Alvarado Roofing Headquarters

4015 Hawkins Street NE

TEMPORARY EROSION AND SEDIMENT CONTROL PLAN

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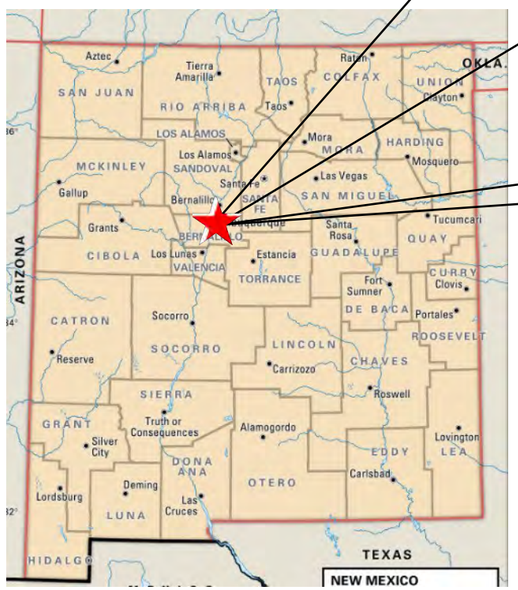

GPS COORDINATES:

Latitude: 35.163250
Longitude: -106.597468

CPESC Stamp

Alvarado Roofing Headquarters	PROJECT TITLE
ALBUQUERQUE, NM, BERNALILLO COUNTY	CITY, COUNTY, STATE
05/20/2024	DATE
B. Henriksen / J. Tolman	DRAWN BY
INSPECTIONS PLUS	

STORMWATER POLLUTION PREVENTION PLAN INFORMATION

PERMIT NUMBER: NMR

NMR100000 STATE OF NEW MEXICO, EXCEPT INDIAN COUNTRY
NMR10I000 INDIAN COUNTRY WITHIN THE STATE OF NEW MEXICO, EXCEPT NAVAJO RESERVATION LANDS THAT ARE COVERED UNDER ARIZONA PERMIT AZR10I000 AND UTE MOUNTAIN RESERVATION LANDS THAT ARE COVERED UNDER COLORADO PERMIT COR10I000.

OPERATOR NAME:	Alvarado Roofing, Inc
OPERATOR POINT OF CONTACT:	Craig Kemper craig@alvaradoroofing.com 505-842-7663
NOI PREPARED BY:	Inspections Plus
PROJECT/SITE NAME:	Alvarado Roofing Headquarters
PROJECT/SITE ADDRESS:	4015 Hawkins Street NE, Albuquerque, NM 87109
LATITUDE	Latitude: 35.163250
LONGITUDE	Longitude: -106.597468
ESTIMATED PROJECT START DATE	05/20/2024
ESTIMATED PROJECT COMPLETION DATE	05/20/2025
ESTIMATED AREA TO BE DISTURBED	2 acres
TYPE OF CONSTRUCTION	Commercial
DEMOLITION OF ANY STRUCTURES, 10,000 SQ FT OF GREATER BUILT OR RENOVATED BEFORE JANUARY 1, 1980?	No
WAS THE PREDEVELOPMENT LAND USED FOR AGRICULTURE?	**NO**
COMMENCED EARTH DISTURBING ACTIVITIES?	**NO**
DISCHARGE TO MS4? MS4 NAME? City of Albuquerque	**Yes**
SURFACE WATERS WITHIN 50FT?	**NO**
RECEIVING WATER? Rio Grande	No
IS RECEIVING WATER IMPAIRED? TIER DESIGNATION	Yes, Category 3
WHAT ARE THE IMPAIRMENTS, IF ANY?	E. coli
SWPPP CONTACT INFORMATION:	Craig Kemper craig@alvaradoroofing.com 505-842-7663
ENDANGERED SPECIES CRITERIA:	**CRITERION "A"; NO CRITICAL HABITATS**
HISTORIC PRESERVATION CRITERIA:	**CRITERION "A" PREEXISTING DEVELOPMENT**

EROSION CONTOL NOTES
ESC Plan Standard Notes (2023-06-16))

1. All Erosion and Sediment Control (ESC) work on these plans, except as otherwise stated or provided hereon shall be permitted, constructed, inspected, and maintained in accordance with:

a. The City Ordinance § 14-5-2-11, the ESC Ordinance,
b. The EPA's 2022 Construction General Permit (CGP), and
c. The City Of Albuquerque Construction BMP Manual.

2. All BMP's must be installed prior to beginning any earth moving activities except as specified hereon in the Phasing Plan. Construction of earthen BMP's such as sediment traps, sediment basins, and diversion berms shall be completed and inspected prior to any other construction or earthwork. Self-inspection is required after installation of the BMPs and prior to beginning construction.
3. Self-inspections - In accordance with City Ordinance § 14-5-2-11(C)(1), "at a minimum a routine self-inspection is required to review the project for compliance with the Construction General Permit once every 14 days and after any precipitation event of 1/4 inch or greater until the site construction has been completed and the site determined as stabilized by the city. Reports of these inspections shall be kept by the person or entity authorized to direct the construction activities on the site and made available upon request.
4. Corrective action reports must be kept by the person or entity authorized to direct the construction activities on the site and made available upon request.
5. Final Stabilization and Notice of Termination (NOT) - In accordance with City Ordinance § 14-5-2-11(C)(1), self-inspections must continue until the site is "determined as stabilized by the city." The property owner/operator is responsible for determining when the "Conditions for Terminating CGP Coverage" per CGP Part 8.2 are satisfied and then for filing their Notice of Termination (NOT) with the EPA. Each operator may terminate CGP coverage only if one or more of the conditions in Part 8.2.1, 8.2.2, or 8.2.3 has occurred. After filing the NOT with the EPA, the property owner is responsible for requesting a Determination of Stabilization from the City.
6. When doing work in the City right-of-way (e.g. sidewalk, drive pads, utilities, etc.) prevent dirt from getting into the street. If dirt is present in the street, the street should be swept daily or prior to a rain event or contractor induced water event (e.g. curb cut or water test).
7. When installing utilities behind the curb, the excavated dirt should not be placed in the street.
8. When cutting the street for utilities the dirt shall be placed on the uphill side of the street cut and the area swept after the work is complete. A wattle or mulch sock may be placed at the toe of the excavated dirt pile if site constraints do not allow placing the excavated dirt on the uphill side of the street cut.
9. ESC Plans must show longitudinal street slope and street names. On streets where the longitudinal slope is steeper than 2.5%, wattles/mulch socks or j-hood silt fence shall be shown in the front yard swale or on the side of the street.

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Alvarado Roofing Headquarters
PROJECT TITLE

ALBUQUERQUE, NM, BERNALILLO COUNTY
CITY, COUNTY, STATE

05/20/2024 DATE

B. Henriksen / J. Tolman DRAWN BY

INSPECTIONS PLUS

SEDIMENT TRACK OUT CONTROL

BMP Objectives

- Sediment Control

BERMS AND SWALES

BMP Objectives

- Runoff Control
- Run-on Diversion

SILT FENCE

BMP Objectives

- Sediment Control
- Sheet Flow Runoff Control
- Wind Erosion Control

MULCH SOCK/STRAW WATTLE

BMP Objectives

- Sediment Control
- Reduce Runoff Velocity
- Inlet Protection

INLET PROTECTION

BMP Objectives

- Sediment Control
- Sheet Flow Runoff Control
- Wind Erosion Control

CPESC Stamp

Alvarado Roofing Headquarters (PROJECT TITLE)	
ALBUQUERQUE, NM, BERNALILLO COUNTY (CITY, COUNTY, STATE)	
05/20/2024 (DATE)	INSPECTIONS PLUS
B. Henriksen / J. Tolman (DRAWN BY)	

FIRM MAP PANEL # 136 G

SUBJECT PROPERTY IS NOT ADJACENT TO A FLOOD HAZARD ZONE.

