACILITY DESIGN SHOULD OPTIMIZE THE FLAT BOTTOM DIMENSIONS (I.E., WIDTH, LENGTH) TO MAXIMIZE THE FUNCTIONAL AREA OF THE FACILITY.
2. CAPTURE AND CONVEY OVERFLOW TO STORM DRAIN SYSTEM (DETAIL SW-22, SW-23). ALTERNATIVELY, CONVEY OVERFLOW TO APPROVED DISCHARGE LOCATION THROUGH OTHER OVERLAND METHODS (IE. CURB CUTS, SIDEWALK UNDERDRAIN, WEIR, ETC.).
3. PROVIDE SPOT ELEVATIONS AT INLETS AND OVERFLOW STRUCTURES ON CIVIL PLANS (FE, OE, GIE, SIE), PER DETAIL SW-18.
4. DUE TO SITE VARIABILITY, TO ENSURE THE LONG-TERM STRUCTURAL STABILITY OF THE BIORETENTION FACILITY AND ANY ADJACENT INFRASTRUCTURE CONSULT WITH A GEOTECHNICAL ENGINEER.
5. A VERTICAL LINER MAY BE USED FOR BIORETENTION FACILITIES TO PREVENT LATERAL FLOW AND TO SEPARATE THE NATIVE SOIL FROM THE BSM AND THE AGGREGATE, HOWEVER A HORIZONTAL LINER SHALL NOT BE USED.
6. DO NOT USE FILTER FABRIC BETWEEN BSM AND AGGREGATE.
7. PROVIDE A CLEAN-OUT/OBSERVATION PORT IN EACH FACILITY, PER BIORETENTION TECHNICAL SPECIFICATIONS.
8. ON LONGITUDINAL SLOPE, USE CHECK DAMS (DETAILS SW-20, SW-21)
9. USE AND DEPTH OF AGGREGATE DETERMINED BY FACILITY SIZING. IF CALTRANS CLASS 2 PERMEABLE IS NOT AVAILABLE, SUBSTITUTE CLASS 3 PERMEABLE WITH AN OVERLYING 3" DEEP CHOKING LAYER OF EITHER CALTRANS COURSE AGGREGATE 1/2" (NO. 4) OR 3/4" X (NO. 4) OPEN-GRADED AGGREGATE.
10. BIORETENTION SOIL MEDIA (BSM) SPECIFICATION PER BIORETENTION TECHNICAL SPECIFICATIONS.
11. PLANT SELECTION PER BIORETENTION TECHNICAL SPECIFICATIONS.
12. MULCH PER BIORETENTION TECHNICAL SPECIFICATIONS.
13. LOCATE ENERGY DISSIPATION AS SPECIFIED IN INLET DETAILS.
14. AVOID DECORATIVE USE OF COBBLE THAT CAN INTERFERE WITH WITH INFILTRATION.

#### LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT STANDARD DETAILS



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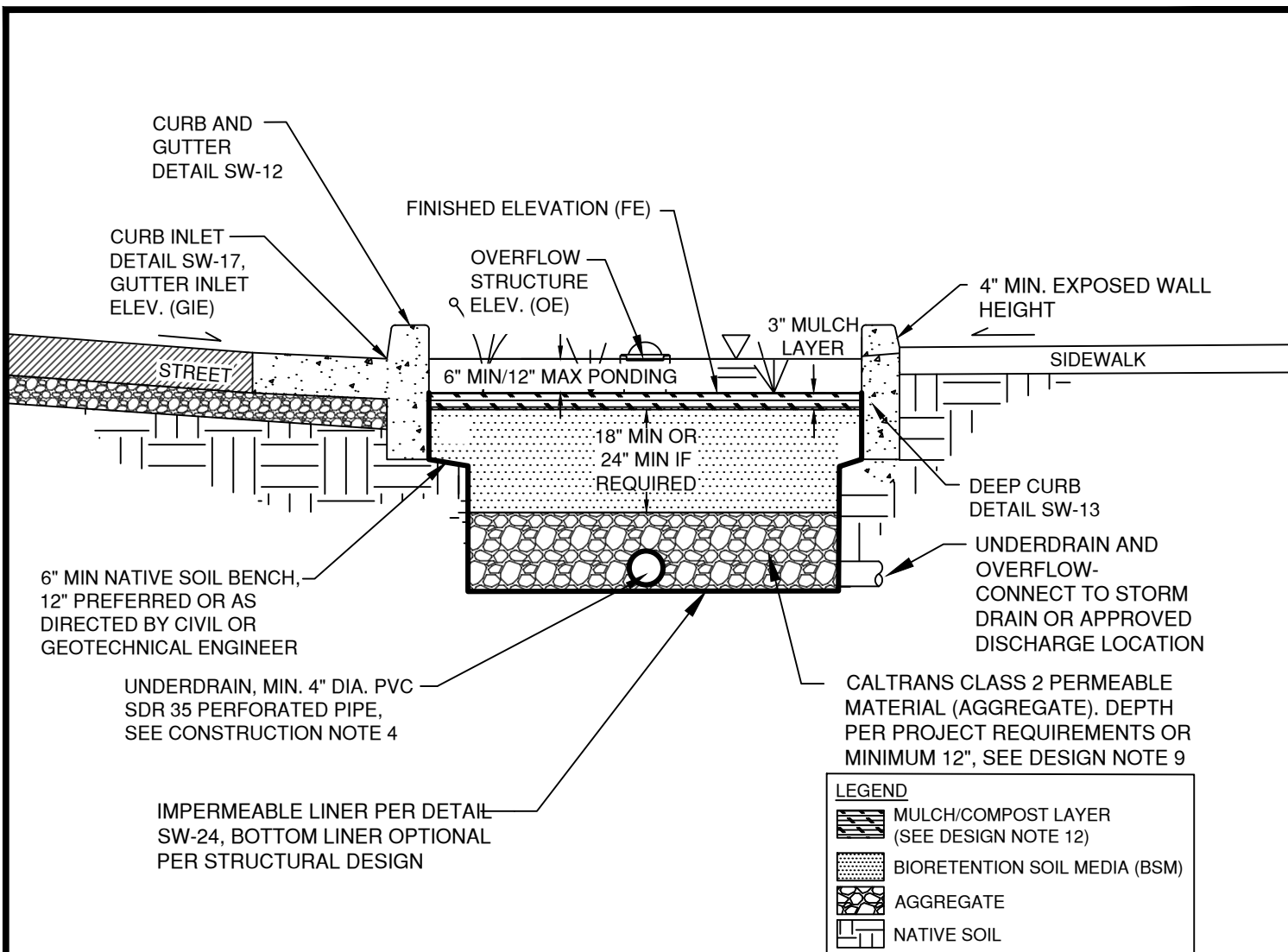
PARKING LOT BIORETENTION PLANTER  
BOX, NO UNDERDRAIN

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

STANDARD PLAN NO.

**SW-7A**

SHEET 2 OF 2



#### CONSTRUCTION NOTES

1. MAINTAIN UNDISTURBED NATIVE SOIL BENCH TO SUPPORT ADJACENT SIDEWALK/ROAD. SEQUENCE WORK TO CONSTRUCT CURBS BEFORE EXCAVATING BIOFILTRATION AREA FOR AGGREGATE AND BSM.
2. SCARIFY SUBGRADE BEFORE INSTALLING BIORETENTION AREA AGGREGATE AND BSM.
3. FACILITY EXCAVATION TO ALLOW FOR SPECIFIED AGGREGATE, BSM, AND MULCH DEPTHS TO ACHIEVE FINISHED ELEVATIONS ON CIVIL PLANS.
4. COMPACT EACH 6" LIFT OF BSM WITH LANDSCAPE ROLLER OR BY LIGHTLY WETTING. IF WETTING, LET DRY OVERNIGHT BEFORE PLANTING.
5. DO NOT WORK WITHIN BIOFILTRATION AREA DURING RAIN OR UNDER WET CONDITIONS.
6. KEEP HEAVY MACHINERY OUTSIDE BIOFILTRATION AREA LIMITS.
7. STORMWATER SHOULD BE DIRECTED AWAY FROM BIOFILTRATION UNTIL CONSTRUCTION IS COMPLETE AND DRAINAGE AREA VEGETATION IS STABILIZED.

#### LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT STANDARD DETAILS



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BIOFILTRATION PLANTER BOX,  
NO PARKING

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

STANDARD PLAN NO.

SW-9

SHEET 1 OF 2

#### DESIGN NOTES

1. BIOFILTRATION FACILITY DESIGN SHOULD OPTIMIZE THE FLAT BOTTOM DIMENSIONS (I.E., WIDTH, LENGTH) TO MAXIMIZE THE FUNCTIONAL AREA OF THE FACILITY.
2. CAPTURE AND CONVEY OVERFLOW TO STORM DRAIN SYSTEM (DETAIL SW-22, SW-23). ALTERNATIVELY, CONVEY OVERFLOW TO APPROVED DISCHARGE LOCATION THROUGH OTHER OVERLAND METHODS (IE. CURB CUTS, SIDEWALK UNDERDRAIN, WEIR, ETC.).
3. PROVIDE SPOT ELEVATIONS AT INLETS AND OVERFLOW STRUCTURES ON CIVIL PLANS (FE,OE, GIE, SIE), PER DETAIL SW-18.
4. DUE TO SITE VARIABILITY, TO ENSURE THE LONG-TERM STRUCTURAL STABILITY OF THE BIOFILTRATION FACILITY AND ANY ADJACENT INFRASTRUCTURE CONSULT WITH A GEOTECHNICAL ENGINEER.
5. DO NOT USE FILTER FABRIC BETWEEN BSM AND AGGREGATE.
6. PROVIDE CAPPED, THREADED PVC CLEANOUT FOR UNDERDRAIN, 4" MIN. DIA. WITH SWEEP BEND.
7. PROVIDE A CLEAN-OUT/OBSERVATION PORT IN EACH FACILITY, PER BIORETENTION TECHNICAL SPECIFICATIONS.
8. ON LONGITUDINAL SLOPE, USE CHECK DAMS (DETAILS SW-20, SW-21)
9. USE AND DEPTH OF AGGREGATE DETERMINED BY FACILITY SIZING. IF CALTRANS CLASS 2 PERMEABLE IS NOT AVAILABLE, SUBSTITUTE CLASS 3 PERMEABLE WITH AN OVERLYING 3" DEEP CHOKING LAYER OF EITHER CALTRANS COURSE AGGREGATE 1/2" (NO. 4) OR 3/4" X (NO. 4) OPEN-GRADED AGGREGATE.
10. BIORETENTION SOIL MEDIA (BSM) SPECIFICATION PER BIORETENTION TECHNICAL SPECIFICATIONS.
11. PLANT SELECTION PER BIORETENTION TECHNICAL SPECIFICATIONS.
12. MULCH PER BIORETENTION TECHNICAL SPECIFICATIONS.
13. LOCATE ENERGY DISSIPATION AS SPECIFIED IN INLET DETAILS.
14. AVOID DECORATIVE USE OF COBBLE THAT CAN INTERFERE WITH WITH INFILTRATION.

#### LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT STANDARD DETAILS



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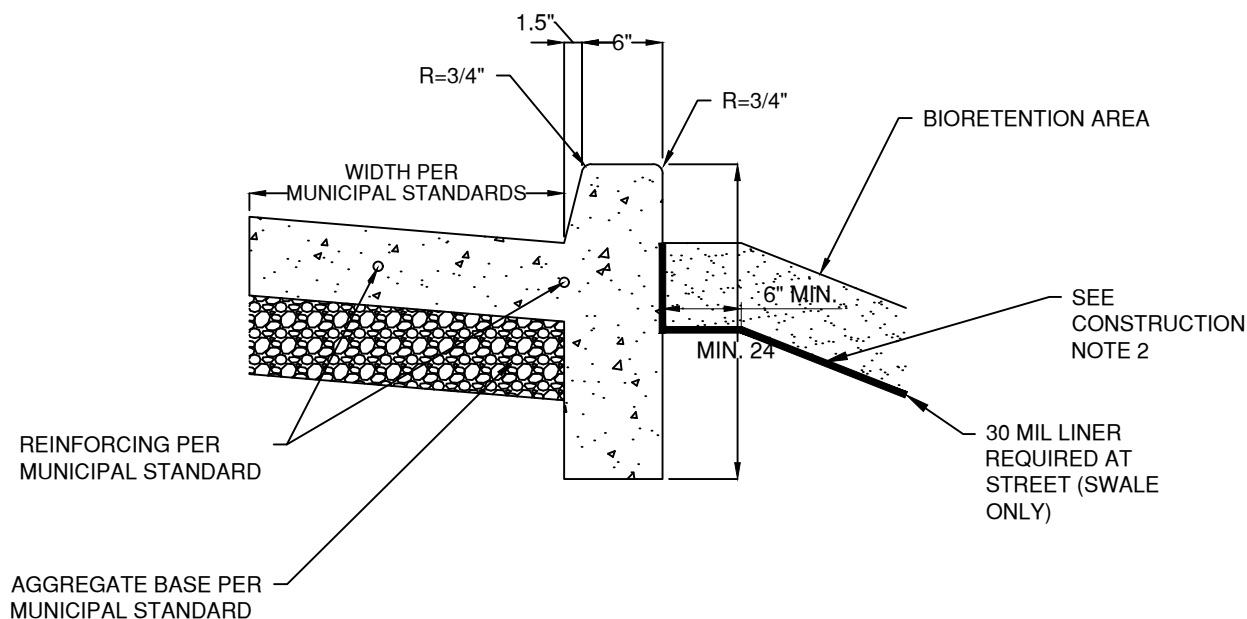
BIOFILTRATION PLANTER BOX,  
NO PARKING

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

STANDARD PLAN NO.

**SW-9**

SHEET 2 OF 2



#### DESIGN NOTES

1. SPECIAL DESIGN CONSIDERATION OR STRUCTURAL REVIEW MAY BE REQUIRED FOR LONGER PLANTER WALL SPANS. STEEL REINFORCEMENT OR ADDITIONAL CONCRETE CHECK DAMS MAY BE NEEDED FOR STABILITY.
2. EDGE CONDITION WILL VARY FOR NEW AND RETROFIT PROJECTS. CURB, GUTTER, AND WALL DETAILS MAY BE MODIFIED BY CIVIL AND GEOTECHNICAL ENGINEERS SUBJECT TO APPROVAL BY CITY ENGINEER.
3. CONCRETE AND EXPANSION JOINTS SHALL MEET THE REQUIREMENTS OF THE MUNICIPALITY.
4. STEEL REINFORCEMENT OR ADDITIONAL CONCRETE CHECK DAMS MAY BE NEEDED FOR STABILITY.

#### CONSTRUCTION NOTES

1. FINISH ALL EXPOSED CONCRETE SURFACES.
2. LAYBACK SLOPE AS FLAT AS POSSIBLE UNTIL TOP WIDTH PRODUCES 1:1 SLOPE & 24" BOTTOM WIDTH. AS PLANTER GETS WIDER MAINTAIN 1:1 SLOPE AND INCREASE BOTTOM WIDTH WIDER THAN 24". ALTERNATIVE TRENCH WALL CONFIGURATIONS MAY BE PROPOSED BY THE PROJECT GEOTECHNICAL ENGINEER (I.E. VERTICAL SHORING, REINFORCED TRENCH SIDEWALL) THAT DO NOT REQUIRE SIDEWALK SUPPORT FROM THE LIGHTLY COMPACTED BSM.

#### LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT STANDARD DETAILS



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CURB AND GUTTER

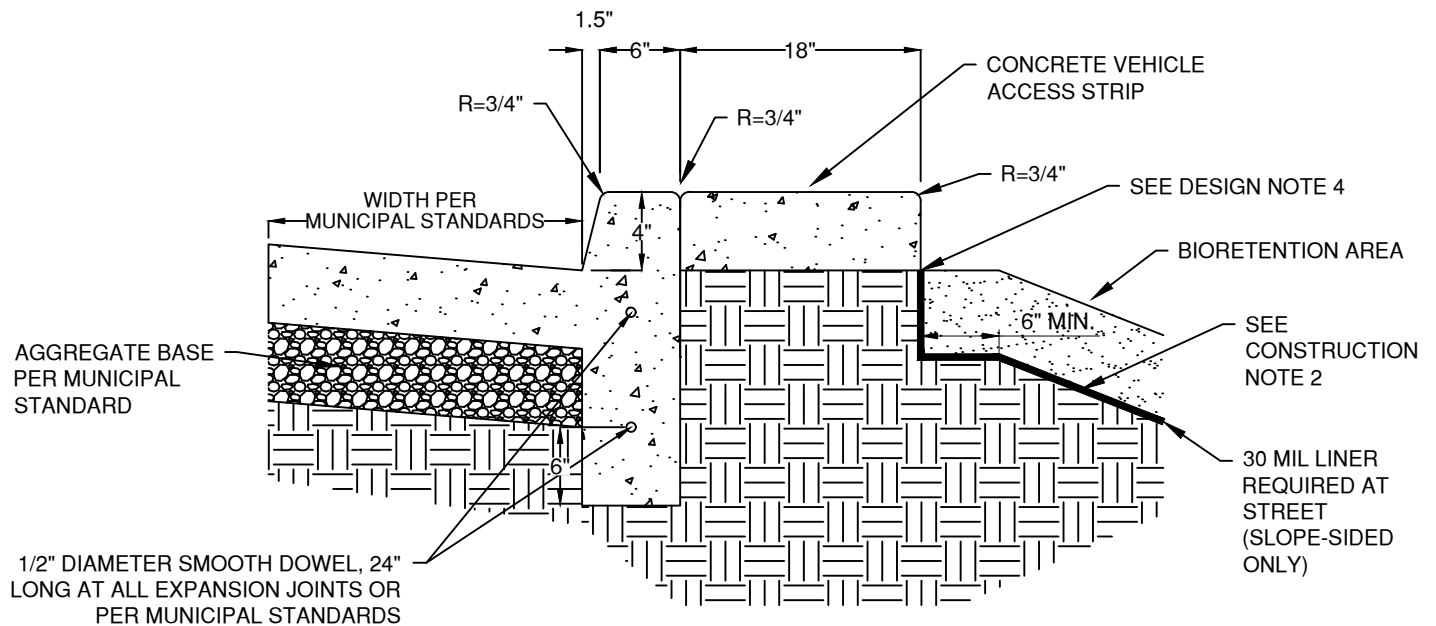
USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

STANDARD PLAN NO.

SW-12

SHEET 1 OF 1





#### DESIGN NOTES

1. SPECIAL CONCRETE AND EXPANSION JOINTS SHALL MEET THE REQUIREMENTS OF THE MUNICIPALITY.
2. PROVIDE OPENINGS IN CURB (12" WIDE) TO ALLOW FOR SURFACE DRAINAGE TO BIORETENTION AREAS IF DEDICATED INLET NOT USED. SPACING TO BE DETERMINED BY PROJECT ENGINEER BASED ON DESIGN STORM TO MINIMIZE PONDING AGAINST CURB FOR MEDIAN ISLAND APPLICATION.
3. STEEL REINFORCEMENT OR ADDITIONAL CONCRETE CHECK DAMS MAY BE NEEDED FOR STABILITY.
4. SEE REFERENCE DETAIL SW-24 FOR ATTACHMENT OF IMPERVIOUS LINER.

#### CONSTRUCTION NOTES

1. FINISH ALL EXPOSED CONCRETE SURFACES.
2. LAYBACK SLOPE AS FLAT AS POSSIBLE UNTIL TOP WIDTH PRODUCES 1:1 SLOPE & 24" BOTTOM WIDTH. AS PLANTER GETS WIDER MAINTAIN 1:1 SLOPE AND INCREASE BOTTOM WIDTH WIDER THAN 24". ALTERNATIVE TRENCH WALL CONFIGURATIONS MAY BE PROPOSED BY THE PROJECT GEOTECHNICAL ENGINEER (I.E. VERTICAL SHORING, REINFORCED TRENCH SIDEWALL) THAT DO NOT REQUIRE SIDEWALK SUPPORT FROM THE LIGHTLY COMPACTED BSM.

### LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT STANDARD DETAILS



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VERSION:

08/31/2017

CURB AND GUTTER

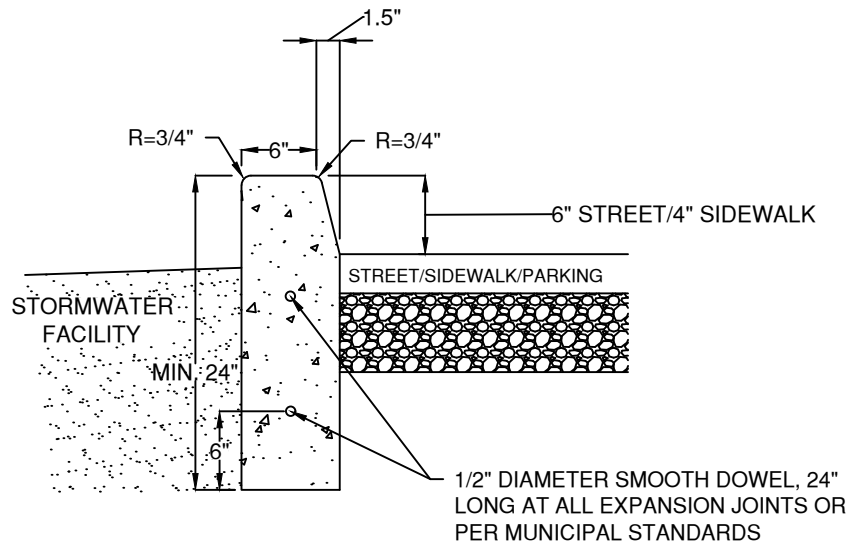
USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

STANDARD PLAN NO.

SW-12A

DEVELOPED UNDER PROP. 84 GRANT

SHEET 1 OF 1



#### DESIGN NOTES

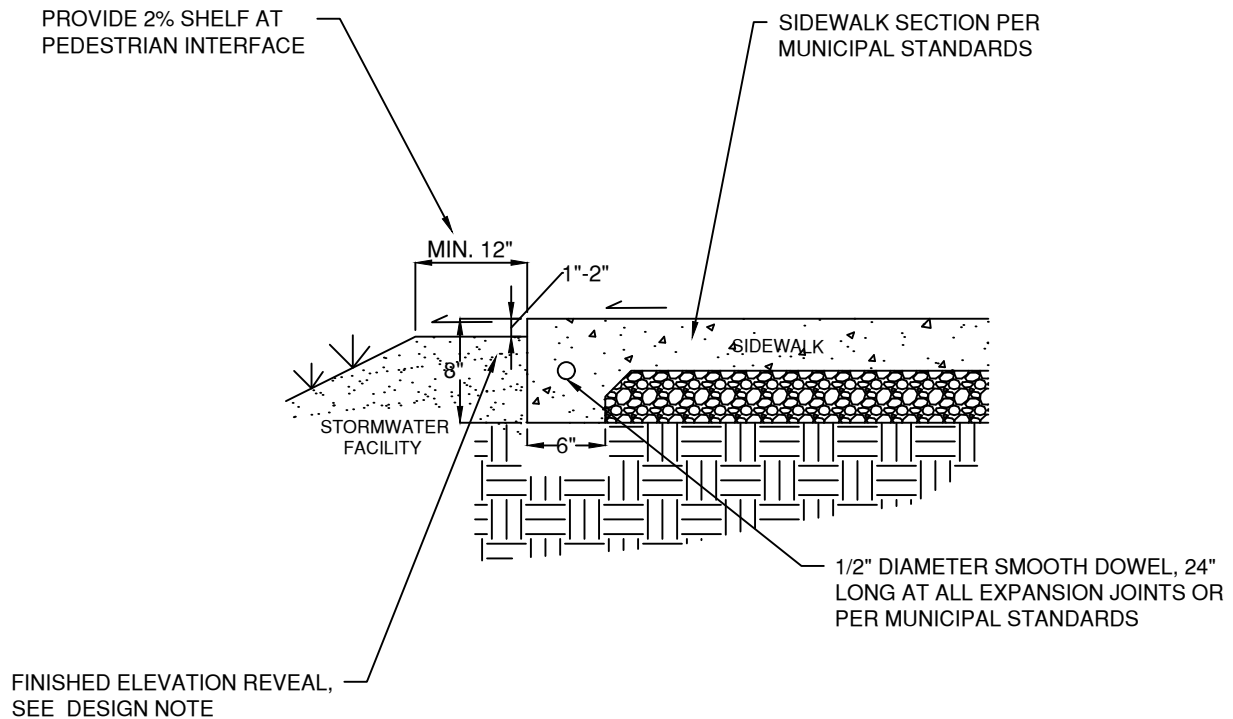
1. SPECIAL DESIGN CONSIDERATION OR STRUCTURAL REVIEW MAY BE REQUIRED FOR LONGER SWALE EDGE SPANS. STEEL REINFORCEMENT OR ADDITIONAL CONCRETE CHECK DAMS MAY BE NEEDED FOR STABILITY.
2. WHEN SIDEWALK DRAINS TO PLANTER, PROVIDE 4" - 6" WIDE NOTCH OPENINGS, 1" BELOW SIDEWALK, SLOPED TO FACILITY, PER BIORETENTION PLANTER DETAILS. SPACE OPENINGS TO CONVEY FLOWS. PROVIDE MINIMUM 2" COVER BETWEEN DRAINAGE NOTCH OPENING AND DOWELS.
3. CONCRETE AND EXPANSION JOINTS SHALL MEET THE REQUIREMENTS OF THE MUNICIPALITY.
4. STEEL REINFORCEMENT OR ADDITIONAL CONCRETE CHECK DAMS MAY BE NEEDED FOR STABILITY.

#### CONSTRUCTION NOTES

1. FINISH ALL EXPOSED CONCRETE SURFACES.
2. LAYBACK SLOPE AS FLAT AS POSSIBLE UNTIL TOP WIDTH PRODUCES 1:1 SLOPE & 24" BOTTOM WIDTH. AS PLANTER GETS WIDER MAINTAIN 1:1 SLOPE AND INCREASE BOTTOM WIDTH WIDER THAN 24". ALTERNATIVE TRENCH WALL CONFIGURATIONS MAY BE PROPOSED BY THE PROJECT GEOTECHNICAL ENGINEER (I.E. VERTICAL SHORING, REINFORCED TRENCH SIDEWALL) THAT DO NOT REQUIRE SIDEWALK SUPPORT FROM THE LIGHTLY COMPACTED BSM.

#### LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT STANDARD DETAILS

  <p>DEVELOPED UNDER PROP. 84 GRANT</p>	<p>APPROVED BY:</p> <p>VERSION:</p> <p>08/31/2017</p>	<p>DEEP CURB</p> <p>USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION</p>	<p>STANDARD PLAN NO.</p> <p><b>SW-13</b></p> <p>SHEET 1 OF 1</p>
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#### DESIGN NOTES

1. SPECIAL DESIGN CONSIDERATION OR STRUCTURAL REVIEW MAY BE REQUIRED FOR LONGER FACILITY EDGE SPANS. STEEL REINFORCEMENT OR ADDITIONAL CONCRETE CHECK DAMS MAY BE NEEDED FOR STABILITY.
2. FINISHED ELEVATION REVEAL - WHERE SIDEWALK CONVEYS SHEET FLOW TO FACILITY, A 1"-2" REVEAL SHOULD BE MAINTAINED BETWEEN SIDEWALK AND FACILITY FINISHED GRADE TO AVOID MULCH OR PLANT BUILDUP FROM BLOCKING FLOWS.
3. CONCRETE AND EXPANSION JOINTS SHALL MEET THE REQUIREMENTS OF THE MUNICIPALITY.

#### CONSTRUCTION NOTES

1. FINISH ALL EXPOSED CONCRETE SURFACES.

### LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT STANDARD DETAILS



DEVELOPED UNDER PROP. 84 GRANT

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08/31/2017

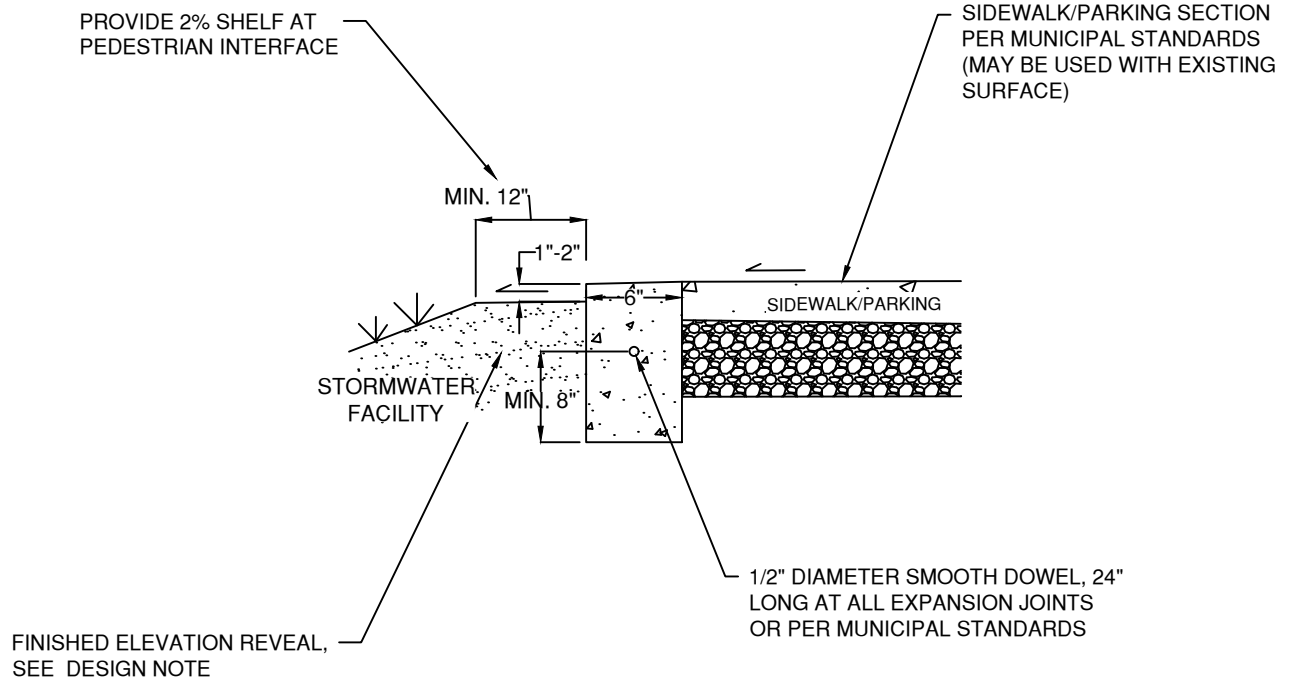
THICKENED EDGE SIDEWALK

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

STANDARD PLAN NO.