NOTICE TO CONTRACTORS - "SO-19 PERMIT"

PRIVATE DRAINAGE FACILITIES WITHIN CITY RIGHT-OF-WAY
NOTICE TO CONTRACTOR
(SPECIAL ORDER 19 ~ "SO-19")
1. BUILD SIDEWALK CULVERT PER COA STD DWG 2236.
2. CONTACT STORM MAINTENANCE AT (505) 857-8033 TO SCHEDULE A MEETING PRIOR TO FORMING.
3. AN EXCAVATION PERMIT WILL BE REQUIRED BEFORE BEGINNING ANY WORK WITHIN CITY RIGHT-OF-WAY.
4. ALL WORK ON THIS PROJECT SHALL BE PERFORMED IN ACCORDANCE WITH APPLICABLE FEDERAL, STATE AND LOCAL LAWS, RULES AND REGULATIONS CONCERNING CONSTRUCTION SAFETY AND HEALTH.
5. TWO WORKING DAYS PRIOR TO ANY EXCAVATION, THE CONTRACTOR MUST CONTACT **NEW MEXICO ONE CALL, DIAL "811"** [OR (505) 260-1990] FOR THE LOCATION OF EXISTING UTILITIES.
6. PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL EXCAVATE AND VERIFY THE LOCATIONS OF ALL OBSTRUCTIONS. SHOULD A CONFLICT EXIST, THE CONTRACTOR SHALL NOTIFY THE ENGINEER SO THAT THE CONFLICT CAN BE RESOLVED WITH A MINIMUM AMOUNT OF DELAY.
7. BACKFILL COMPACTION SHALL BE ACCORDING TO TRAFFIC/STREET USE.
8. MAINTENANCE OF THE FACILITY SHALL BE THE RESPONSIBILITY OF THE OWNER OF THE PROPERTY BEING SERVED.
9. WORK ON ARTERIAL STREETS MAY BE REQUIRED ON A 24-HOUR BASIS.
10. CONTRACTOR MUST CONTACT STORM MAINTENANCE AT (505) 857-8033 TO SCHEDULE A CONSTRUCTION INSPECTION. FOR EXCAVATING AND BARRICADING INSPECTIONS, CONTACT CONSTRUCTION COORDINATION AT (505) 924-3416.

GRADING & DRAINAGE PLAN

THE COMMERCIAL/CONTRACTOR'S YARD PROJECT IS LOCATED IN THE INTERSTATE INDUSTRIAL PARK OF ALBUQUERQUE APPROXIMATELY 5 MILES NORTH OF THE DOWNTOWN CORE OF ALBUQUERQUE, NM. THE GRADING & DRAINAGE SCHEME HEREON IS IN COMPLIANCE WITH THE CITY FLOOD HAZARD ORDINANCE, 2009, AND THE LATEST REVISED CITY STORM DRAINAGE ORDINANCE. THE PLAN IS REQUIRED IN ORDER TO FACILITATE THE OWNER'S REQUEST FOR BUILDING PERMIT. THE PLAN SHOWS:

1. *EXISTING CONTOURS, AND SPOT ELEVATIONS AND EXISTING DRAINAGE PATTERNS AND EXISTING IMPROVEMENTS: INCLUDING TWO RESIDENCES AND EXISTING FLATWORK :*
2. *PROPOSED IMPROVEMENTS: 300 SF OFFICE, PARKING, 15000 SF OF STORAGE BLDGS, ASPHALT DRIVE, GRAVEL SURFACING, NEW GRADE ELEVATIONS, WALLS, FLATWORK AND LANDSCAPING.*
3. *CONTINUITY BETWEEN EXISTING AND PROPOSED ELEVATIONS.*
4. *QUANTIFICATION OF ONSITE RUNOFF COMPUTATIONS INCLUDING UPSTREAM (IF ANY CONTRIBUTE) TO THE DEVELOPED FLOWS GENERATED BY THE IMPROVEMENTS.*

THE PURPOSE OF THE PLAN IS TO ESTABLISH CRITERIA FOR CON- TROLLING STORM RUNOFF AND EROSION. PRESENTLY, THE SITE IS BOUNDED ON THE EAST AND NORTH BY DEVELOPED COMMERCIAL PROPERTY. HAWKINS STREET, NE, IS A MAJOR STREET PER THE LRM/RSP AND IS PAVED WITH CURB, GUTTER WITHOUT SIDEWALK, AND IS MAINTAINED BY THE CITY OF ALBUQUERQUE. THE SITE CURRENTLY HAS SLOPES AT APPROX. 2%.

HISTORICAL SITE RUNOFF OUTFALL LOCATIONS WILL REMAIN UNCHANGED. SINCE HAWKINS ST. IS IMPROVED ONLY MINIMAL GRADING (ACCESS RECONSTR~N) IS PROPOSED WITHIN THE CITY R.O.W. FREE DISCHARGE OF DEVELOPED FLOW IS ACCEPTABLE. THIS PLAN ROUTES DEVELOPED RUNOFF THROUGH/TO THE PROPOSED LANDSCAPE AREAS. THE SITE IS NOT IMPACTED ADVERSELY BY ANY OFF-SITE DRAINAGE FLOWS.

CALCULATIONS

DESIGN CRITERIA

HYDROLOGIC METHODS: HYDROLOGY OF THE DEVELOPMENT PROCESS MANUAL (DPM) CHAPTER 6, JUNE 2020 EDITION FOR CITY OF ALBUQUERQUE
DISCHARGE RATE: Q=0PEAK x AREA.."Peak Discharge Rates For Small Watersheds"
VOLUMETRIC DISCHARGE: VOLUME = EWeighted x AREA
P100 = 2.29 Inches, Zone 2 Time of Concentration, TC = 12 Minutes
DESIGN STORM: 100-YEAR/6-HOUR, 10-YEAR/6-HOUR [ ] = 10 YEAR VALUES

EXISTING CONDITIONS - FORMER DEVELOPED PROPERTY

TOTAL AREA = 2.0 ACRES, WHERE EXCESS PRECIP. 'W' =1.03 In. [0.5]
PEAK DISCHARGE, Q100 = 6 CFS [3.2] WHERE UNIT PEAK DISCHARGE 'Q' = 3 CFS/AC. [1.6]
THEREFORE: VOLUME 100 = 7478 CF [XXX]

DEVELOPED CONDITIONS

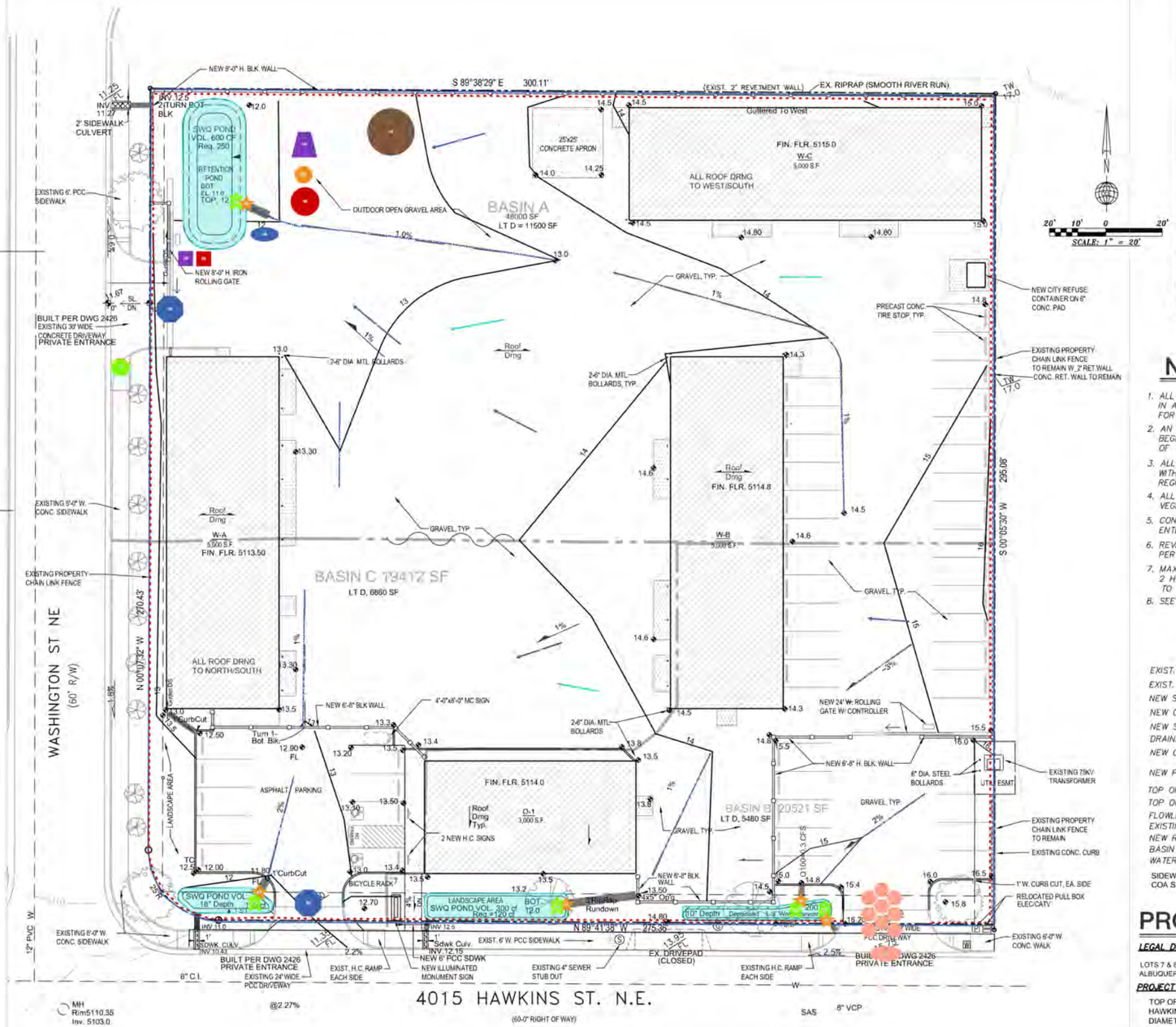
DETERMINE LAND TREATMENTS, PEAK DISCHARGE AND VOLUMETRIC DISCHARGE FOR STUDY AREA

	AREA	LAND TREATM'T	Q Peak	E
UNDEVELOPED	~~~ Ac.	A	1.71[0.41]	0.62[0.15]
LANDSCAPING/POND	0.26 Ac.(13%)	B	2.36[0.95]	0.80[0.30]
GRAVEL & COMPACTED SOIL	1.19 Ac.(60%)	C	3.05[1.59]	1.03[0.48]
ROOF - PAVEMENT	0.55 Ac.(27%)	D	4.34[2.71]	2.33[1.51]
	2 Ac.			

THEREFORE: E Weighted = 1.35 In. & VOLUME 100 = 9809 CF
Q100 =6.6 CFS >>INCREASE OF 0.6 CFS

RECOMMEND : ROUTE DEVELOPED RUNOFF THROUGH UPGRADED SOFT LANDSCAPING
CHECK EPA, MS4 PERMITTING ... "FIRST FLUSH", REDEVELOPED
0.26/12 X 24000 = ...USE 520 CF TOTAL FOR SITE
THEREFORE: SEE BASINS A, B2, AND C FOR BREAKOUT OF SWQ PONDS / LT Ds

SIZE EMERGENCY OUTFALL, REF: Brater-King, Handbook of Hydraulics
SEE BROAD-CRESTED WEIR
SIZE OUTLET: Q = CLH**3/2 = 2.7 X 1 X 0.75 **3/2 = 1.75 CFS Where: C = 2.7, H= 9 INCHES
THEREFORE: 2' SDWK CULVERT = 3.5 CFS



VICINITY MAP D-17

NOTES

1. *ALL WORK WITHIN THE RIGHT-OF-WAY SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE CITY OF ALBUQUERQUE STANDARD SPECS. FOR PUBLIC WORKS CONSTRUCTION, 9TH UPDATE W/ AMMENDS.*
2. *AN EXCAVATION/CONSTRUCTION PERMIT IS REQUIRED BEFORE BEGINNING ANY WORK WITHIN CITY R.O.W. AN APPROVED COPY OF THIS PLAN MUST BE SUBMITTED AT THE TIME OF APPLICATION.*
3. *ALL WORK ON THIS PROJECT SHALL BE PERFORMED IN ACCORDANCE WITH APPLICABLE FEDERAL, STATE AND LOCAL LAWS, RULES, AND REGULATIONS CONCERNING CONSTRUCTION SAFETY AND HEALTH.*
4. *ALL LANDSCAPING AREA SHALL BE SOFT-LINED WITH NATIVE VEGETATION AND/OR GRAVEL.*
5. *CONTRACTOR SHALL ENSURE THAT NO SITE SOILS/SEDIMENT OR SILT ENTER THE RIGHT-OF-WAYS DURING CONSTRUCTION.*
6. *REVEGETATE ALL AREAS DISTURBED DUE TO CONSTRUCTION PER CITY OF ALBUQ. SPEC. 1011, NATIVE SEED MIX.*
7. *MAXIMUM SITE GRADING WITHOUT EROSION PROTECTION: 2 HORIZONTAL TO 1 VERTICAL, 2:1<3' HIGH. ALL DIMENSIONS TO FACE OF CURB, UNLESS NOTED OTHERWISE.*
8. *SEE SPECIAL ORDER 19 NOTES, UPPER LEFT THIS SHT.*

LEGEND

EXIST. SPOT ELEVATION	
EXIST. CONTOUR	10
NEW SPOT ELEVATION (FINISH)	24.0
NEW CONTOUR	12
NEW SWALE	
DRAINAGE DIRECTION, EXISTING	
NEW CONCRETE CURB (0.5" HEIGHT)	
NEW P.C.C., CONCRETE	
TOP OF CURB, EXISTING	TC
TOP OF ASPHALT	TA
FLOWLINE	FL
EXISTING POWER POLE	P.P.
NEW RIPRAP	
BASIN BDRY	
WATER BLOCK	
SIDEWALK CULVERT PER COA STD DWG 2236	With STL. PLATE

PROJECT DATA

LEGAL DESCRIPTION, UPC # UPC: 101706320612530610

LOTS 7 & 8, INTERSTATE INDUSTRIAL TRACT, UNIT 4
ALBUQUERQUE, BERNALILLO COUNTY, NEW MEXICO

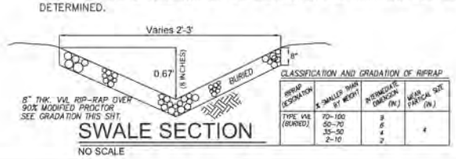
PROJECT BENCHMARK

TOP OF EXISTING NORTH RIM OF SANITARY SEWER RING LOCATED IN HAWKINS ST. MSL ELEVATION = 5110.35, AS TIED FROM COA 3-1/4" DIAMETER ALUM DISK, "DOUGLAS", MSL, NAVD 88, 4975.08.

TOPOGRAPHIC DESIGN SURVEY - Inc/dg Cartesian ALTA

PROVIDED BY ALPHA PRO SURVEYING, LLC, DECEMBER 2019 AND FIELD SUPPLEMENTED BY CLARK CONSULTING ENGINEERS.

I, PHILIP W. CLARK, A PROFESSIONAL ENGINEER LICENSED IN ACCORDANCE WITH THE LAWS OF THE STATE OF NEW MEXICO, DO HEREBY CERTIFY THAT I HAVE VISITED THE SITE SHOWN HEREON, AND THAT THE CONTOURS SHOWN REPRESENT THE EXISTING GROUND CONDITIONS, AND DO FURTHER CERTIFY THAT NO MAJOR EARTHWORK EXCEPT MINIMAL DISTURBANCE OF THE EXISTING GROUND HAS OCCURRED ON THIS SITE SINCE THE CONTOURS WERE DETERMINED.



City of Albuquerque
Planning Department
Development Review Services
HYDROLOGY SECTION
APPROVED
DATE: 04/25/24
BY: Renée Brissette
Conditions: D17D008
APPROVAL OF GRADING & DRAINAGE PLAN(S) SHALL EXPIRE TWO (2) YEARS AFTER THE APPROVAL DATE BY THE CITY IF NO BUILDING PERMIT HAS BEEN PULLED ON THE DEVELOPMENT.

CERTIFIED PROFESSIONAL CPESC® James Tolman No. 10631 EROSION AND SEDIMENT CONTROL

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DRAWN BY

INSPECTIONS PLUS

LEGEND

- Property Boundary/Limit of Disturbance (1)
- Silt Fence (5)
- Drainage Swale (8)
- Post-Construction Water Flow (5)
- Pre-Construction Water Flow (3)
- Retention Pond (4)
- Material Storage (1)
- Stockpiles (1)
- Water Truck (1)
- Street Sweeping (1)
- Portable Toilet (1)
- Dumpster (1)
- Blockade (2)
- Spill Kit (1)
- SWPPP Sign (1)
- Outfall (5)
- Portable Concrete Washout - In secondary containment (1)
- Rip Rap (5)
- Stabilized Construction Exit (1)

Latitude: 35.163250
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SECTION 5: EROSION AND SEDIMENT CONTROLS

The following categories of BMP activity are BMPs that will be implemented to control pollutants in storm water discharges as details are provided in each area. The SWPPP map will include the BMPs that are located on site. The maps will be updated according to what is on site at the current time along with the notes about the specific BMPs.

For SWPPPs that are being managed on compliance|**GO** the site maps will be updated with the appropriate BMPs. The site maps are located in the site maps section in compliance|**GO**.

Please notify the contact person for the operator found on the NOI in order to access this information if needed.