SW-14

SHEET 1 OF 1



#### DESIGN NOTES

1. SPECIAL DESIGN CONSIDERATION OR STRUCTURAL REVIEW MAY BE REQUIRED FOR LONGER FACILITY EDGE SPANS. STEEL REINFORCEMENT OR ADDITIONAL CONCRETE CHECK DAMS MAY BE NEEDED FOR STABILITY.
2. EDGE CONDITION WILL VARY FOR PROJECTS. CURB DETAILS MAY BE MODIFIED BY CIVIL AND GEOTECHNICAL ENGINEERS SUBJECT TO APPROVAL BY CITY ENGINEER.
3. CONCRETE AND EXPANSION JOINTS SHALL MEET THE REQUIREMENTS OF THE MUNICIPALITY.
4. FINISHED ELEVATION REVEAL AT SIDEWALK - WHERE SIDEWALK CONVEYS SHEET FLOW TO FACILITY, A 1"-2" REVEAL SHOULD BE MAINTAINED BETWEEN SIDEWALK AND FACILITY FINISHED GRADE TO AVOID MULCH OR PLANT BUILDUP FROM BLOCKING FLOWS AND REDUCE DROP AT PEDESTRIAN INTERFACE.

#### CONSTRUCTION NOTES

1. FINISH ALL EXPOSED CONCRETE SURFACES.

### LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT STANDARD DETAILS



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### FLUSH CURB AT SIDEWALK

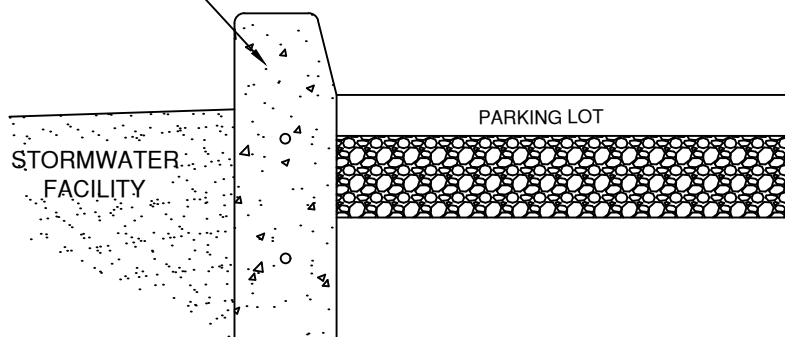
USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

STANDARD PLAN NO.

**SW-15**

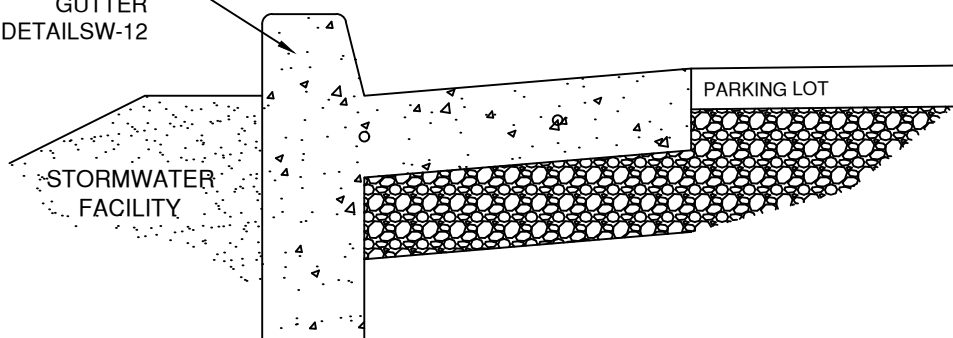
SHEET 1 OF 1

DEEP CURB  
DETAIL SW-13



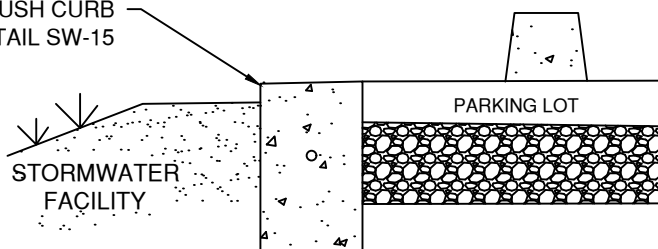
DEEP CURB

CURB AND  
GUTTER  
DETAIL SW-12



CURB AND GUTTER

FLUSH CURB  
DETAIL SW-15



FLUSH EDGE/WHEEL STOPS

#### DESIGN NOTES

1. WHEEL STOPS MAY BE USED ON NON-FLUSH DESIGNS TO KEEP CARS FROM OVERHANGING BIORETENTION FACILITY.
2. VEHICLE OVERHANG CAN BE USED TO REDUCE IMPERVIOUS PAVEMENT AREA.
3. WHERE VEHICLE OVERHANG IS UTILIZED SELECT LOW GROWING PLANTS THAT WILL TOLERATE SHADING.

#### LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT STANDARD DETAILS



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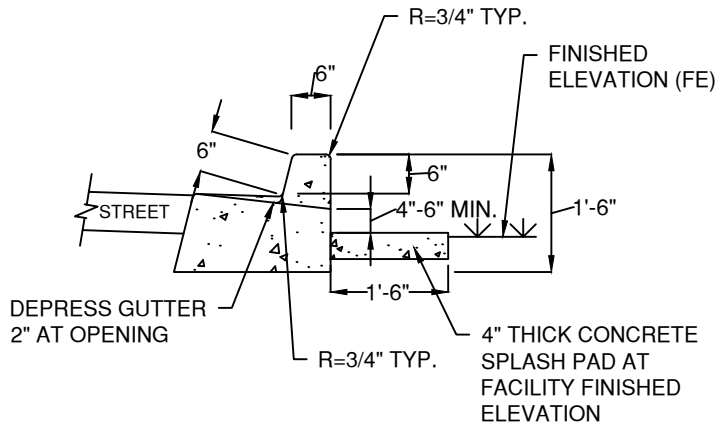
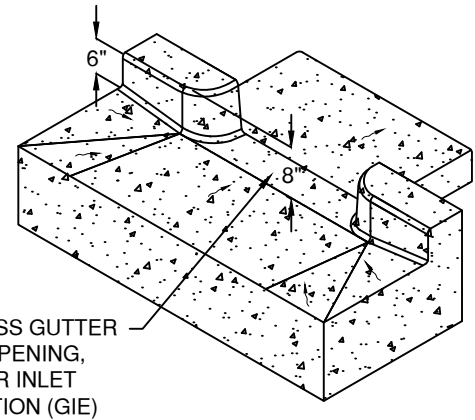
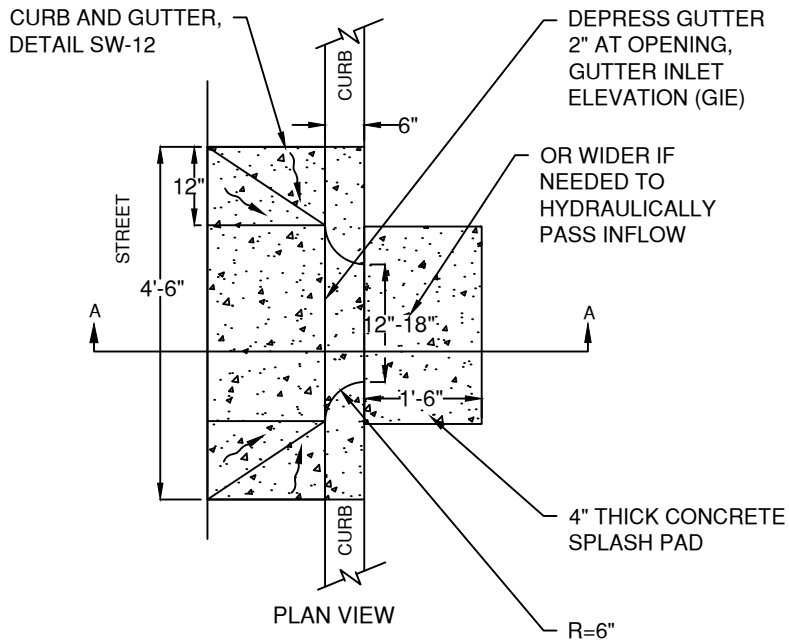
PARKING LOT EDGE OPTIONS

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

STANDARD PLAN NO.

SW-16

SHEET 1 OF 1



#### BIORETENTION DESIGN NOTES

1. FOR USE WITH STORMWATER FACILITIES WITH FLAT BOTTOMS.
2. PROVIDE SPOT ELEVATIONS ON PLANS (FE, OE, GIE, IE). SEE DETAIL SW-2, SW-2A, SW-4 OR SW-4A.
3. CURB AND WALL DETAILS MAY BE MODIFIED BY CIVIL AND GEOTECHNICAL ENGINEERS SUBJECT TO APPROVAL BY CITY ENGINEER.
4. CURB HEIGHT MAY BE REDUCED TO 4-INCHES WHERE ADJACENT TO A SIDEWALK. SEE DETAILS SW-12 & SW-13.

#### CONSTRUCTION NOTES

1. AFTER CONSTRUCTION PLACE SAND BAGS AT GUTTER OPENINGS TO KEEP STORM FLOWS FROM ENTERING FACILITY UNTIL VEGETATION IS ESTABLISHED.

### LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT STANDARD DETAILS



DEVELOPED UNDER PROP. 84 GRANT

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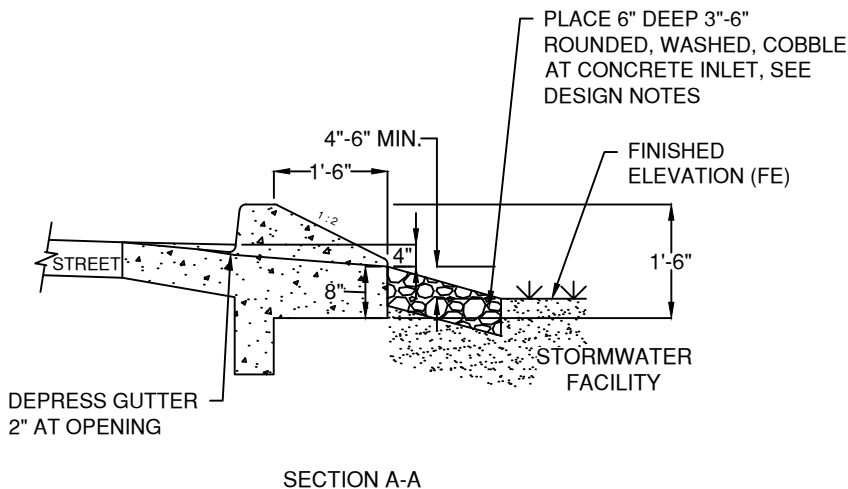
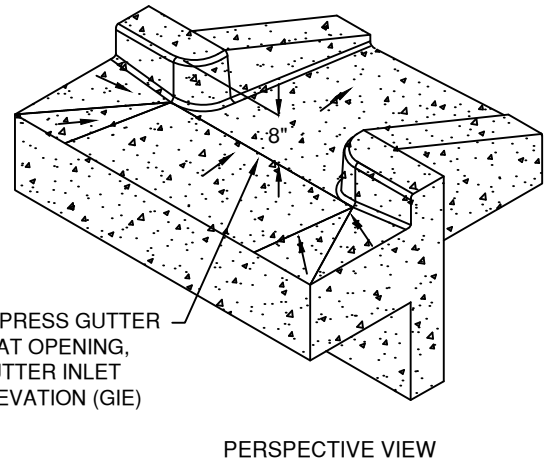
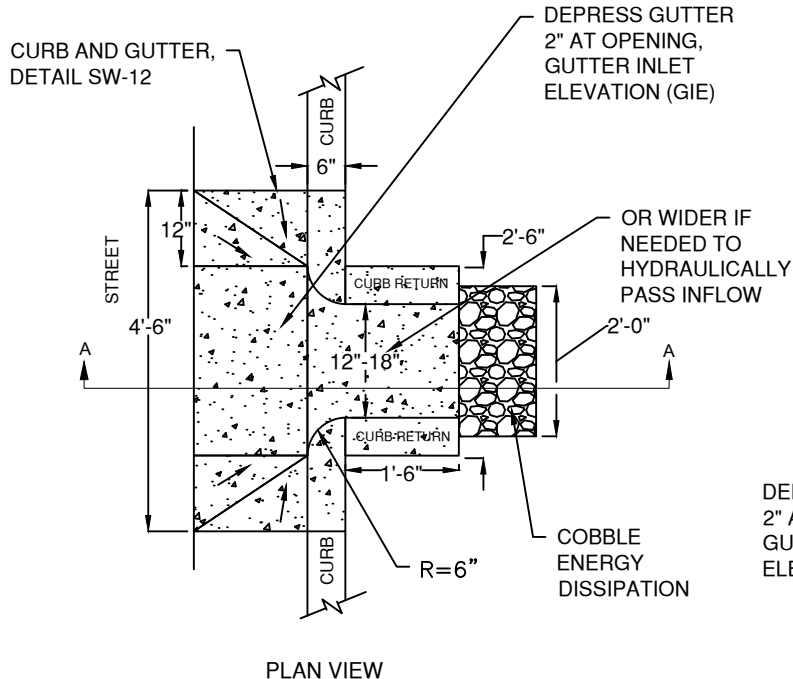
CURB CUT INLET FOR PLANTERS

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

STANDARD PLAN NO.

SW-17

SHEET 1 OF 1



#### BIORETENTION DESIGN NOTES

1. FOR USE WITH STORMWATER FACILITIES WITH SIDE SLOPES.
2. PROVIDE SPOT ELEVATIONS ON PLANS (FE, OE, GIE, IE). SEE DETAIL SW-1, SW-1A, SW-3 OR SW-3A.
3. CURB AND WALL DETAILS MAY BE MODIFIED BY CIVIL AND GEOTECHNICAL ENGINEERS SUBJECT TO APPROVAL BY CITY ENGINEER.
4. WHERE INLET FLOW VELOCITY IS HIGH, EXTEND COBBLE INTO FACILITY, BUT AVOID EXCESSIVE USE.
5. CURB HEIGHT MAY BE REDUCED TO 4-INCHES WHERE ADJACENT TO A SIDEWALK. SEE DETAILS SW-12 & SW-13.