5.1 Minimize Area of Disturbance

CGP Requirement	Example BMPs	BMPs Selected (Name and Reference Number if applicable)
Preserve vegetation where possible and direct storm water to vegetated areas when feasible (CGP 2.2.2.)	Phasing to minimize disturbance, signs/fences to protect areas not being disturbed.	5.1.1.a Minimize Area of Disturbance, 5.1.1.b Minimize Exposed Soils Through Phasing
Install sediment controls along perimeter areas that receive pollutant discharges (CGP 2.2.3).	Silt fence, fiber rolls, earth berms	5.1.2.a Silt Fence
Minimize sediment track-out (CGP 2.2.4).	Restrict access, stabilize exits, track-out pads, tire washing station, clean-up sediments	5.1.3.a Stabilized Construction Exit, 5.1.3.b Street Sweeping
Manage stockpiles with perimeter controls and locate away from storm water conveyances (CGP 2.2.5.)	Sediment barriers downgradient, proper location, covered stockpiles, diverting storm water from stockpiles	5.1.4.a Stockpile Containment
Minimize dust (CGP 2.2.6.)	Water application, mulching, chemical dust suppression techniques	5.1.5.a Wetting with Water
Minimize steep slope disturbance (CGP 2.2.7.)	Erosion control blankets, tackifiers, protect slopes from disturbance	NA
Preserve topsoil (CGP 2.2.8.)	Stockpile topsoil	5.1.7.a Topsoil Stockpiling
Minimize soil compaction where final cover is vegetation (CGP 2.2.9.)	Restrict vehicle access, recondition soils before seeding	5.1.8.a Remediation of Soils Prior to Landscaping
Protect storm drain inlets (CGP 2.2.10.)	Inserts, rock-filled bags, covers	NA
Slow down runoff with erosion controls and velocity dissipation devices (CGP 2.2.11.)	Check dams, riprap	5.1.10.a Rock Rip Rap
Appropriately design any sediment basins or impoundments (CGP 2.2.12.)	Design to 2-year 24-hour storm or 3,600 cubic feet per acre drained, include design specifications	5.1.11.a Retention Basin

Follow requirements for any treatment chemicals (polymers, flocculants, coagulants, etc.) (CGP 2.2.13)	Store in leak proof containers and cover, proper training, minimize use	NA
Stabilize exposed portions of site with 14 days of inactivity (CGP 2.2.14).	Seeding, erosion control blankets, gravel, hydromulch	NA

Minimize Area of Disturbance

5.1.1.a Minimize Area of Disturbance
Phase of Construction/Timing of Installation: Throughout construction
Describe: The majority of the site will need to be disturbed for construction purposes. The SWPPP map(s) in Appendix A will show where the limit of disturbance is, and any areas of the site that will be preserved and protected. Removal of vegetation will only progress in areas that will be disturbed as needed. The other areas outside of these limits will be left undisturbed.
How to Maintain: Put up perimeter controls and/or other barriers to prevent construction exceeding its limits.
Design Specifications and Drawings: Please refer to Appendix H.

5.1.1.b Minimize Exposed Soils Through Phasing
Phase of Construction/Timing of Installation: Throughout construction
Describe: Disturbance of any part of the site will only occur as needed. All other areas of the site will be left undisturbed. Construction will progress in this manner minimizing the exposed soils until disturbance is absolutely needed.
How to Maintain: Leave vegetation in place wherever possible.
Design Specifications and Drawings: Please refer to Appendix H.

Perimeter Controls

5.1.2.a Silt Fence
Phase of Construction/Timing of Installation: Prior to construction.
Describe: Silt fence is installed to inhibit sediment-laden water, thus promoting sedimentation and filtration.
How to Maintain: Silt fence requires maintenance when not properly attached to the stakes, when not properly entrenched, when capacity is over 50%, or when it is ripped.
Design Specifications and Drawings: Please refer to Appendix H.

Minimize Sediment Track-Out

5.1.3.a Stabilized Construction Exit
Phase of Construction/Timing of Installation: Prior to construction and throughout all phases.
Describe: A stabilized construction exit is used to prevent vehicles from tracking out sediment when leaving the site.
How to Maintain: The stabilized construction exit requires maintenance when the rock begins to fill in with mud or sediment.
Design Specifications and Drawings: Please refer to Appendix H.

5.1.3.b Street Sweeping
Phase of Construction/Timing of Installation: Throughout all phases of construction.
Describe: Street sweeping is needed as construction vehicles track dirt onto the road.
How to Maintain: The streets will need to be swept as sediment is observed.
Design Specifications and Drawings: Please refer to Appendix H.

Manage Stockpiles

5.1.4.a Stockpile Containment
Phase of Construction/Timing of Installation: During excavation and grading
Describe: Stockpiles must be placed outside of natural buffers and away from any concentrated storm water flow such as storm water conveyances, storm drain inlets, and areas where storm water flows are concentrated. There must be a perimeter control placed along down-gradient areas from the stockpile. If stockpiles are not expected to be disturbed for more than 14 days, they will be covered or seeded.
How to Maintain: Provide cover or appropriate temporary stabilization for stockpiles that will be unused for 14 or more days and are stored in areas being inspected at a reduced frequency due to temporary stabilization or frozen conditions. Maintain the perimeter controls. Hosing down or sweeping soil or sediment from impervious surfaces into any storm water conveyance, storm drain inlet, or water of the state is prohibited. Contain and securely protect stockpiles from wind. Water the stockpiles to form a crust in order to prevent dust.
Design Specifications and Drawings: Please refer to Appendix H.

Minimize Dust

5.1.5.a Wetting with Water
Phase of Construction/Timing of Installation: As needed, throughout the length of the project.
Describe: Either a water truck or water hose will be brought on site as needed and used to help minimize dust on site.
How to Maintain: If using a water truck, make sure water tank has adequate amounts of water. If using a water hose, make sure that the hose is firmly secured and does not have any leaks or holes.
Design Specifications and Drawings: Please refer to Appendix H.

Minimize Steep Slope Disturbance

Slope protection is required in areas of the site that have steep slopes:
Does this site have steep slopes?
☒ No ☐ >3% ☐ >15%

Preserve Topsoil

5.1.7.a Topsoil Stockpiling
Phase of Construction/Timing of Installation: During excavation and grading
Describe: Topsoil will be stockpiled and saved. Please see above for stockpiling controls. Topsoil will be replaced in areas to be landscaped. If additional topsoil is needed then it will be hauled in.
How to Maintain: Water the stockpiles to form a crust in order to prevent dust. Maintain the perimeter controls.
Design Specifications and Drawings: Please refer to Appendix H.

Minimize Soil Compaction

5.1.8.a Remediation of Soils Prior to Landscaping
Phase of Construction/Timing of Installation: Prior to landscaping
Describe: The soils will have remediation prior to landscaping to allow for infiltration of water following construction. Remediation will include rototilling the soil to break up the soil compaction and allow for better water infiltration. Also, topsoil will be added to the landscape areas to increase the infiltration rate.
How to Maintain: Rototill the soil during the landscaping phase in areas where the soil has been compacted.
Design Specifications and Drawings: Please refer to Appendix H.

Protect Storm Drain Inlets

NA

Slow Down Runoff with Erosion Controls and Velocity Dissipation Devices

5.1.10.a Rock Rip Rap
Phase of Construction/Timing of Installation: Development
Describe: Rip rap is used to help filter out sediment as storm water enters the ground. It's also used to break up energy sot that the ground doesn't erode.
How to Maintain: Rip rap needs to be maintained when it fills up with sediment, trash, or other debris.
Design Specifications and Drawings: Please refer to Appendix H.

Sediment Basins or Impoundments

5.1.11.a Retention Basin
Phase of Construction/Timing of Installation: Installed during grading
Describe: A basin designed to detain stormwater runoff indefinitely to allow particles and associated pollutants to settle at the bottom of the basin.
How to Maintain: Note erosion of basin banks or bottom. Inspect for damage to the embankment. Monitor for sediment accumulation in the facility and forebay. Seed or sod to restore dead or damaged ground. Remove sediment when pond volume has been reduced by 25%.
Design Specifications and Drawings: Please refer to Appendix H.

Treatment Chemicals

NA

Inactivity Stabilization

The extent necessary to prevent erosion in arid and semi-arid areas means for visually flat areas, temporary non-vegetative stabilization is not required (roughly from 0 percent up to 5 percent) unless an erosion concern exists. Areas with slopes roughly 5 percent to 20 percent must have, at minimum, controls to reduce storm water velocities to a point that erosion is controlled. Over a 20 percent slope requires soil surface stabilization. The amount of stabilization provided must increase commensurately with increasingly steeper slopes.

Is temporary non-vegetative stabilization required for this site (to qualify for no stabilization, slopes must be below 5% with no erosion concerns)?
☐ Yes ☒ No

5.2 Linear Site Perimeter Control Exemption

Linear Activities

Is this project a linear project? ☐ Yes ☒ No

5.3 Final Stabilization

Stabilization requirements

The description of procedures for final stabilization is listed below for areas not covered by permanent structures). If final cover is vegetation, a uniform perennial vegetation that provides 70% or more of the vegetative cover that existed prior to earth-disturbing activities will be provided. Initiate the installation of stabilization measures on any areas of exposed soil on site that are permanently suspended from earth-disturbing activities, and will be undisturbed for more than fourteen days, prior to the end of the 14th day of inactivity. Complete the installation of stabilization measures as soon as practicable, but no later than 14 calendar days after the start of initial installation. Exception: Arid, semi-arid, and drought-stricken areas are required to be seeded/planted so that the before mentioned vegetative requirement is expected to be met within 3 years. Establishment of vegetation is not required; however, additional erosion controls may be needed. Both vegetative and non-vegetative stabilization techniques must be described.

Sensitive or High-Quality Waters:
For sites that discharge to high-quality waters or to sediment or nutrient impaired waters: Stabilization must be completed within 7 days after stabilization has been initiated.

Does this site discharge to sediment or nutrient impaired waters? ☐ Yes ☒ No

For sites in arid, semi-arid, or drought-stricken areas:

Beginning date of the seasonally dry period: June
End date of the seasonally dry period: October
Schedule for initiating and completing vegetative stabilization: Stabilization will be completed within the time frame designated by the operator.

Describe the detailed plan for site stabilization:

Type of Stabilization: Vegetation/Landscaping
Implementation Schedule: Following construction activities within the time frame set by the MS4.
Location: Throughout pervious surfaces on site.

Type of Stabilization: Pavement
Implementation Schedule: Following construction activities within the time frame set by the MS4.
Location: Throughout designated areas on site.

Type of Stabilization: Gravel
Implementation Schedule: Following construction activities within the time frame set by the MS4.
Location: Throughout designated areas on site.

For SWPPPs that are being managed on compliance|**GO** the site maps will be updated with implemented stabilization measures and are located in the documents section and the site maps section of compliance|**GO**.

SECTION 6: POLLUTION PREVENTION

6.1 Spill Prevention and Response

Spill Response Prevention and Control Plan

- Describe the spill prevention and control plan to include ways to reduce the chance of spills, stop the source of spills, contain and clean-up spills, dispose of materials contaminated by spills, and train personnel responsible for spill prevention and control. (For more information, see *SWPPP Guide*, Chapter 5, P2 Principle 6.)
- Some projects/site may be required to develop a Spill Prevention Control and Countermeasure (SPCC) plan under a separate regulatory program (40 CFR 112). If you are required to develop an SPCC plan, or you already have one, you should include references to the relevant requirements from your plan.
- Also, see EPA's *Spill Prevention and Control Plan BMP Fact sheet* at https://www.epa.gov/npdes/national-menu-best-management-practices-bmps-stormwater#constr
- Spill controls must contain spills and be mobilized at the moment of need. The plan must include the materials and method of containment and for flowing liquid, cleanup, disposal and follow the minimum spill controls below.

Any discharges in 24 hours equal to or in excess of the reportable quantities listed in 40 CFR 117, 40 CFR 110, and 40 CFR 302, will be reported to the National Response Center and the Division of Water Quality (DWQ) as soon as practical after knowledge of the spill is known to the permittees. The permittee shall submit within seven calendar days of knowledge of the release a written description of: the release (including the type and estimate of the amount of material released), the date that such release occurred, the circumstances leading to the release, and measures taken and/or planned to be taken. The Storm Water Pollution Prevention Plan must be modified within fourteen calendar days of knowledge of the release to provide a description of the release, the circumstances leading to the release, and the date of the release. In addition, the plan must be reviewed to identify measures to prevent the reoccurrence of such releases and to respond to such releases, and the plan must be modified where appropriate.

Other than the below procedures and specifications for management of hazardous spill, absorbent/oil dry, sealable containers, plastic bags, and shovels/brooms are suggested minimum spill response items that should be at this location.

Designated Person on Site for Spill Clean-up and Response:

Craig Kemper
President
Alvarado Roofing, Inc
505-842-7663
craig@alvaradoroofing.com

EMERGENCY NUMBERS

Reportable Quantity	
EPA National Response Center	800-424-8802
Albuquerque City Storm Water Contact/Public Works	505-768-2765
Albuquerque Fire Department	505-833-7300
Albuquerque Police Department	505-242-2677
Emergency	911

A list of hazardous material spill response companies is listed on the following pages.

Hazardous Material	Location of Spill	Reportable Quantity
Oils, fuel, hydraulic, brake fluid	Land/Water	25 gallons/ Visible Sheen
Refrigerant	Air	1 lb.
Antifreeze	Land/Water	13 gallons
Battery Acid	Land/Water	100 lbs.
Engine Degreaser Products	Land/Water	100 lbs.
Gasoline/Diesel Fuels	Land/Water	100 lbs.

SPILL RESPONSE PLAN

Spills require action. Ensure your people are safe, then on-site equipment and property, then the environment.

1st Priority: Protect all People
2nd Priority: Protect Equipment and Property
3rd Priority: Protect the Environment

1. Make sure the spill area is safe to enter and that it does not pose an immediate threat to health or safety of any person.

2. Stop the spill source. Refer to MSDS sheets so that the spilled material can be handled properly.

3. Check for hazards (flammable material, noxious fumes, cause of spill) - If flammable liquid, turn off engines and nearby electrical equipment. If serious hazards are present leave area and call 911. LARGE SPILLS ARE LIKELY TO PRESENT A HAZARD.

4. Call co-workers and supervisor for assistance and to make them aware of the spill and potential dangers.

5. If possible, stop spill from entering storm drain (use absorbent or other material as necessary, close valve to drain, cover or plug drain)

6. Stop spill from spreading (use absorbent or containment materials)

7. If spilled material has entered a storm drain, then check oil/water interceptor or catch basins then notify the local city. Clean out the storm drain if possible. Do not spray spilled materials down the storm drain.

8. Clean up spilled material/absorbent (do not flush area with water) - If outside clean-up service is required, phone numbers of qualified clean-up companies is available on following pages.

9. Properly dispose of cleaned material/absorbent into secure container for disposal as hazardous waste

10. Make sure cleaned area is not slippery (if slippery, put down no-slip material or mark area with a “slippery when wet” sign)

Spill Kit Information:

Is there a spill kit on site? ☒ Yes ☐ No

Describe the spill kit: The spill kit will consist of absorbent pads, granular absorbents, socks, gloves, disposal bags, scoop or shovel, and a broom.

The information below is to assist in obtaining the correct materials and equipment for spill response and spill clean-up.

Absorbents – pads, pillows, booms, socks, dikes, rolls, and loose or particulate sorbents

1. Universal – absorbs – oils, water-based fluids, water, coolants, solvents, and most non-hazardous liquids.
2. Oil Only – Absorbs oils and repels water
3. Hazmat – Absorbs most fluids including corrosive liquids

Containment:

1. Spill Berm – A mobile containment boom – designed to contain a spill or protect an inlet
2. Drain Seals – Designed to seal an inlet to prevent any liquid from entering the inlet to allow for clean-up of the spill
3. Drain absorbents – designed to absorb oils while allowing water to pass through

Tools (Non-sparking, chemical and corrosion resistant):

1. Shovel – A shovel that does not produce sparks
2. Scoops – to clean up absorbents
3. Broom – sweep up absorbents
4. Squeegee
5. Plastic bags
6. Container – to hold the spill cleaned-up debris

Personal Protective Equipment:

1. Heavy Duty Gloves made of nitrile or neoprene
2. Safety Glasses or goggles that are chemical resistant
3. Disposable lab coat or apron
4. Boot covers

Other Supplies (May be needed):

1. Warning Tape or signs
2. Labels – to mark the cleaned-up equipment for disposal
3. Markers
4. MSDS

Hazardous Material Spill Reporting

Fill out the online form found at the following link, or contact the agency at the address or phone number below. A printed form is not available:
https://www.nmstatelands.org/report-environmental-incident/

New Mexico Environment Department
1190 St. Francis Drive, Suite N4050
Santa Fe, New Mexico 87505
24/7 Environmental Emergency Phone Number: 505-827-9329

6.2 Pollution Prevention Controls

CGP Requirements	Example BMPs	BMPs Selected (Name and Reference Number if applicable)
Equipment and vehicle fueling (CGP 2.3.1)	Spill kits, SPCCP, drip pans, locate activities away from conveyances, use secondary containment	6.2.1.a Mobile Fueling
Equipment and vehicle washing (CGP 2.3.2.)	Locating away from surface waters and storm water conveyances, directing wash waters to a sediment basin or sediment trap, using filtration devices	NA
Storage, handling, and disposal of building products and waste (CGP 2.3.3.)	Cover (plastic sheeting / temporary roofs), secondary containment, leakproof containers, proper dumpsters, secured portable toilets, locate away from storm water conveyances	6.2.2.a Leakproof Dumpsters, 6.2.2.b Covered Cans or Bagging of Trash, 6.2.2.c Portable Toilets, 6.2.2.d Construction Materials Storage, 6.2.2.e Landscape Materials Storage
Washing of stucco, paint, concrete, form release oils, curing compounds, etc. (CGP 2.3.4.)	Leak proof containers, lined pits, locate away from storm water conveyances	6.2.3.a Portable Concrete Washout Bin, 6.2.3.b Paint, Stucco, and Other Materials Washout, 6.2.3.c Containment of Material Mixing, 6.2.3.d Containment and Cleanup of Concrete and/or Asphalt Slurry and Dust
Properly apply fertilizer (CGP 2.3.5)	Follow manufacture specifications, document deviations in applications, avoid applications to frozen ground, before heavy rains, or to storm water conveyances	NA

Equipment and Vehicle Fueling

6.2.1.a Mobile Fueling
Phase of Construction/Timing of Installation: Throughout construction as needed
Describe: Vehicles may be fueled on site using a mobile fueler. Wheels will be chocked during fueling activities, a drip pan provided, and fueling activities will be manned at all times. Vehicles will not be topped off.
How to Maintain: Properly dispose of fuel drippings. Clean up spills immediately.