#### CONSTRUCTION NOTES

1. AFTER CONSTRUCTION PLACE SAND BAGS AT GUTTER OPENINGS TO KEEP STORM FLOWS FROM ENTERING FACILITY UNTIL VEGETATION IS ESTABLISHED.

### LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT STANDARD DETAILS



DEVELOPED UNDER PROP. 84 GRANT

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08/31/2017

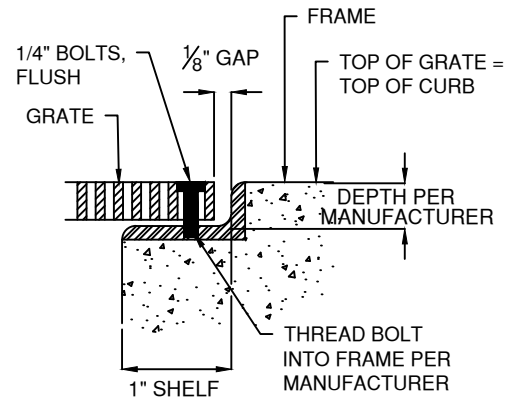
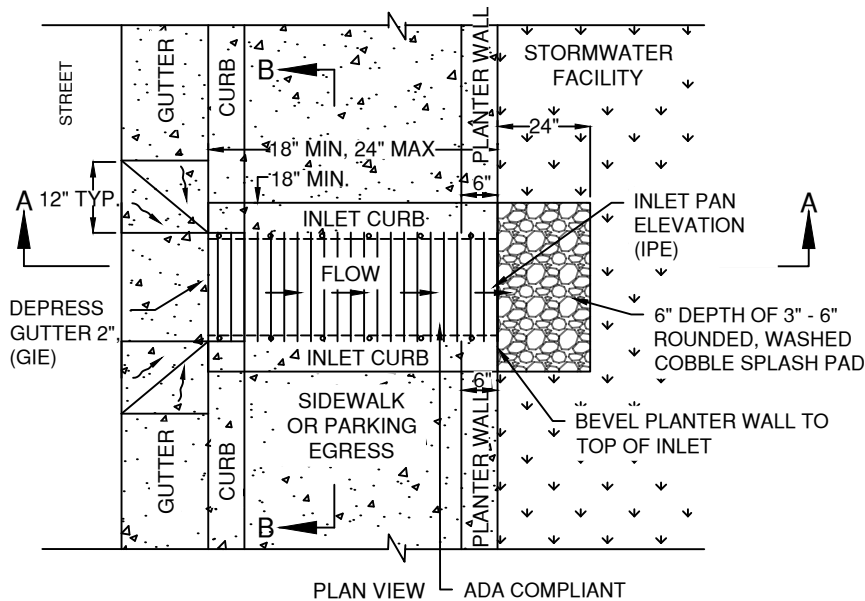
#### CURB CUT INLET FOR SLOPE SIDED BIORETENTION SWALE

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

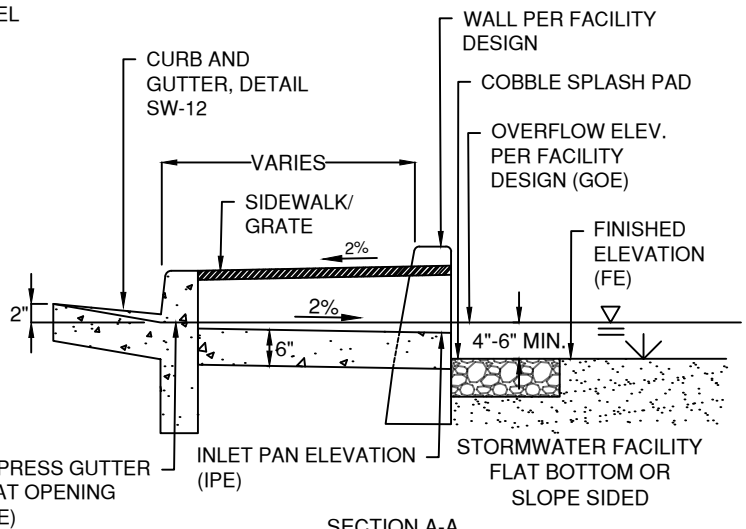
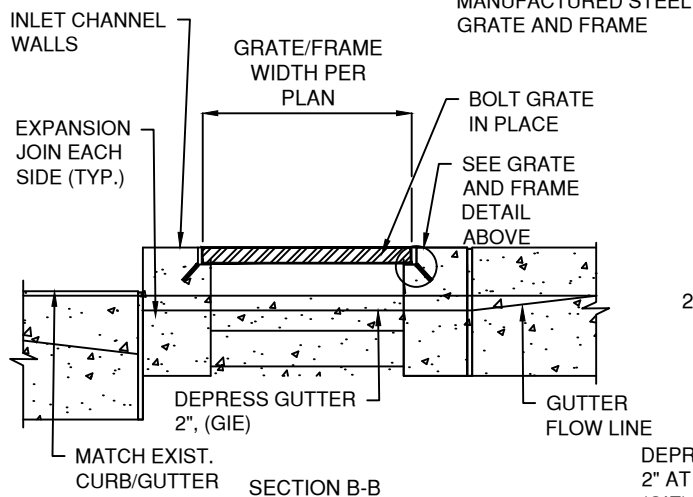
STANDARD PLAN NO.

**SW-18**

SHEET 1 OF 1



GRATE AND FRAME



#### BIORETENTION DESIGN NOTES

1. FOR USE WITH STORMWATER FACILITIES WITH SLOPED SIDES OR FLAT BOTTOMS.
2. PROVIDE SPOT ELEVATIONS ON PLANS (FE, OE, GIE, IPE). SEE DETAIL SW-2, SW-2A, SW-4 OR SW-4A.
3. REFER TO MUNICIPAL STANDARD DRAWINGS AND MATCH GUTTER PAN OF ADJACENT CURB AND GUTTER.
4. IF SLOPED SIDES, WHERE INLET FLOW VELOCITY IS HIGH, EXTEND COBBLE INTO FACILITY, BUT AVOID EXCESSIVE USE.
5. BASE MATERIAL FOR CURB, GUTTER, AND SIDEWALK PER MUNICIPAL STANDARDS.
6. GRATE AND FRAME SHALL SUPPORT H-20 LOADING (ALHAMBRA FOUNDRY A-1540/A-1551 OR EQUIVALENT).
7. SOLID COVER AND FRAME (ALHAMBRA FOUNDRY A-1430/A-1433 OR EQUIVALENT) MAY BE USED IN PLACE OF GRATE AND FRAME.

#### CONSTRUCTION NOTES

1. AFTER CONSTRUCTION PLACE SAND BAGS AT GUTTER OPENINGS TO KEEP STORM FLOWS FROM ENTERING FACILITY UNTIL VEGETATION IS ESTABLISHED.

### LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT STANDARD DETAILS



DEVELOPED UNDER PROP. 84 GRANT

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08/31/2017

INLET WITH GRATE

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

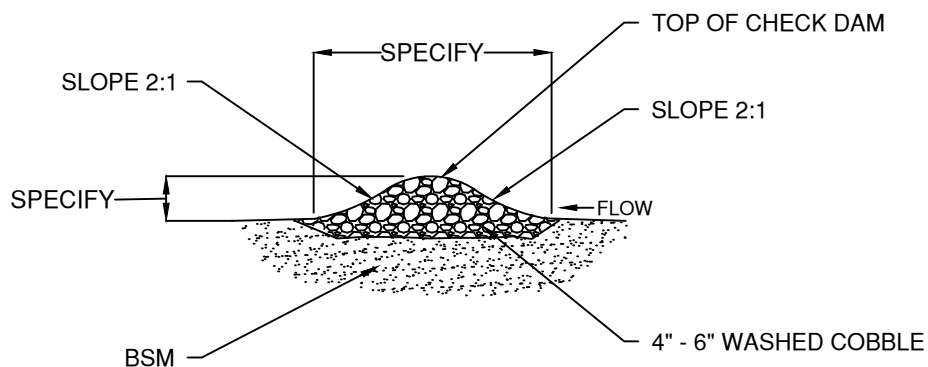
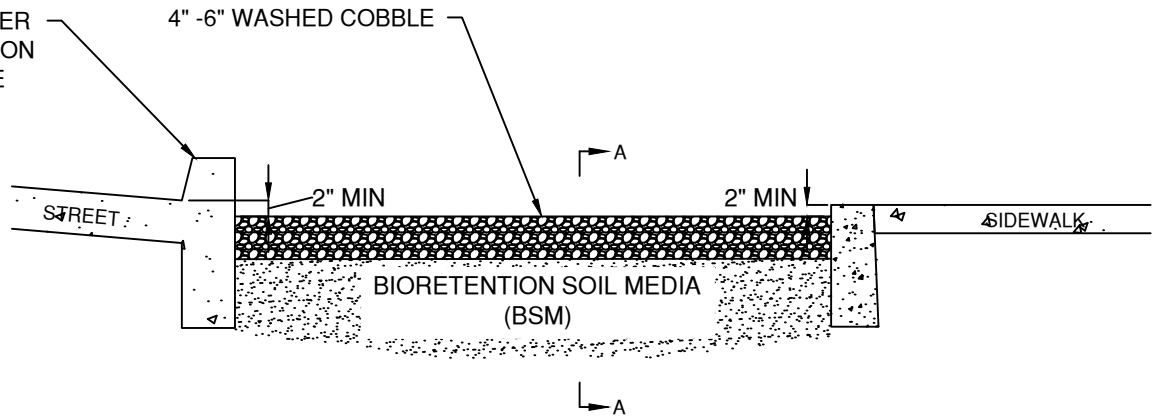
STANDARD PLAN NO.

SW-19

SHEET 1 OF 1



CURB AND GUTTER  
PER BIORETENTION  
WITH SIDESLOPE  
DETAIL



SECTION A-A

#### BIORETENTION DESIGN NOTES

1. FOR USE WITH STORMWATER FACILITIES WITH SLOPED SIDES.
2. BEST SUITED FOR FACILITIES WITH  $\leq 2\%$  LONGITUDINAL SLOPE.
3. PROVIDE ELEVATIONS AND STATIONING AND/OR DIMENSIONING FOR CHECK DAMS.
4. SPACE CHECK DAMS TO MAXIMIZE PONDING ACROSS ENTIRE CELL.
5. ENSURE THAT CHECK DAM ELEVATIONS DO NOT CAUSE STORMWATER TO OVERFLOW TO SIDEWALK.

#### CONSTRUCTION NOTES

1. DO NOT WORK DURING RAIN OR UNDER WET CONDITIONS.
2. KEEP ALL HEAVY MACHINERY OUTSIDE BIORETENTION AREA LIMITS.

#### LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT STANDARD DETAILS



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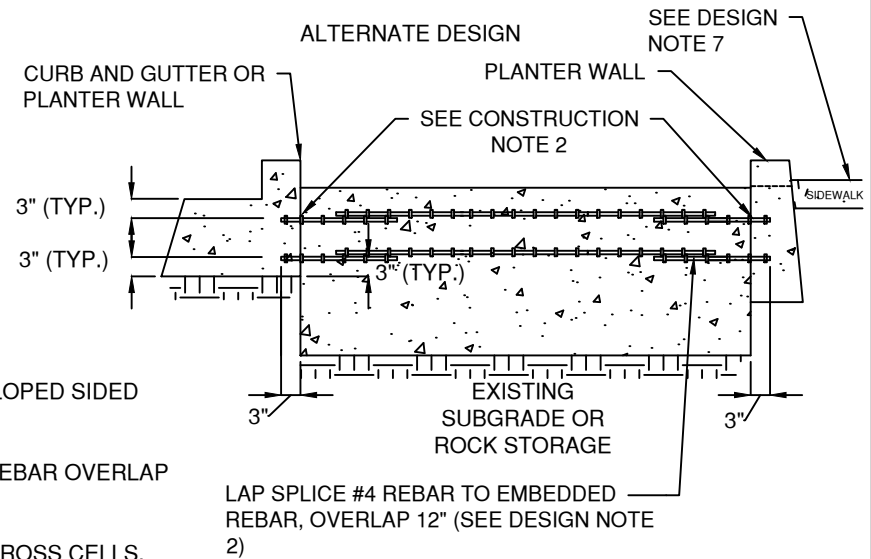
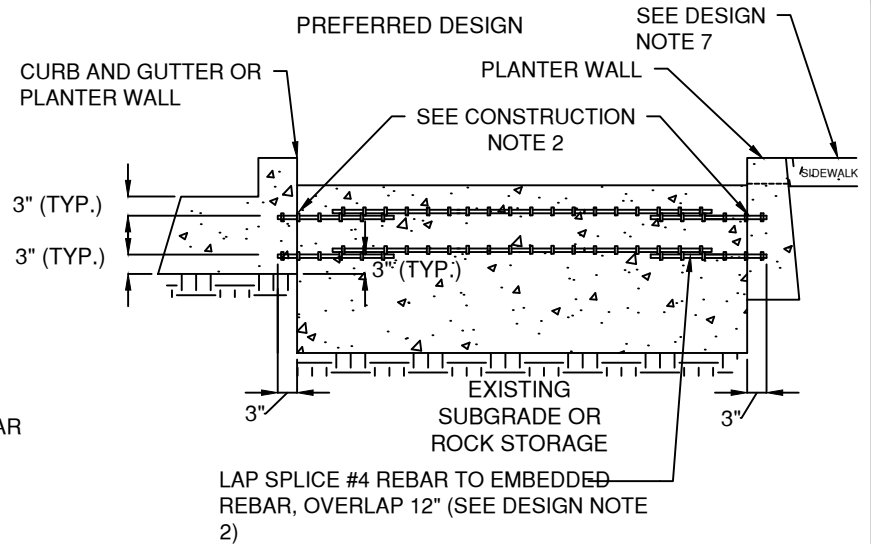
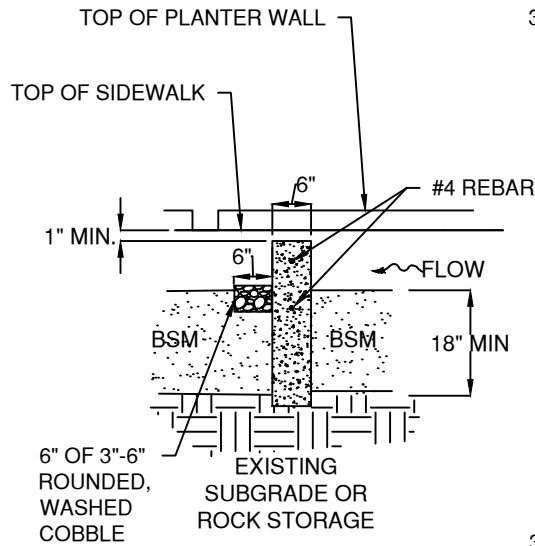
GRAVEL CHECK DAM

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

STANDARD PLAN NO.

**SW-20**

SHEET 1 OF 1



#### BIORETENTION DESIGN NOTES

1. FOR USE WITH BIORETENTION PLANTERS OR SLOPED SIDED SWALES/RAIN GARDENS.
2. FOR CHECK DAMS LONGER THAN 12' SPECIFY REBAR OVERLAP LENGTH.
3. SPACE CHECK DAMS TO MAXIMIZE PONDING ACROSS CELLS.
4. PROVIDE ELEVATIONS AND STATIONING AND/OR DIMENSIONING FOR CHECK DAMS.
5. ENSURE THAT CHECK DAM ELEVATIONS DO NOT CAUSE STORMWATER TO OVERFLOW TO SIDEWALK.
6. SHOW PLANTER WALL EMBEDDED IN EXISTING SUBGRADE OR DRAINROCK.
7. PREFERRED DESIGN IS TO CONSTRUCT TOP OF SIDEWALK AT GRADE WITH TOP OF PLANTER WALL TO ALLOW RUNOFF TO SHEETFLOW INTO BIORETENTION PLANTER. IF CURB IS NEEDED, USE ALTERNATE DESIGN AND ENSURE TOP OF CONCRETE CHECK DAM IS A MINIMUM OF 1" BELOW BOTTOM OF CURB NOTCH.

#### CONSTRUCTION NOTES

1. EMBED #3 REBAR 3" INTO CURB AND PLANTER WALL.
2. DO NOT WORK DURING RAIN OR UNDER WET CONDITIONS.
3. KEEP ALL HEAVY MACHINERY OUTSIDE BIORETENTION AREA LIMITS.

### LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT STANDARD DETAILS



DEVELOPED UNDER PROP. 84 GRANT

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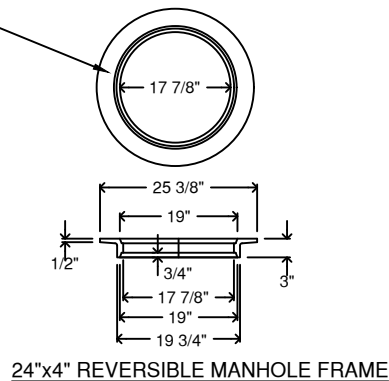
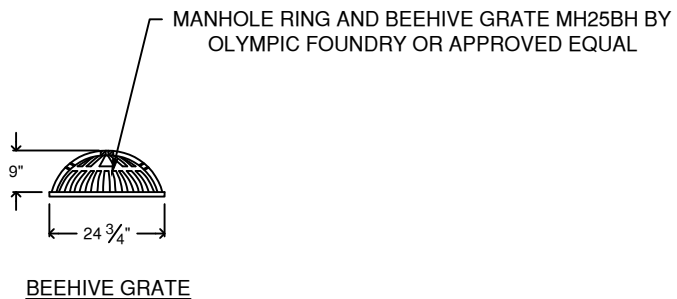
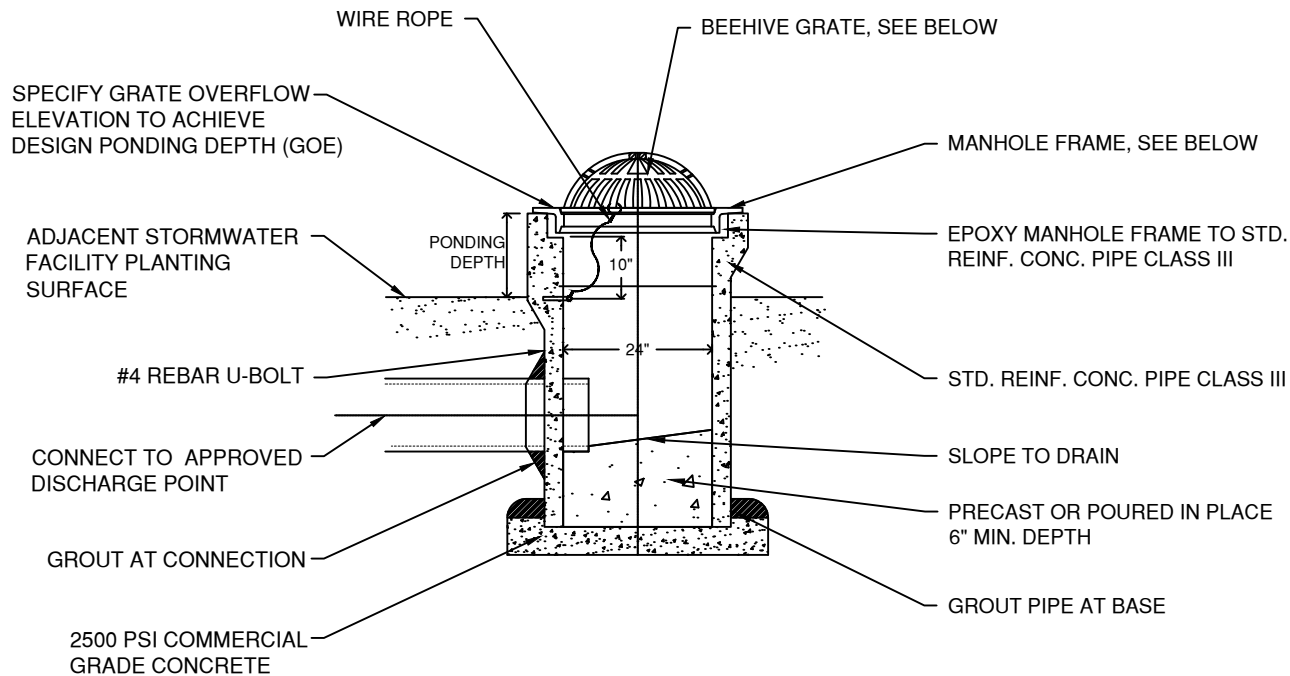
#### CONCRETE CHECK DAM

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

STANDARD PLAN NO.

SW-21

SHEET 1 OF 1



#### DESIGN NOTES

1. PROVIDE GRATE OVERFLOW ELEVATION ON PLANS.
2. TO INCORPORATE FLEXIBILITY INTO DESIGN OVERFLOW ELEVATION OR CORRECT ELEVATION OF AN EXISTING STRUCTURE, INSTALL OVERFLOW COLLAR, PER DETAIL SW-22A.
3. IN PRIVATE SITES NOT IN CITY R/W THE PROJECT CIVIL ENGINEER MAY PROPOSE ALTERNATIVES FOR GRATE INSTALLATIONS USING ALTERNATIVE MANUFACTURER'S PRODUCT/CONFIGURATION.

#### CONSTRUCTION NOTES

1. DO NOT ADJUST OVERFLOW GRATE ELEVATION, CONSTRUCT AS SHOWN ON PLANS.

### LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT STANDARD DETAILS



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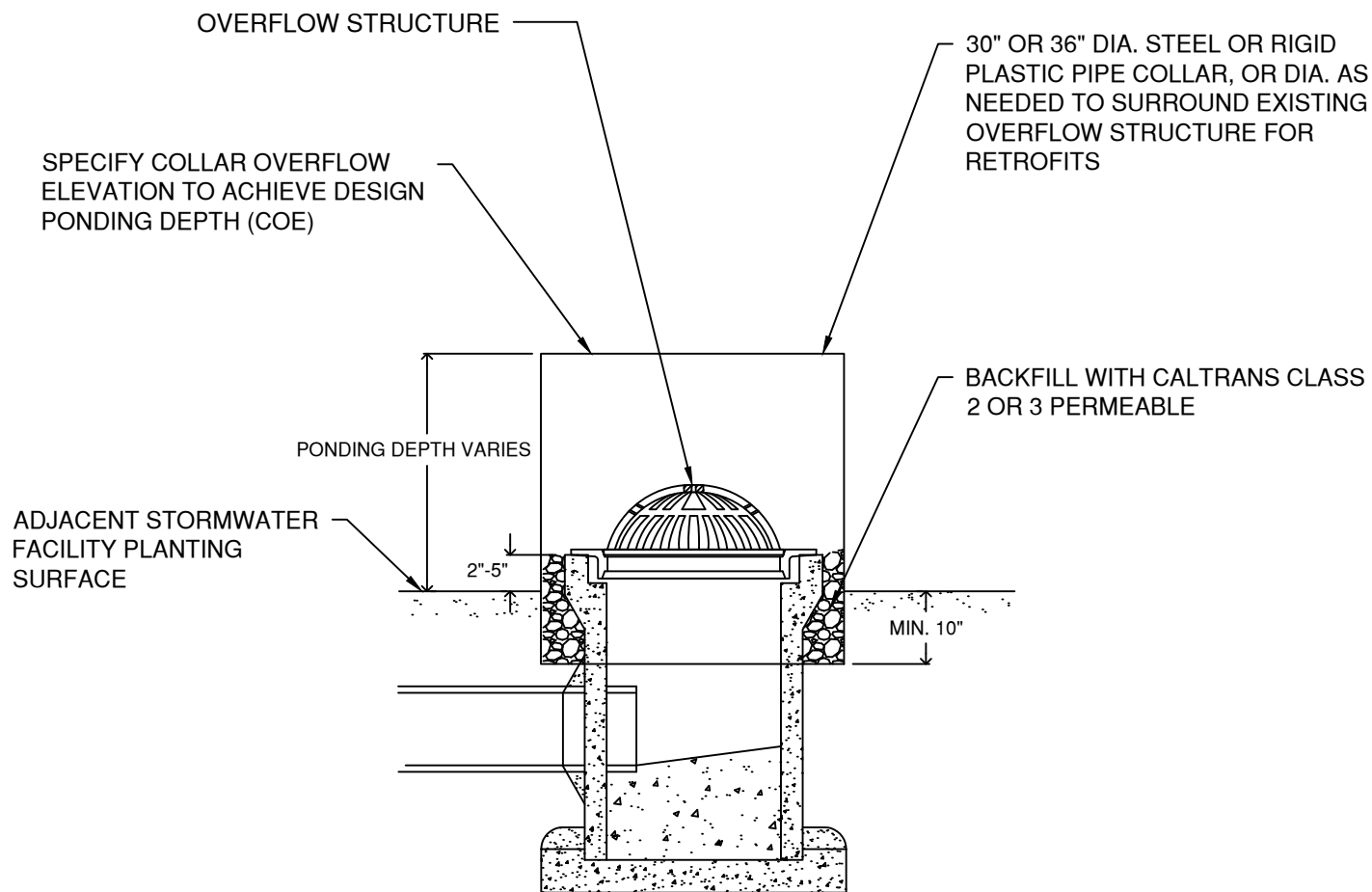
#### OVERFLOW STRUCTURE WITH BEEHIVE GRATE

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

STANDARD PLAN NO.

**SW-22**

SHEET 1 OF 1



#### DESIGN NOTES

1. MAY BE USED IN CONJUNCTION WITH OVERFLOW STRUCTURES TO ALLOW FOR FIELD ADJUSTMENT OF OVERFLOW ELEVATION, OR AS RETROFIT TO CORRECT EXISTING STRUCTURE THAT DOES NOT ALLOW PONDING TO OCCUR.
2. PROVIDE COLLAR OVERFLOW ELEVATION (COE) ON PLANS.
3. PCC PIPE RISER EXTENSIONS MAY BE UTILIZED IN LIEU OF OVER FLOW STRUCTURE COLLAR.

#### CONSTRUCTION NOTES

1. CENTER COLLAR ON OVERFLOW GRATE.

### LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT STANDARD DETAILS



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## OVERFLOW STRUCTURE COLLAR

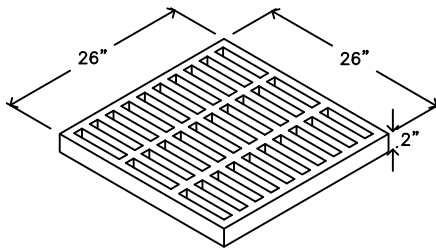
USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

STANDARD PLAN NO.

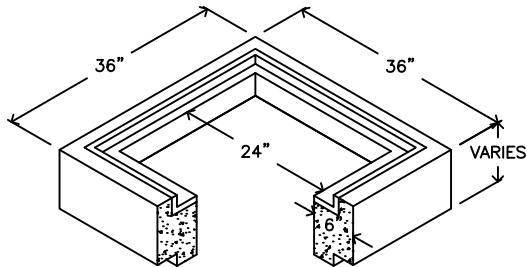
**SW-22A**

SHEET 1 OF 1

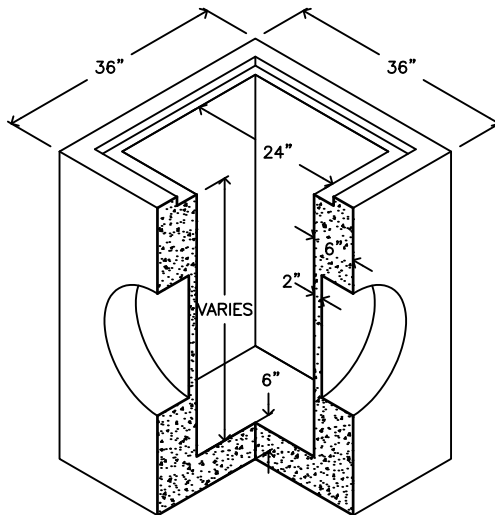
C.I. GRATE



C.I. FRAME  
EXTENSION



BOTTOM



#### DESIGN NOTES

1. PROVIDE GRATE OVERFLOW ELEVATION ON PLANS.
2. PROVIDE EXTENSION OVERFLOW ELEVATION (COE) ON PLANS.
3. ON PRIVATE SITES NOT IN CITY RIGHT-OF-WAY THE PROJECT CIVIL ENGINEER MAY PROPOSE ALTERNATIVES FOR GRATE INSTALLATIONS USING ALTERNATIVE MANUFACTURER'S PRODUCTION/CONFIGURATION.