Design Specifications and Drawings: Please refer to Appendix H.

Equipment and Vehicle Washing

NA

Storage, Handling, and Disposal of Building Products and Waste

6.2.2.a Leakproof Dumpsters
Phase of Construction/Timing of Installation: Beginning of construction
Describe: Dumpsters will be put into place for construction waste on site.
How to Maintain: Dumpster must be emptied prior to trash and debris going above the rim of the dumpster.
Design Specifications and Drawings: Please refer to Appendix H.

6.2.2.b Covered Cans or Bagging of Trash
Phase of Construction/Timing of Installation: Beginning of construction
Describe: All blowable trash or pollutant producing waste must be bagged for containment. Liquid or leachable waste must be bagged to prevent leaks from the container.
How to Maintain: Blowable trash must be contained and picked up when found on the ground in the construction site. Liquid or leachable waste must be contained, and if leak-proof dumpster used, repairs made if needed.
Design Specifications and Drawings: Please refer to Appendix H.

6.2.2.c Portable Toilets
Phase of Construction/Timing of Installation: Beginning of construction
Describe: Portable toilets placed on impervious surfaces will be placed in secondary containment.
How to Maintain: Must be placed in secondary containment to prevent spillage that could flow into the storm drains.
Design Specifications and Drawings: Please refer to Appendix H.

6.2.2.d Construction Materials Storage
Phase of Construction/Timing of Installation: Prior to bringing construction materials on site.
Describe: A materials storage area will be designated on site and will be placed away from storm water conveyances. Liquid materials will be sealed properly and placed in secondary containment.
How to Maintain: All materials will be returned to designated area at the end of each day if not being used. Clean up any spills (please refer to Section 6.1) if necessary.

Design Specifications and Drawings: Please refer to Appendix H.

6.2.2.e Landscape Materials Storage
Phase of Construction/Timing of Installation: Prior to bringing landscape materials on site.
Describe: Place landscaping materials away from impervious surfaces. If placing on impervious surfaces is unavoidable then a weighted fiber roll needs to be placed around them.
How to Maintain: Sweep streets if landscape materials get on the road.
Design Specifications and Drawings: Please refer to Appendix H.

Washing of Stucco, Paint, Concrete, Form Release Oils, Curing Compounds, Etc.

6.2.3.a Portable Concrete Washout Bin
Phase of Construction/Timing of Installation: Prior to pouring concrete.
Describe: Prefabricated bin to contain concrete washout waters.
How to Maintain: Must be water tight and emptied when it is 75% full to prevent spillage.
Design Specifications and Drawings: Please refer to Appendix H.

6.2.3.b Paint, Stucco, and Other Materials Washout
Phase of Construction/Timing of Installation: Prior to painting, stucco work, etc.
Describe: Paint and other materials will be washed out in the concrete washout as long as they are not oil-based. If oil-based materials are used on site then they will be washed out in a separate container and the SWPPP updated.
How to Maintain: Must be leak-proof and emptied when it is 75% full to prevent spillage. Liquid wastes must not be dumped into storm sewers or waters of the state and must be disposed using one of three methods: 1) evaporate the waste and dispose of the residual solids with other solid waste, 2) have a liquid waste hauler for wash water haul it off and dispose of it, 3) settle it and pretreat it if necessary with arrangements to discharge the liquid waste to a treatment plant that has the ability to treat it and dispose of it.
Design Specifications and Drawings: Please refer to Appendix H.

6.2.3.c Containment of Material Mixing
Phase of Construction/Timing of Installation: During material mixing operations such as concrete, paint, stucco, grout, etc.
Describe: Material mixing will be done in secondary containment.
How to Maintain: Clean up any spills immediately.
Design Specifications and Drawings: Please refer to Appendix H.

6.2.3.d Containment and Cleanup of Concrete and/or Asphalt Slurry and Dust
Phase of Construction/Timing of Installation: During concrete and/or asphalt cutting operations.
Describe: Dust will be contained with water. Dirt will be piled up on the inside of gutter check bags to catch any slurry. The gutter check bags will then catch the dirt. Slurry will then be disposed of in the concrete washout.
How to Maintain: Contain coolant waste on each project and remove dry cuttings and coolant waste at the end of each day, or prior to wet or windy conditions whichever comes first. The concrete cutting dust will be kept down with water. Contain slurry and dust from cutting with gutter check bags. Sweep up any remaining slurry and dust. All slurry and dust will be disposed of in the concrete washout bin.
Design Specifications and Drawings: Please refer to Appendix H.

Properly Apply Fertilizer

NA

BMP: Employee Training

ET
Construction

DESCRIPTION:
Employee training, like equipment maintenance, is a method by which to implement BMPs. Employee training should be used in conjunction with all other BMPs as part of the facility's SWPPP.

The specific employee training aspects of each of the source controls are highlighted in the individual information sheets. The focus of this information sheet is more general, and includes the overall objectives and approach for assuring employee training in stormwater pollution prevention. Accordingly, the organization of this information sheet differs somewhat from the other information sheets in this chapter.

OBJECTIVES:
Employee training should be based on four objectives:

- Promote a clear identification and understanding of the problem, including activities with the potential to pollute stormwater;
- Identify solutions (BMPs);
- Promote employee ownership of the problems and the solutions; and
- Integrate employee feedback into training and BMP implementation.

APPROACH:

- Integrate training regarding stormwater quality management with existing training programs that may be required for your business by other regulations.
- Businesses that are not regulated in Federal, State, or local regulations, may use the information in this handbook to develop a training program to reduce their potential to pollute stormwater.
- Employee training is a vital component of many of the individual source control BMPs included in this manual.

OUTPAK CORRUGATED WASHOUT

PART 1: GENERAL

1.01 Description

A. Work shall consist of furnishing and installing an OUPAK CORRUGATED CONCRETE WASHOUT in accordance with these specifications and in conformity with the plans.

B. Work includes preparing foundation soil, furnishing and installing leveling pad, washout and removal of washout.

C. The washout may be used for concrete, sediment, paint, drywall, stucco, or mortar.

1.02 Submittals/Certification

A. Contractor shall submit a Manufacturer's certification, prior to start of work, that the washout meets the requirements of this specification.

B. The washout location should be shown on the Project specific Storm Water Pollution Plan (SWPPP) drawings or Erosion and Sediment Control Plan (ESCP) drawings.

1.03 Delivery, Storage and Handling

A. Contractor shall check all materials upon delivery to assure that the size, type, and quantities have been received.

B. Contractor shall protect all materials from damage due to jobsite conditions and in accordance with manufacturer's recommendations. Damaged materials shall not be incorporated into the work.

PART 2: PRODUCTS

2.01 Washout

A. The Washout consists of a corrugated box and a 6-mm poly liner.

B. The Outpak Corrugated Box is constructed of water resistant 350#VC# water-treated Kraft fiberboard.

2.02 Base

A. Material shall consist of native or imported soil. May also be level asphalt or concrete surface.

PART 3: EXECUTION

3.01 Prepare Level Surface

A. Locate level area to deploy. The washout should be located away from storm drains, gutters, or other stormwater conveyances as much as practical.

B. Clear area where washout is to be deployed of debris, rocks, other materials that may puncture the corrugated board and 6-mm plastic liner. If rocks or other debris cannot be removed, cover protrusions with imported sand.

3.02 Set Up Washout

A. Locate a level area to deploy the Washout and clear it of any debris that may cause damage.

B. Unfold the corrugated box.

C. Cover the corrugated box with the enclosed 6-mm polyethylene liner.

D. Secure Liner into pinch points at top washout box perimeter.

E. Insert tie-down stakes if required (note tie-down stakes are not provided with corrugated washout).

F. If a storm is imminent cover the Outpak washout with a tarp to prevent overflow of the washout.

3.03 Dispose Outpak Washout

A. After the Washout has been filled with washout residue material, allow the wastewater to evaporate leaving only solid concrete residue. Wastewater can be pumped form the washout and disposed of a facility permitted to receive liquid waste. Alternatively, use OutPak's Slurry Solution to solidify wastewater.

B. After residue has dried, load the hardened unit onto a flat-bed truck or dump truck with construction equipment such as a forklift or loader. Full, hardened units can be stacked for easy transportation.

3.04 Field Quality Control

A. Check washout unit for leaks. Ensure wash water is not leaking out of washout.

B. Washouts may be used for multiple washout events and concrete placement events. Make sure that the washout has sufficient free space to hold the next planned washout event.

C. Cover the Washout if precipitation is likely. Prevent stormwater from over-filling the washout and causing a discharge of wash water.