#### CONSTRUCTION NOTES

1. DO NOT ADJUST OVERFLOW GRATE ELEVATION, CONSTRUCT AS SHOWN ON PLANS.

### LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT STANDARD DETAILS



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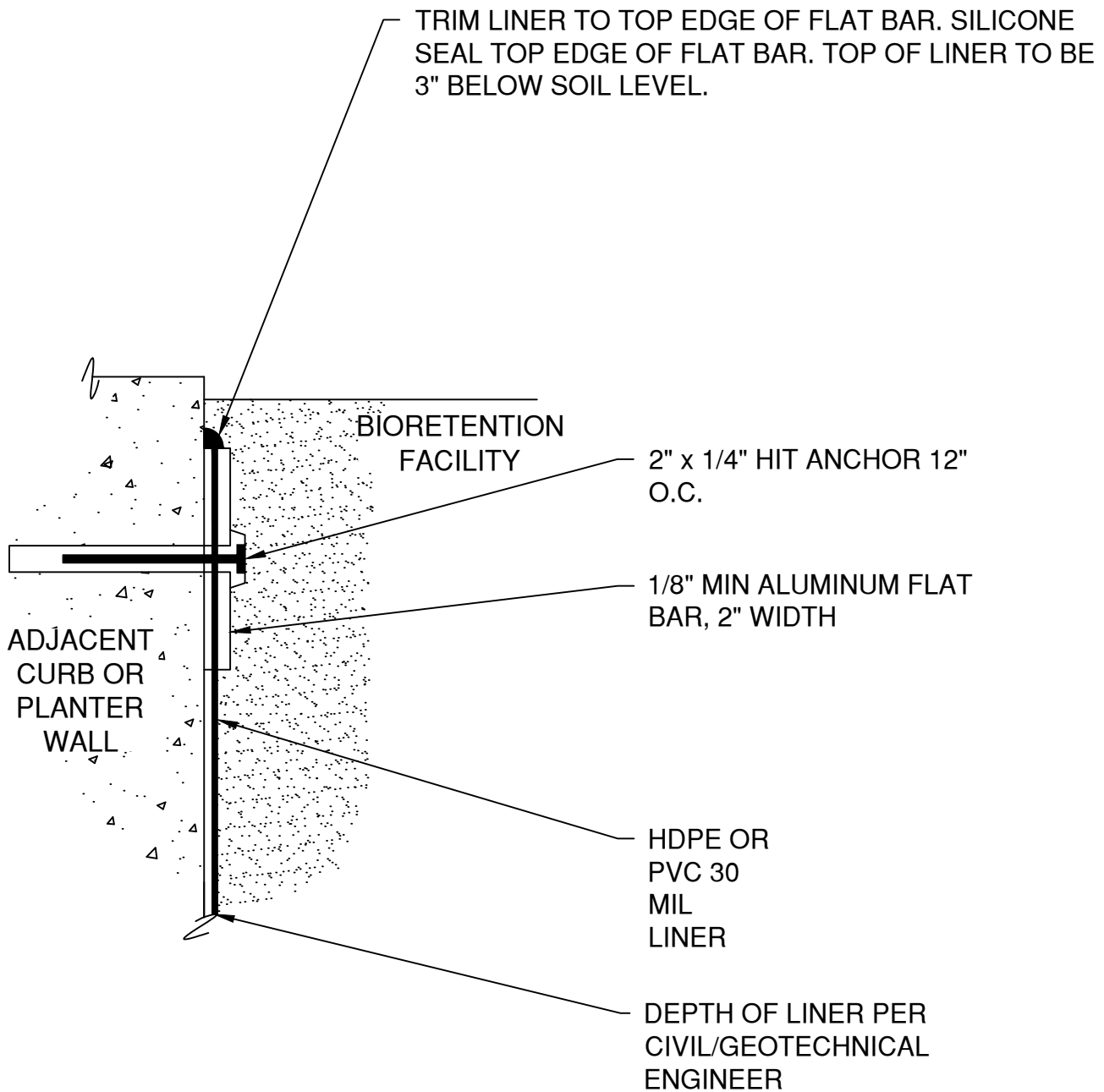
### OVERFLOW STRUCTURE WITH SQUARE GRATE

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

STANDARD PLAN NO.

**SW-23**

SHEET 1 OF 1



LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT STANDARD DETAILS



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IMPERMEABLE LINER CONNECTION

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

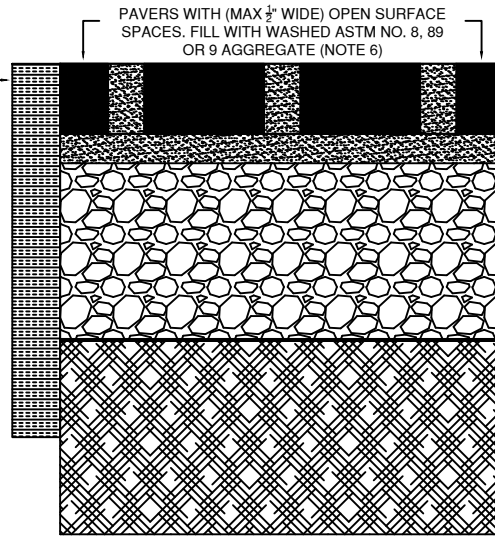
STANDARD PLAN NO.

**SW-24**

SHEET 1 OF 1

	RESIDENTIAL DRIVEWAY OR PEDESTRIAN ONLY	PRIVATE STREET, PARKING LOT	PUBLIC STREET OR FIRE LANE
PERVIOUS CONCRETE	4"	6"	8"
POROUS ASPHALT	3"	4"	6"
PERMEABLE INTERLOCKING PAVERS	2 $\frac{3}{8}$ "	3 $\frac{1}{8}$ "	3 $\frac{1}{8}$ "
ENGINEERING REQ'D	NO	YES	YES
COMPACTION REQ'D	NO	YES	95%

EDGE RESTRAINT  
AS SHOWN ON PLANS



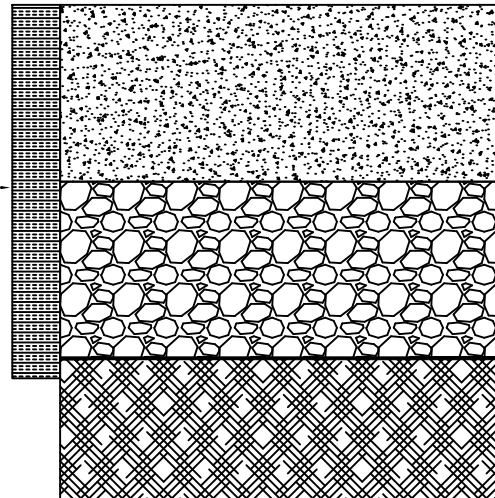
1  $\frac{1}{2}$ " TO 2" ASTM NO. 8 BEDDING LAYER

WASHED 4" ASTM NO. 57 BASE OR SIMILAR CRUSHED AGGREGATE OVER ASTM NO. 2, 3, OR 4 AGGREGATE SUBBASE - THICKNESS VARIES WITH WATER STORAGE AND TRAFFIC.

GEOTEXTILE IF SPECIFIED

SUBGRADE, SEE DESIGN REQUIREMENTS FOR COMPACTION INFORMATION

EDGE RESTRAINT  
AS SHOWN ON PLANS



POROUS ASPHALT OR PERVIOUS CONCRETE

POROUS ASPHALT: USE WASHED 1" - 2" CHOKER LAYER OF WASHED NO. 57 AGGREGATE OVER ASTM NO. 2, 3 OR 4 AGGREGATE - THICKNESS VARIES WITH WATER STORAGE AND TRAFFIC LOADS.

PERVIOUS CONCRETE: USE WASHED ASTM NO. 57 AGGREGATE - THICKNESS VARIES WITH WATER STORAGE AND TRAFFIC LOADS.

GEOTEXTILE IF SPECIFIED

SUBGRADE, SEE DESIGN REQUIREMENTS FOR COMPACTION INFORMATION

#### NOTES:

1. UNDERDRAIN TO REMOVE WATER THAT CANNOT BE INFILTRATED WITHIN 72 HOURS.
2. DESIGNS PROVIDED SHALL BE SIGNED & STAMPED BY A GEOTECHNICAL &/OR CIVIL ENGINEER REGISTERED IN THE STATE OF CALIFORNIA.
3. GEOTEXTILE USE AND SELECTION MAY BE DETERMINED BY A GEOTECHNICAL ENGINEER PER AASHTO M-288.
4. UNDERDRAIN AND ORIFICE CONFIGURATION SHALL BE BASED ON ENGINEERED DESIGN.

### LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT STANDARD DETAILS



DEVELOPED UNDER PROP. 84 GRANT

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PERVIOUS PAVEMENT

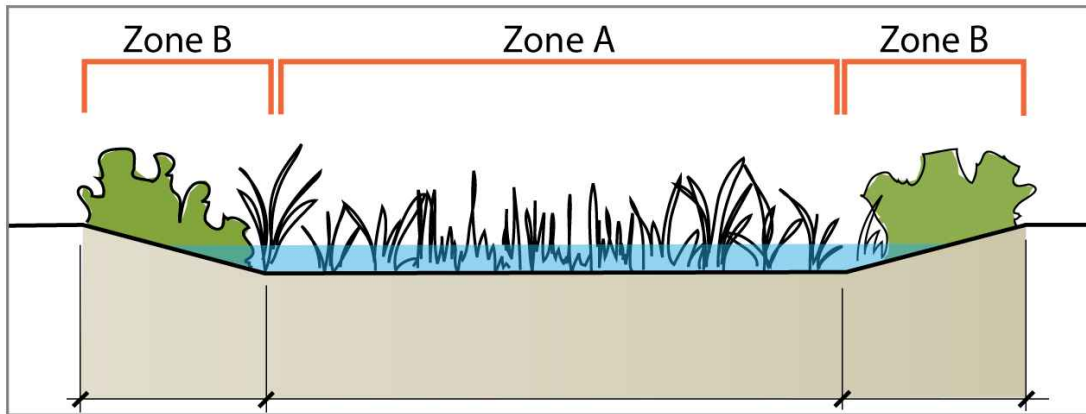
USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

STANDARD PLAN NO.

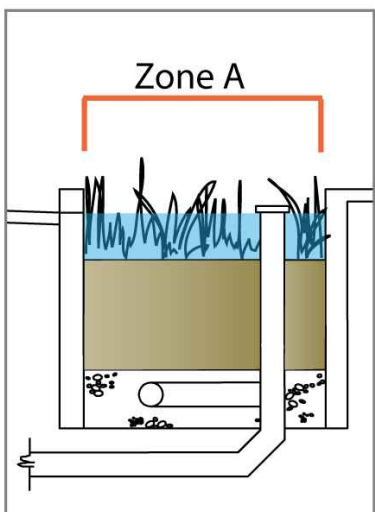
SW-25

SHEET 1 OF 1

**Varying slope and ponding levels:** Varying slope and ponding levels: This bioretention planting area has sloped edges. Plants in the bottom area will be inundated during storms (**Zone A**). Those planted on the sideslopes are above the level of ponding, but will experience seasonally wet conditions (**Zone B**).



**Uniform surface grade:** This stormwater planter has a flat bottom with consistent depth of ponding across the structure. All of the plants selected for this design must be tolerant of periodic inundation (**Zone A**).



#### LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT STANDARD DETAILS



DEVELOPED UNDER PROP. 84 GRANT

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08/31/2017

#### PLANTING INUNDATION ZONES

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

STANDARD PLAN NO.

**SW-26**

SHEET 1 OF 4



Trees	San Diego Co. Native - SD	California Native - CA	Non-Native - X	Landscape Position: 1 - Low1, 2 - Mid2, 3 - High3	Mature Size (height x width)	Irrigation Demands: High - H ■ Moderate - M Low - L ■ Rainfall Only - N	Light Requirements Sun - SU ■ Shade - SH Part Shade - PS	Season Evergreen - E, Deciduous - D Semi-Evergreen - SE	Coastal Exposure? Yes - Y	City of Imperial Beach Sunset Zone: 24
<i>Acer negundo</i> <i>californicum</i> <sup>4,5</sup>		SD		1	60'x60'	M-H	SU, PS	D		A2-3, 1-10, 12-24
<i>Cercis occidentalis</i> <sup>4</sup>		SD		1	10-18' x 10-18'	M	SU, PS	D		2-24
<i>Ilex vomitoria</i>		X		1	15-20' x 10-15'	H	SU, PS	E		4-9, 11-24
<i>Juglans californica</i>		SD		1	15-30' x 15-30'	N-L	SU	D		18-24
<i>Liquidambar styraciflua</i> <sup>5</sup>		X		1	60' x 20-25'	M-H	SU	D		3-9, 14-24
<i>Magnolia grandiflora</i> <sup>5</sup>		X		1	80' x 60'	H	SU, PS	E	Y	4-12, 14-24, H1-2
<i>Metasequoia glyptostroboides</i> <sup>5</sup>		X		1	90' x 20'	H	SU	D		A3, 3-10, 14-24
<i>Myrica californica</i>		CA		1	10-30 x 10-30'	M	SU	E	Y	4-9, 14-24
<i>Platanus acerifolia</i>		X		1	40-80' x 30-40'	M-H	SU	D		2-24
<i>Platanus racemosa</i> <sup>4,5</sup>		SD		1	30-80' x 20-50'	M-H	SU	D	Y	4-24
<i>Quercus agrifolia</i> <sup>4,5</sup>		SD		1	20-70' x 20-70'	N-L	SU	E	Y	7-9, 14-24
<i>Salix gooddingii</i> <sup>4,5</sup>		SD		1	20-40'x20-30'	H	SU	D		-
<i>Sambucus mexicana</i> <sup>4,5</sup>		SD		1	10-30' x 8-20'	M-H	SU, PS	SE		2-24, H1
<i>Taxodium spp.</i> <sup>5</sup>		X		1	50-70' x 15-30'	L-H	SU	D		2-10, 12-24
<i>Umbellularia californica</i> <sup>5</sup>		CA		1	20-25' x 20-25'	L-H	SU, PS, SH	E	Y	4-9, 14-24
<i>Washingtonia filifera</i> <sup>4,5</sup>		SD		1	60' x 20'	L-M	SU	E		8,9,10,11-24,H1-2

DEPARTMENT OF PUBLIC WORKS  
IMPERIAL BEACH

TITLE: ZONE A LID RECOMMENDED PLANT LIST

DESIGNED BY:

APPROVED:

DATE:

DRAWN BY:

CHECKED BY:

CITY ENGINEER: \_\_\_\_\_

STANDARD PLAN

SW-26

SHEET 2 OF 6

DEPARTMENT OF PUBLIC WORKS IMPERIAL BEACH											
TITLE: ZONE A LID RECOMMENDED PLANT LIST						STANDARD PLAN					
DESIGNED BY:	APPROVED: _____ CITY ENGINEER: _____					DATE: _____  <b>SW-26</b> SHEET 3 OF 6					
DRAWN BY:											
CHECKED BY:											
Perennials		San Diego Co. Native - SD	California Native - CA	Non-Native - X	Landscape Position: 1 - Low1, 2 - Mid2, 3 - High3	Mature Size (height x width)	Irrigation Demands: High - H ■ Moderate - M Low - L ■ Rainfall Only - N	Light Requirements Sun - SU ■ Shade - SH Part Shade - PS	Season Evergreen - E, Deciduous - D Semi-Evergreen - SE	Coastal Exposure? Yes - Y	City of Imperial Beach Sunset Zone: 24
<i>Achillea millefolium</i> 4	Common Yarrow	SD			1	3' x 2'	L-M	SU	SE	Y	A1-A3, 1-24
<i>Anemopsis californica</i> 4	Yerba Mansa	SD			1	1'x2-4'	H	SU, PS, SH	D		-
<i>Aquilegia formosa</i>	Western Columbine	SD			2	1-3' x 1.5'	H	SU, PS	SE		A1-3, 1-11, 14-24
<i>Artemisia palmeri</i> 4	San Diego Sagewort	SD			2	2-3'x3'	H	SU, PS	SE	Y	-
<i>Asarum caudatum</i>	Wild Ginger	CA			2	1' x 3'	H	SH	E		4-6, 14-24
<i>Epilobium californica</i> 4	California Fuchsia	CA			1	1-2'x3-5'	L-M	SU	SE		2-11, 14-24
<i>Fragaria chiloensis</i> 4	Beach Strawberry	CA			1	4-8" x spreading	H	SU, PS	E	Y	4-24
<i>Iris douglasiana</i>	Pacific Coast Iris	CA			1	2' x 2'	M	SU, PS	E	Y	4-9, 14-24
<i>Iris missouriensis</i>	Western Blue Flag Iris	SD			1	2' x 2'	M-H	SU, PS	D		1-10, 14-24
<i>Iva hayesiana</i> 4	San Diego Marsh Elder	SD			2	1' x 5'	N	SU, PS	SE	Y	17, 23-24
<i>Jaumea carnosa</i>	Jaumea	SD			1	<1' x spreading	H	SU	E		-
<i>Limonium californicum</i>	California Sea Lavender	SD			1	1-1.5' x < 3' spreading	M-H	SU, PS	SE	Y	-
<i>Lobelia dunnii</i>	Dunn's Lobelia	SD			2	1-1.5' x 1.5-3' spreading	M-H	SU, PS	E	Y	-
<i>Mimulus cardinalis</i>	Scarlet Monkey Flower	SD			1	2.5' x 2.5'	M-H	SU, PS, SH	D		2-24
<i>Polystichum munitum</i>	Western Sword Fern	CA			2	2-4' x 2-4'	H	SH	E	Y	A3, 2-9, 14-24
<i>Potentilla glandulosa</i>	Sticky Cinquefoil	SD			1	2' x 3'	M-H	SU, PS, SH	E	Y	-
<i>Ribes viburnifolium</i>	Evergreen Currant	SD			3	3-6' x 12'	N-M	SU, PS	E	Y	5,7-9,14-17, 19-24
<i>Salicornia pacifica</i> (or <i>virginica</i> ) 4	Pickleweed	SD			1	1-2' x spreading	H	SU	SE	Y	-
<i>Salvia uliginosa</i>	Bog Sage	X			2	4-6' x 3-4'	M-H	SU	E		6-9, 14-24
<i>Satureja douglasii</i>	Yerba Buena	CA			2	<1' x 3'	H	PS	E		4-9, 14-24
<i>Satureja mimuloides</i>	Monkeyflower Savory	CA			1	1-3' x 1-3'	M-H	SU, PS	D		-

Perennials	<i>Sisyrinchium bellum</i> 4	Blue-eyed Grass	San Diego Co. Native - SD	California Native - CA	Non-Native - X	Landscape Position: 1 - Low1, 2 - Mid2, 3 - High3	Mature Size (height x width)	Irrigation Demands: High - H ■ Moderate - M Low - L ■ Rainfall Only - N	Light Requirements Sun - SU ■ Shade - SH Part Shade - PS	Season Evergreen - E, Deciduous - D Semi-Evergreen - SE	Coastal Exposure? Yes - Y	City of Imperial Beach Sunset Zone: 24
	<i>Trifolium wormskoldii</i>	Coast Clover	SD	SD	SD	1	2' x spreading	H	SU	D		-
	<i>Salicornia pacifica</i> (or <i>virginica</i> ) 4	Pickleweed	SD	SD	SD	1	1-2' x spreading 4-6' x 3-4'	H	SU	SE	Y	-
	<i>Salvia uliginosa</i>	Bog Sage	X	X	X	2	4-6' x 3-4'	M-H	SU	E		6-9, 14-24
	<i>Satureja douglasii</i>	Yerba Buena	CA	CA	CA	2	<1' x 3'	H	PS	E		4-9, 14-24
	<i>Satureja mimuloides</i>	Monkeyflower Savory	CA	CA	CA	1	1-3' x 1-3'	M-H	SU, PS	D		-
	<i>Sisyrinchium bellum</i> 4	Blue-eyed Grass	SD	SD	SD	2	6-18" x 6-18"	M-H	SU, PS	E	Y	2-9, 14-24
	<i>Trifolium wormskoldii</i>	Coast Clover	SD	SD	SD	1	2' x spreading	H	SU	D		-

DEPARTMENT OF PUBLIC WORKS  
IMPERIAL BEACH

TITLE: ZONE A LID RECOMMENDED PLANT LIST

DESIGNED BY:

APPROVED:

DATE:

DRAWN BY:

CHECKED BY:

CITY ENGINEER: \_\_\_\_\_

STANDARD PLAN

SW-26

SHEET 4 OF 6

DEPARTMENT OF PUBLIC WORKS  
IMPERIAL BEACH

TITLE: ZONE A LID RECOMMENDED PLANT LIST

STANDARD PLAN

DESIGNED BY:

APPROVED:

DATE:

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CHECKED BY:

CITY ENGINEER: \_\_\_\_\_

SW-26

SHEET 5 OF 6

Grasses & Grass-Like Plants		San Diego Co. Native - SD	California Native - CA	Non-Native - X	Landscape Position: 1 - Low1, 2 - Mid2, 3 - High3	Mature Size (height x width)	Irrigation Demands: High - H ■ Moderate - M Low - L ■ Rainfall Only - N	Light Requirements Sun - SU ■ Shade - SH Part Shade - PS	Season Evergreen - E, Deciduous - D Semi-Evergreen - SE	Coastal Exposure? Yes - Y	City of Imperial Beach Sunset Zone: 24
<i>Buchloe dactyloides</i>	'UC Verde' Buffalo grass	X			1	6-8" x spreading	L-H	SU	D		-
<i>Carex praegracilis</i>	California Field Sedge	SD			1	1'-2' x spreading	M-H	SU, PS	E	Y	-
<i>Carex pansa</i>	California Meadow Sedge	CA			1	6-8" x spreading	M-H	SU, PS	SE	Y	7-9, 11-24
<i>Carex spissa</i> <sup>4</sup>	San Diego Sedge	SD			1	5' x 6'	H	SU, PS	SE	Y	7-9, 14-17, 19, 24
<i>Carex subfusca</i>	Rusty Sedge	SD			1	6-8" x spreading	M	SU, PS, SH	SE		7-9, 11-24
<i>Chondropetalum tectorum</i>	Small Cape Rush	X			1	3-4' x 3-4'	M-H	SU, PS	E	Y	8-9, 14-24
<i>Distichlis spicata</i> <sup>4</sup>	Salt Grass	SD			1	1' x 3'	M-H	SU, PS	D	Y	-
<i>Eleocharis macrostachya</i> <sup>4</sup>	Common Spike Rush	SD			1	1-3' x 2'	H	SU, PS	E	Y	-
<i>Equisetum hyemale</i> ssp. affine	Horsetail Reed	SD			1	4' x spreading	H	SU, PS	E		1-24
<i>Festuca californica</i>	California Fescue	CA			1	2-3' x 1-2'	M-H	SU, PS	E	Y	4-9, 14-24
<i>Festuca rubra</i> 'Molate'	Molate Red Fescue	CA			1	1-2' x spreading	H	SU, PS	E		A2-3, 1-10, 14-24
<i>Juncus effusus</i>	Soft Rush	SD			1	2.5' x 2.5'	M-H	SU, PS	E		1-24, H1
<i>Juncus mexicanus</i> <sup>4</sup>	Mexican Rush	SD			1	2' x 2'	M-H	SU, PS	E		-
<i>Juncus patens</i> <sup>4</sup>	California Gray Rush	CA			1	2' x 2'	L-H	SU, PS	E		4-9, 14-24
<i>Leymus triticoides</i>	Creeping Wildrye	CA			1	1.5'-4.5'	L-M	SU, PS	E	Y	-
<i>Muhlenbergia rigens</i> <sup>4</sup>	Deer Grass	SD			1	2-4' x 3-4'	L	SU	E		4-24
<i>Nassella pulchra</i>	Purple Needlegrass	CA			2	3' x 2'	N-L	SU	D		5-9, 11, 14-24
<i>Schoenoplectus californicus</i> <sup>4</sup>	California Bulrush	SD			1	10' x spreading	H	SU, PS, SH	E		-
<i>Sporobolus airoides</i>	Alkali Dropseed	CA			1	3' x 3'	L-M	SU	D		1-24
<i>Zephyranthes candida</i>	Rain Lily	X			1	12" x 12"	H	SU, PS	E		4-9, 12-24, H1, H2

Annuals and Short-Lived Perennials <i>Limnanthes douglasii</i> <i>Limnanthes gracilis</i> ssp. <i>Parishii</i> <i>Lupinus succulentus</i> 4 <i>Oenothera elata</i> 4 <i>Pluchea odorata</i> 4	San Diego Co. Native - SD California Native - CA Non-Native - X	1	6-12" x 6-12"	Mature Size (height x width)	Irrigation Demands: High - H ■ Moderate - M Low - L ■ Rainfall Only - N	Light Requirements Sun - SU ■ Shade - SH Part Shade - PS	Season Evergreen - E, Deciduous - D Semi-Evergreen - SE	Coastal Exposure? Yes - Y	City of Imperial Beach Sunset Zone: 24 1-9, 14-24
	CA	1	6-12" x 6-12"		H	SU			
	SD	2	6-12" x 6-12"		H	SU			
	SD	2	3'x3'		M-H	SU			7-24
	SD	1	2-3' x 2-3'		L-H	SU, PS	E		5-7, 14-24
	SD	1	2-3' x 1-2'		H	SU, PS	SE		-

Vines <i>Vitis californica</i>	San Diego Co. Native - SD California Native - CA Non-Native - X	1	30'	Mature Size (height x width)	Irrigation Demands: High - H ■ Moderate - M Low - L ■ Rainfall Only - N	Light Requirements Sun - SU ■ Shade - SH Part Shade - PS	Season Evergreen - E, Deciduous - D Semi-Evergreen - SE	Coastal Exposure? Yes - Y	City of Imperial Beach Sunset Zone: 24 4-24
	SD	1	30'		N-L	SU, PS	D		

DEPARTMENT OF PUBLIC WORKS  
IMPERIAL BEACH

TITLE: ZONE A LID RECOMMENDED PLANT LIST

DESIGNED BY:

APPROVED:

DATE:

DRAWN BY:

CHECKED BY:

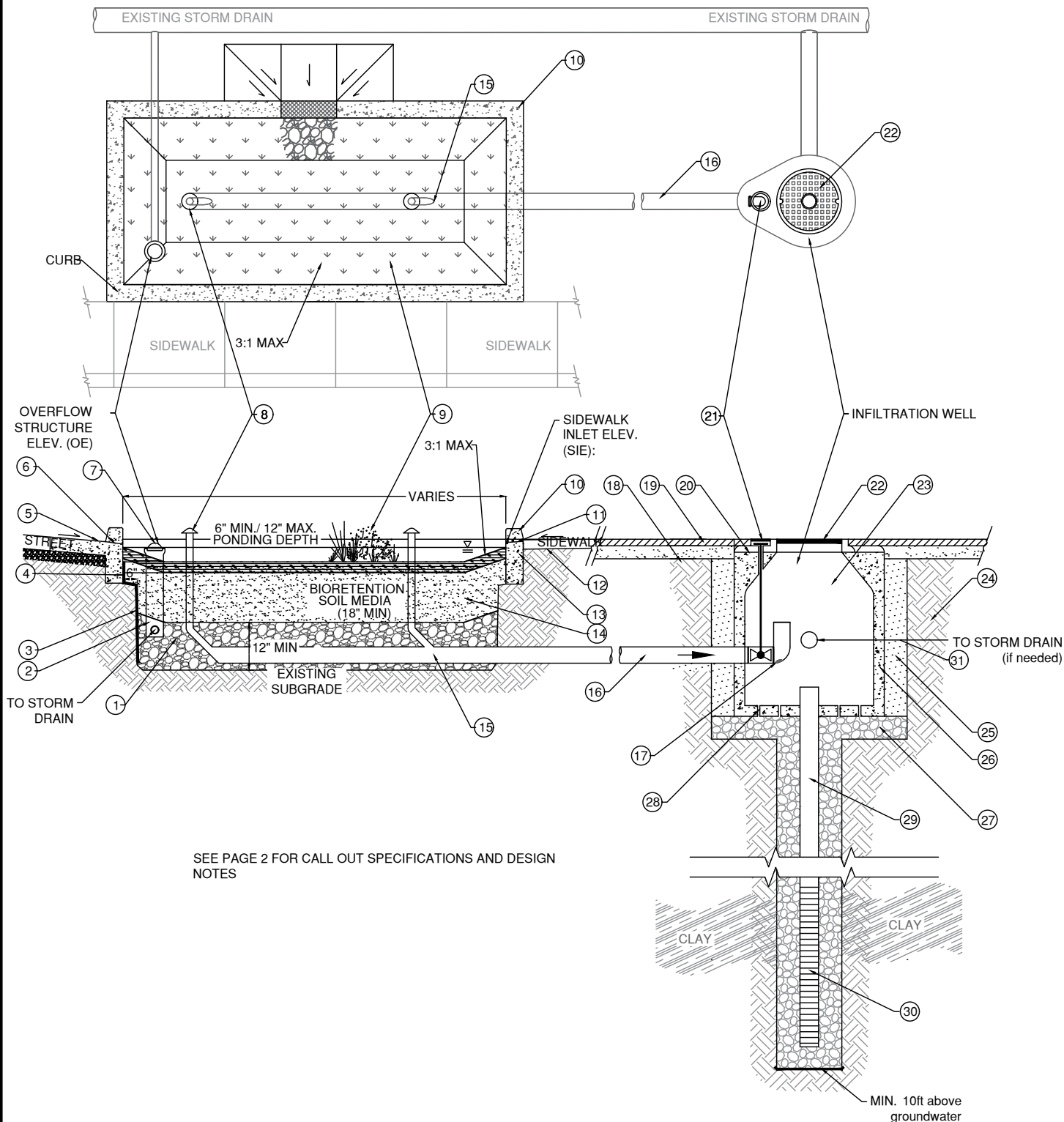
CITY ENGINEER:

STANDARD PLAN

SW-26

SHEET 6 OF 6





# LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT STANDARD DETAILS



DEVELOPED UNDER PROP. 84 GRANT

APPROVED BY:

VERSION:

08/31/2017

## DRYWELL STORMWATER BMP

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION

STANDARD PLAN NO.