C. If the washout is moved, note the new location in the project stormwater pollution prevention documents.

Waste Management

Definition	Provide designated waste collection areas and containers, arranging for regular disposal, and training employees and subcontractors.
Purpose	Prevent or reduce the discharge of pollutants to stormwater from solid, leachable, or construction waste.

Conditions Where the Practice Applies

This BMP is suitable for construction sites where the following wastes are generated or stored:

- Solid waste generated from trees and shrubs removed during land clearing, demolition of existing structures (rubble), and building construction.
- Packaging materials including wood, paper, and plastic.
- Scrap or surplus building materials including scrap metals, rubber, plastic, glass pieces, and masonry products.
- Domestic wastes including food containers such as beverage cans, coffee cups, paper bags, plastic wrappers, and cigarettes.
- Construction wastes including brick, mortar, timber, steel and metal scraps, pipe and electrical cuttings, non-hazardous equipment parts, Styrofoam and other materials used to transport and package construction materials.
- Planting wastes, including vegetative material, plant containers, and packaging materials.

Specifications: Design and Installation

The following steps will help keep a clean site and reduce stormwater pollution:

- Select designated waste collection areas onsite.
- Provide an adequate number of containers to prevent loss of wastes when it is windy.
- Plan for additional containers and more frequent pickup during the demolition phase of construction.
- Arrange for regular waste collection. Do not allow containers to overflow.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- Trash receptacles should be provided in the Contractor's yard, field trailer areas, and at locations where workers congregate for lunch and break periods.
- Dumpsters of sufficient size and number should be provided to contain the solid waste generated by the Project.

- Stormwater run-on should be prevented from contacting stored solid waste through the use of berms, dikes, or other temporary diversion structures or through the use of measures to elevate waste from site surfaces.
- Solid waste storage areas should be, where possible, located at least 50 feet from drainage facilities and watercourses and should not be located in areas prone to flooding or ponding.

Education

- Have the Contractor's superintendent or representative oversee and enforce proper solid waste management procedures and practices.
- Instruct employees and subcontractors on identification of solid waste and hazardous waste. Hazardous waste must not be disposed of in dumpsters.
- Educate employees and subcontractors on solid waste storage and disposal procedures. Include bagging of blowable trash.
- Hold regular meetings to discuss and reinforce disposal procedures.
- Require that employees and subcontractors follow solid waste handling and storage procedures.
- Prohibit littering by employees, subcontractors, and visitors.
- Minimize production of solid waste materials whenever possible.

Collection, Storage, and Disposal

- Littering on the Project site is prohibited.
- To prevent clogging of the stormwater drainage system, litter and debris removal from drain gates, trash racks, and ditch lines should be a priority.
- Trash receptacles from work areas within the construction limits of the Project site should be collected, regardless of whether the litter was generated by the Contractor, the public, or others. Collected litter and debris shall not be placed in or next to storm drain inlets, stormwater drainage systems, watercourses, or near the site perimeter.
- Full dumpsters should be removed from the Project site and the contents should be disposed of properly by trash hauling contractor.
- Construction material visible to the public should be stored or stacked in an orderly manner.
- Dispose of planting waste in dumpsters.
- Segregate potentially hazardous waste from non-hazardous construction site waste.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are NOT disposed of in dumpsters designated for construction debris.
- Make sure that demolition materials containing hazardous wastes are NOT disposed of in dumpsters designated for construction debris.
- For disposal of hazardous waste, have hazardous waste hauled to an appropriate disposal and/or recycling facility.
- Salvage or recycle useful vegetation debris, packaging and surplus building materials when practical. For example, trees and shrubs from land clearing can be used as a brush barrier or converted into wood chips, then used as mulch on graded areas. Wood pallets, cardboard boxes, and construction scraps can also be recycled.
- Collect site trash daily and dispose in the dumpster, throughout the life of the Project, especially during the rainy and windy conditions.
- Make sure that construction waste is collected, removed, and disposed of only at authorized disposal areas.
- Remove solid waste promptly since erosion and sediment control devices tend to collect litter.
- Bag any waste that can leak out of the dumpster.
- Bag all blowable trash so that it is contained within the dumpster.
- Arrange for regular waste collection.

Maintenance & Inspection

- Inspect and verify that activity based BMPs are in place prior to the commencement of associated activities.
- Inspect BMPs daily during extended rain events, after rain events, and weekly throughout the life of the Project.
- Inspect construction waste area regularly.
- Monitor employees, subcontractors, and visitors and ensure no littering.
- Check erosion and sediment controls for the accumulation of trash or debris.
- Inspect dumpsters to be sure that blowable trash is bagged.
- Inspect the dumpsters for leaks or signs of liquid waste in the dumpsters.
- Do not hose out dumpsters on the construction site. Leave dumpster cleaning to the trash hauling Contractor.
- Clean up immediately if a container does spill.

Waste Management

WM–4 Sanitary Waste Management

Definition	Practices and procedures such as providing convenient, well-maintained facilities, and arranging for regular service and disposal prevents the discharge of pollutants to stormwater from sanitary and septic waste.
Purpose	Proper sanitary and septic waste management prevent the discharge of pollutants to stormwater from sanitary and septic waste.
Conditions Where the Practice Applies	Sanitary septic waste management practices are suitable for use at all construction sites that use temporary or portable sanitary and septic waste systems.
Specifications: Design and Installation	Sanitary or septic wastes should be treated or disposed of in accordance with state and local requirements. In many cases, one contract with a local facility supplier will be all that it takes to make sure sanitary wastes are properly disposed.

Storage and Disposal Procedures

- Temporary sanitary facilities should be located away from drainage facilities, watercourses, the Project perimeter, and from traffic circulation. When there is a risk of high winds, temporary sanitary facilities should be secured (staked down or tied to a sturdy structure) to prevent overturning.
- Temporary sanitary facilities should be located on a permeable surface at all times. If a temporary sanitary facility needs to be placed on an impermeable surface than it must be placed in an overflow pan or bin.
- Wastewater should not be discharged or buried within the Project site.
- Only reputable, licensed sanitary and septic waste haulers should be used.
- Sanitary facilities should be located in a convenient location.
- Untreated raw wastewater should never be discharged or buried.
- Temporary septic systems should treat wastes to appropriate levels before discharging.
- Sanitary and septic facilities should be maintained in good working order by a licensed service.
- Regular waste collection by a licensed hauler should be arranged before facilities are full. Sanitary and septic facilities should never overflow.

Education

- Educate employees, subcontractors, and suppliers on sanitary and septic waste storage and disposal procedures.
- Educate employees, subcontractors, and suppliers of potential dangers to humans and the environment from sanitary and septic wastes.
- Instruct employees, subcontractors, and suppliers in identification of sanitary and

Waste Management

WM–4 Sanitary Waste Management

septic waste.

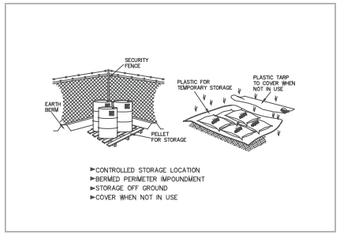
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.

Maintenance & Inspection

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, and weekly throughout the life of the Project.
- Arrange for regular waste collection.
- If high winds are expected, portable sanitary facilities must be secured with spikes to prevent over turning.

BMP: Material Storage

MS
Construction



DESCRIPTION:
Controlled storage of on-site materials.

APPLICATION:
- Storage of hazardous, toxic, and all chemical substances.
- Any construction site with outside storage of materials.

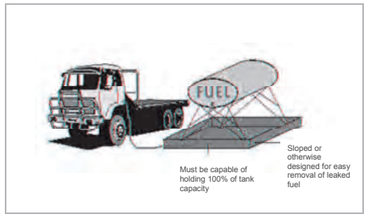
INSTALLATION/APPLICATION CRITERIA:
- Designate a secured area with limited access as the storage location. Ensure no waterways or drainage paths are nearby.
- Construct compacted earthen berm (See Earth Berm Barrier Information Sheet), or similar perimeter containment around storage location for impoundment in the case of spills.
- Ensure all on-site personnel utilize designated storage area. Do not store excessive amounts of material that will not be utilized on site.
- For active use of materials away from the storage area ensure materials are not set directly on the ground and are covered when not in use. Protect storm drainage during use.

LIMITATIONS:
- Does not prevent contamination due to mishandling of products.
- Spill Prevention and Response Plan still required.
- Only effective if materials are actively stored in controlled location.

MAINTENANCE:
- Inspect daily and repair any damage to perimeter impoundment or security fencing.
- Check materials are being correctly stored (i.e. standing upright, in labeled containers, tightly capped) and that no materials are being stored away from the designated location.

BMP: Vehicle And Equipment Fueling

VEF
Construction



DESCRIPTION:
Prevent fuel spills and leaks, and reduce their impacts to storm water by using off-site facilities, fueling in designated areas only, enclosing or covering stored fuel, implementing spill controls, and training employees and subcontractors.