**SW-27**

SHEET 1 OF 2

## SPECIFICATIONS

1. 12" DEEP OPEN GRADED WASHED STONE (TYPICALLY 3/4" TO 1-1/2" (ASTM #4 STONE) OR 1" TO 2" (ASTM #3 STONE).
2. BRIDGING LAYER(S) PER LIDI BIORETENTION TECHNICAL SPECIFICATIONS (BTS). DO NOT USE FILTER FABRIC BETWEEN BSM AND AGGREGATE. DO NOT USE FILTER FABRIC BETWEEN BIOFILTER SOIL MATERIAL (BSM) AND AGGREGATE.
3. 30 ML LINER MAY BE REQUIRED TO AVOID LATERAL INFILTRATION BELOW STREET; SUBJECT TO GEOTECHNICAL RECOMMENDATIONS.
4. MAINTAIN 6" MINIMUM BENCH OF NATIVE SOIL FOR SUPPORT OF ADJACENT SIDEWALK/ROAD (TYPICAL).
5. CURB AND GUTTER DETAIL SW-12.
6. CURB INLET DETAIL SW-17, GUTTER INLET ELEV (GIE). LOCATE ENERGY DISSIPATION COBBLE PADS AS SPECIFIED IN INLET DETAILS.
7. OVERFLOW STRUCTURE REQUIRED FOR IN-LINE SYSTEMS WITHOUT OVERFLOW BYPASS, DETAIL SW-22, SW-22A, and SW-23.
8. MAINTENANCE PIPES - 4" MIN. DIA. VERTICAL PVC PIPES CONNECTED TO UNDERDRAIN. PLACED AT START AND 3 FEET BEFORE END OF UNDERDRAIN. REQUIRES DIRECTIONAL SWEEP BEND. THREADED AND CAPPED
9. VEGETATION - PLANT SELECTION AND MULCH (OPTIONAL) PER BIORETENTION TECHNICAL SPECIFICATIONS.
10. 4" MIN. EXPOSED WALL HEIGHT
11. SIDEWALK DRAINAGE NOTCH 1" LOWER THAN SIDEWALK, SLOPED TO FACILITY
12. SEE PLANS FOR SIDEWALK RESTORATION
13. DEEP CURB DETAIL SW-13
14. BIORETENTION SOIL MEDIA (BSM). SPECIFICATION PER BIORETENTION TECHNICAL SPECIFICATIONS (BTS). SPECIFICATION SHOULD AVOID COMPOST OR OTHER MATERIAL KNOWN TO LEACH NUTRIENTS.
15. UNDERDRAIN, MIN. 4" DIA. PVC SDR 35 PERFORATED PIPE OR LARGER AS NEEDED TO CONVEY PEAK TREATED FLOWRATE WITH MINIMAL HEAD LOSS, SEE CONSTRUCTION NOTES.
16. 8" INLET PIPE OR OTHER.
17. LOW FLOW ORIFICE. (SEE DESIGN NOTE 11).
18. STABILIZED BACKFILL - TWO-SACK SLURRY MIX.
19. SIDEWALK PER MUNICIPAL STANDARDS.
20. COMPACTED BASE MATERIAL.
21. ACCESS HATCH WITH SHUT OF VALVE SWITCH. CONNECTED TO SHUT OF VALVE IN INLET PIPE.
22. MAINTENANCE HOLE COS TYPE 204-204 MH A OR B. 3/4" I.D. MIN OBSERVATION PORT.
23. MANHOLE CONE - MODIFIED FLAT BOTTOM.
24. EXISTING SOILS. (SEE CONSTRUCTION NOTE 4, 8).
25. COMPACTED BACKFILL
26. PRE-CAST OR INSITU CAST CONTROL VAULT (SEE DESIGN NOTE 8)
27. ROCK - WASHED, SIZED BETWEEN 3/8" AND 1-1/2"
28. PERFORATED BASE OF CONTROL VAULT
29. DRILLED SHAFT WITH 6" WELDED STEEL OR THREADED PVC CASING (SEE DESIGN NOTE 13 & CONSTRUCTION NOTE 7,8)
30. 6 - 8" O.D. WELDED WIRE STAINLESS STEEL WELL SCREEN OR THREADED PVC SLOTTED SCREEN. SCREEN LENGTH + LENGTH + SLOT WIDTH TO BE DETERMINED IN ACCORDANCE WITH LOCAL CONSTRAINTS .I.E. DISTANCE BETWEEN CLAY LAYER AND MIN. 10FT ABOVE SEASONAL HIGH GROUNDWATER LEVEL
31. PVC STORMDRAIN CONNECTOR PIPE. SAME DIAMETER AS INFLOW PIPE TO CONTROL VAULT.

## DESIGN NOTES

1. ADDITIONAL DESIGN GUIDANCE FOR BIOFILTRATION SYSTEM PROVIDED IN LIDI BIORETENTION TECHNICAL SPECIFICATIONS (BTS) DOCUMENT.
2. BOTTOM WIDTH - PROVIDE 2 FT MINIMUM FLAT BREGENALL
3. BOTTOM WITH A MAX 3:1 SLOPE FOR SURFACE FINISHING WITHIN BIOFILTRATION SYSTEM
4. IF CALTRANS CLASS 2 PERMEABLE IS NOT AVAILABLE, SUBSTITUTE CLASS 3 PERMEABLE WITH AN OVERLYING 3" DEEP LAYER OF 3/4" (NO. 4) OPEN-GRADED AGGREGATE.
5. PROVIDE SPOT ELEVATIONS AT INLETS ON CIVIL PLANS (FE, OE, GIE, SIE). SEE DETAIL SW-17.
6. EDGE CONDITION WILL VARY FOR NEW AND RETROFIT PROJECTS. CURB, WALL, AND SIDEWALK DETAILS MAY BE MODIFIED FOR PROJECT BY CIVIL AND GEOTECHNICAL ENGINEERS.
7. PROVIDE MONITORING WELL IN EACH FACILITY, PER BIORETENTION TECHNICAL SPECIFICATIONS.
8. LONGITUDINAL SLOPE 6% WITH CHECK DAMS.
9. IF CHECK DAMS ARE NEEDED, SEE CONCRETE CHECK DAM DETAIL SW-18.
10. VARIATIONS IN DRY WELL DESIGN SHOULD BE MADE TO ACCOMMODATE STORAGE VOLUME DESIGN AND TO SUIT LOCAL CONDITIONS AND CONSTRAINTS.
11. IN AREAS WITHOUT A STORMDRAIN, THE SYSTEM SHOULD ONLY BE CONSTRUCTED WHERE THE MAINTENANCE HOLE SURFACE INVERT IS ABOVE THE BIOFILTER OVERFLOW ELEVATION.
12. ALTERNATIVE VAULT LOCATIONS POSSIBLE INCLUDING WITHIN THE BIOFILTER FOOTPRINT.
13. VALVE CAN BE MOVED TO THE BIOFILTER IF DESIRED. REQUIRES STRUCTURAL SUPPORT.
14. ALTERNATIVE PRODUCTS SUCH AS VENDOR-SUPPLIED DRY WELL PRODUCTS MAY BE USED AS A SUBSTITUTE PROVIDED THAT THE ALTERNATIVE PRODUCT IS EQUAL.
15. THIS DESIGN IS LIKELY TO QUALIFY AS A CLASS V WELL SUBJECT TO REGISTRATION WITH THE USEPA.

## LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT STANDARD DETAILS

 DEVELOPED UNDER PROP. 84 GRANT		APPROVED BY:	DRYWELL STORMWATER BMP	STANDARD PLAN NO.
		VERSION:		SW-27
		08/31/2017	USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION	SHEET 2 OF 2

## Low Impact Development Initiative (LIDI) Bioretention Technical Specifications

The following technical information is for use in conjunction with the complete set of bioretention area standard details developed by the LIDI for use in the Central Coast region and throughout California. Central Coast region-specific requirements are noted where applicable.

### Facility Design/Dimensions

- Bioretention facilities should be sized to retain and/or treat the water quality design flow and/or volume in accordance with the stormwater permit requirements that apply to the local jurisdiction and appropriate local, countywide, and/or statewide (CASQA) guidance documents. Design parameters specified in stormwater permits will determine the surface area and storage volume required within the facility.
- Bottom width – facilities should have flat bottoms and sufficient width for ease of constructability and maintenance.
  - Provide 2' wide minimum for facilities with side slopes and planters (facilities with vertical side walls).
- Allowable standing water duration – generally 48 to 72 hours  
Allowable ponding time is typically associated with mosquito vector control or perceived nuisance flooding and varies by location.
- Ponding depth - Min. 6", max. 12". The depth is measured from the surface of the bioretention soil media and not adjusted for application of mulch.
- Planter depth – (from adjacent pedestrian walking surface to facility finished elevation/planting surface) is based on desired ponding plus freeboard, but also relates to planter width. Planters can be deeper if they are wider, and need to be shallower as they narrow. This is a pedestrian perception and safety issue. Some recommended width to depth guidelines are as follows (allowable depths and appropriate edge treatments may be specified by the local jurisdiction and may be determined by ADA requirements):

PLANTER WIDTH	MAX. PLANTER DEPTH
> 5'	16"
4' – 5'	12"
3' – 4'	10"
2' – 3'	8"



- Slope/grades
  - Side slope - 4:1 preferred
    - Max. 3:1 allowed with min. 12" wide shoulder (2% slope toward facility) adjacent to pedestrian use or curb.
  - Longitudinal slope – Facility should be relatively flat (i.e., maximum of 2% longitudinal slope of bottom) so that water ponds and infiltrates evenly across the facility surface.
    - If installed on a slope, facilities should be terraced and separated by check dams and weir overflows to provide flat-bottomed cells with proper storage and infiltration.
    - Installation not recommended on slopes > 8%.
  - Grades on opposite sides within a facility should be similar to optimize ponding across the entire basin/cell.

### Hard Infrastructure

- Inlet curb cut design selection should be based on application considerations:
  - Sloped sided or planter facility
  - Curb and gutter adjacent to facility or separated by pedestrian sidewalk
- Curb cut width – 12"-18" minimum, with rounded edges, depress gutter 2" at opening (see SW-14, SW-15, SW-16)
- Sidewalk edge type selection should be based on application considerations:
  - New or retrofit
  - Sloped sided or planter box
- Sidewalk wall - planter box requires 4" min. height wall adjacent to sidewalk for pedestrian safety.
- Sidewalk wall drainage notch – when sidewalk drains to planter, provide 4"-6" wide notch openings in wall, opening 1" below sidewalk, slope to facility. Space openings to convey flows.
  - Provide minimum 2" cover between notch and structural dowels in curbs/walls.
- Energy dissipation – provide aggregate or concrete splash pads at inlets per inlet details.
  - For aggregate: 6" depth, 3" – 6" rounded, washed cobble
  - For sloped sided facilities where inlet flow velocity is high, extend cobble into facility, but avoid excessive or decorative use.
- Where impermeable liner is included between facility and adjacent

infrastructure (street, parking lot), use 30 ML HDPE or PVC material, see Impermeable Liner detail.

- Check dams – provide for facilities installed on slope
  - Per check dam details SW-17 and SW-18
  - Check dams should be placed for every 4-6” of elevation change and so that the top of each dam is at least as high as the toe of the next upstream dam.
- Overflow structure – required for on-line systems without an overflow bypass
  - Per overflow structure details SW-19, SW-20
  - Connect to approved discharge point or another downstream bioretention area.
- Provide observation well in facility if required
  - Upright 6 inch rigid PVC (SDR 40 or equivalent) pipe, perforated for the section extending through the depth of the bioretention soil media (and aggregate layer if included), extending 6 inches above the top of soil elevation, with a threaded cap.
  - Locate to avoid damage from maintenance activities.

#### Facility Media (soil, aggregate, mulch)

- Aggregate layer – where an aggregate layer is included in the design (underdrain design or optional use based on project requirements, depth based on sizing calculations), specify “CalTrans Class 2 Permeable.”
  - CalTrans Class 2 Permeable does not require an aggregate filter course between the aggregate storage layer and the bioretention soil media above.
  - When CalTrans Class 2 Permeable is not available, substitute CalTrans Class 3 Permeable.
    - Class 3 Permeable requires an overlying 3” deep layer of ¾” (No. 4) open graded aggregate (between Class 3 and bioretention soil media above).
  - Filter fabric - do NOT use fabric between bioretention soil media and aggregate layer
- Bioretention soil media (BSM) - use local jurisdiction approved/recommended BSM (e.g. Bay Area Stormwater Management Agencies Association (BASMAA) Regional Biotreatment Soil Specification (revised January 29, 2016)<sup>1</sup>.

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[http://www.waterboards.ca.gov/sanfranciscobay/water\\_issues/programs/stormwater/MRP/provisionC.3/Revised\\_%20Biotreatment%](http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/stormwater/MRP/provisionC.3/Revised_%20Biotreatment%20Soil%20Specification.pdf)

- Using a performance specification for alternative bioretention soil mix is not recommended (but may be allowed by the local jurisdiction).
- A pre-mixed bioretention soil media is preferable to mixing soil on-site.
- BSM depth – 18” minimum depth; 24” recommended, or as required by the local jurisdiction. 24” depth required in the Central Coast Region for facilities with underdrains.
- Where trees are specified, increase BSM depth in tree planting locations, per arborist’s or landscape architects direction, or allow trees access to sufficient volume of native soil.
  - Tree planting in bioretention - see BASMAA Literature Review - Bioretention Design for Tree Health (September 15, 2016)<sup>2</sup>
- Bioretention soil media placement and compaction – place BSM in 6” lifts. Compact each lift with a landscape roller or by lightly wetting. Allow BSM to dry overnight before planting.
- Mulch depth – 2” – 3” (3” recommended and required by State Model Water Efficiency Landscape Ordinance)
  - Do not apply mulch in ponding zone just prior to or during rainy season.
  - When mulch is used, excavation must allow for specified bioretention soil depth to achieve finished elevations as shown on civil plans
- Mulch type - when used in ponding zone, must be aged, stabilized, non-floating mulch, such as a specified composted wood mulch. Gravel mulch may also be used when high flow velocities through the system are expected.

#### Landscape (planting and irrigation)

- Irrigation - Provide irrigation for plant establishment (2-3 years), and supplemental irrigation during periods of prolonged drought.
  - Provide separate zone for connection to water supply
- Planting - see LIDI plant guidance for bioretention areas technical assistance memo (TAM) or use bioretention plant list in other local or countywide guidance document.
  - Landscape Architects who have not previously designed bioretention systems should use plants from the LIDI TAM or other approved plant list. Landscape Architects with experience designing for bioretention may use additional plant species consistent with the above lists and

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<sup>2</sup> 20\_Soil.pdf  
[www.basmaa.org](http://www.basmaa.org)

appropriate for the facility design and local conditions.

- Do not locate plants at inlets. Consider mature growth to determine planting layout and avoid future blockage of inlets by plants.
- Trees located on slopes should be 5' minimum from inlets to avoid erosion of soil at root ball.

### Underdrain Design

- Aggregate layer depth – 12" minimum depth.
- Underdrain – use 4" diameter, PVC SDR 35 perforated pipe.
  - Install underdrain with holes facing down.
  - Underdrain discharge elevation should be near top of aggregate layer if facility is allowed to infiltrate into native soil.
  - Underdrain slope may be flat or have a slight slope.
  - Connect underdrain to approved discharge point.
  - Provide capped, threaded PVC cleanout for underdrain, 4" min. dia. with sweep bend.
  - Do NOT wrap underdrain with filter fabric.