INSTALLATION/APPLICATION:
- Use off-site fueling stations as much as possible. Fueling vehicles and equipment outdoors or in areas where fuel may spill/leak onto paved surfaces or into drainage pathways can pollute storm water. If you fuel a large number of vehicles or pieces of equipment, consider using an off-site fueling station. These areas are better equipped to handle fuel and spills properly. Performing this work off-site can also be economical by eliminating the need for a separate fueling area at your site.
- If fueling must occur on-site, use designated areas, located away from drainage courses, to prevent the runon of storm water and the runoff of spills. Discourage topping-off of fuel tanks.
- Always use secondary containment, such as a drain pan or drop cloth, when fueling to catch spills/leaks. Place a stockpile of spill cleanup materials where it will be readily accessible. Use adsorbent materials on small spills rather than hosing down or burying the spill. Remove the adsorbent materials promptly and dispose of properly.
- Carry out all Federal and State requirements regarding stationary above ground storage tanks. (40 CF Sub. J) Avoid mobile fueling of mobile construction equipment around the site; rather, transport the equipment to designated fueling areas. With the exception of tracked equipment such as bulldozers and perhaps forklifts, most vehicles should be able to travel to a designated area with little lost time. Train employees and subcontractors in proper fueling and cleanup procedures.

LIMITATIONS:
Sending vehicles/equipment off-site should be done in conjunction with Stabilized Construction Entrance.

MAINTENANCE:
- Keep ample supplies of spill cleanup materials on-site.
- Inspect fueling areas and storage tanks on a regular schedule.

Dry Retention/Detention Ponds

Minimum Measure: Post-Construction Stormwater Management in New Development and Redevelopment

Subcategory: Retention/Detention

Description

Photo of a dry detention pond designed to temporarily detain runoff during storm events.

Dry detention ponds (a.k.a. dry ponds, extended detention basins, detention ponds, extended detention ponds) are basins whose outlets have been designed to detain stormwater runoff for some minimum time (e.g., 24 hours) to allow particles and associated pollutants to settle. Unlike wet ponds, these facilities do not have a large permanent pool of water. However, they are often designed with small pools at the inlet and outlet of the basin. They can also be used to provide flood control by including additional flood detention storage.

Applicability

Dry detention ponds have traditionally been one of the most widely used stormwater best management practices. In some instances, these ponds may be the most appropriate best management practice. However, they should not be used as a one size fits all solution. If pollutant removal efficiency is an important consideration then dry detention ponds may not be the most appropriate choice. Dry detention ponds require a large amount of space to build them. In many instances, smaller-sized best management practices are more appropriate alternatives (see Grassed Swales, Infiltration Basin, Infiltration Trench, Porous Pavement, and Bioretention (Rain Gardens), Alternative Pavers, or Green Roofs.

Regional Applicability

Dry detention ponds can be applied in all regions of the United States. Some minor design modifications might be needed, however, in cold or arid climates or in regions with karst (i.e. limestone) topography.

Ultra-Urban Areas

Ultra-urban areas are densely developed urban areas in which little pervious surface is present. It is difficult to use dry detention ponds in the ultra-urban environment because of the land area each pond consumes.

Stormwater Hot Spots

Stormwater hot spots are areas where land use or activities generate highly contaminated runoff, with concentrations of pollutants in excess of those typically found in stormwater. Dry detention ponds can accept runoff from stormwater hot spots, but they need significant separation from ground water if they will be used for this purpose.

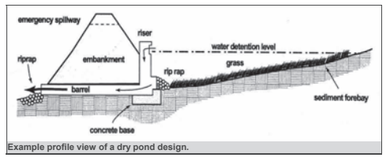
Stormwater Retrofit

A stormwater retrofit is a stormwater management practice (usually structural) put into place after development has occurred to improve water quality, protect downstream channels, reduce flooding, or meet other specific objectives. Dry detention ponds are useful stormwater retrofits, and they have two primary applications as a retrofit design. In many communities in the past, detention basins have been designed for flood control. It is possible to modify these facilities to incorporate features that encourage water quality control and/or channel protection. It is also possible to construct new dry ponds in open areas of a watershed to capture existing drainage.

Cold Water (Trout) Streams

A study in Prince George's County, Maryland, found that stormwater management practices can increase stream temperatures (Galli, 1990). Overall, dry detention ponds increased temperature by about 5°F. In cold water streams, dry ponds should be designed to detain stormwater for a relatively short time (i.e., less than 12 hours) to minimize the amount of warming that occurs in the practice. If the temperature of the water is a factor, then alternative best management practices may be more appropriate.

Siting and Design Considerations



Example profile view of a dry pond design.

Siting Considerations

Designers need to ensure that the dry detention pond is feasible at the site in question. This section provides basic guidelines for siting dry detention ponds.

Drainage Area

In general, dry detention ponds should be used on sites with a minimum area of 10 acres. On smaller sites, it can be challenging to provide channel or water quality control because the orifice diameter at the outlet needed to control relatively small storms becomes very small and thus prone to clogging. Low impact development techniques and on-lot treatment controls are recommended for smaller sites.

Slope

Dry detention ponds can be used on sites with slopes up to about 15 percent. The local slope needs to be relatively flat, however, to maintain reasonably flat side slopes in the practice. There is no minimum slope requirement, but there does need to be enough elevation drop from the pond inlet to the pond outlet to ensure that flow can move through the system.

Soils / Topography

Dry detention ponds can be used with almost all soils and geology, with minor design adjustments for regions of karst topography or in rapidly percolating soils such as sand. In these areas, extended detention ponds should be designed with an impermeable liner to prevent ground water contamination or sinkhole formation.

Ground Water

Except for the case of hot spot runoff, the only consideration regarding ground water is that the base of the extended detention facility should not intersect the ground water table. A permanently wet bottom may become a mosquito breeding ground. Research in Southwest Florida (Santana et al., 1994) demonstrated that intermittently flooded systems, such as dry extended detention ponds, produced more mosquitoes than other pond systems, particularly when the facilities remained wet for more than 3 days following heavy rainfall.

Design Considerations

Specific designs may vary considerably, depending on site constraints or preferences of the designer or community. Some features, however, should be incorporated into most dry extended detention pond designs. These design features can be divided into five basic categories: pretreatment, treatment, conveyance, maintenance reduction, and landscaping.

Pretreatment

Pretreatment incorporates design features that help to settle out coarse sediment particles. By removing these particles from runoff before they reach the large permanent pool, the maintenance burden of the pond is reduced. In ponds, pretreatment is achieved with a sediment forebay, which is a small pool (typically about 10 percent of the volume of water to be treated for pollutant removal).

Treatment

Treatment design features help enhance the ability of a stormwater management practice to remove pollutants. Designing dry ponds with a high length-to-width ratio (i.e., at least 1.5:1) and incorporating other design features to maximize the flow path effectively increases the detention time in the system by eliminating the potential of flow to short-circuit the pond. Designing ponds with relatively flat side slopes can also help to lengthen the effective flow path. Finally, the pond should be sized to detain the volume of runoff to be treated for between 12 and 48 hours.

Conveyance

Conveyance of stormwater runoff into and through the dry pond is a critical component. Stormwater should be conveyed to and from dry ponds safely in a manner that minimizes erosion potential. The outfall of pond systems should always be stabilized to prevent scour. To convey low flows through the system, designers should provide a pilot channel. A pilot channel is a surface channel that should be used to convey low flows through the pond. In addition, an emergency spillway should be provided to safely convey large flood events. To help mitigate the warming of water at the outlet channel, designers should provide shade around the channel at the pond outlet.

Maintenance Reduction

Regular maintenance activities are needed to maintain the function of stormwater practices. In addition, some design features can be incorporated to ease the maintenance burden of each practice. In dry detention ponds, a "micropool" at the outlet can prevent resuspension of sediment and outlet clogging. A good design includes maintenance access to the forebay and micropool.

Another design feature that can reduce maintenance needs is a non-clogging outlet. Typical examples include a reverse-slope pipe or a weir outlet with a trash rack. A reverse slope pipe draws from below the permanent pool extending in a reverse angle up to the riser and determines the water elevation of the micropool. Because these outlets draw water from below the level of the permanent pool, they are less likely to be clogged by floating debris.

Landscaping

Designers should maintain a vegetated buffer around the pond and should select plants within the extended detention zone (i.e., the portion of the pond up to the elevation where stormwater is detained) that can withstand both wet and dry periods. The side slopes of dry ponds should be relatively flat to reduce safety risks.

Design Variations

Tank Storage

Another variation of the dry detention pond design is the use of tank storage. In these designs, stormwater runoff is conveyed to large storage tanks or vaults underground. This practice is most often used in the ultra-urban environment on small sites where no other opportunity is available to provide flood control. Tank storage is provided on small areas because underground storage for a large drainage area would generally be costly. Because the drainage area contributing to tank storage is typically small, the outlet diameter needed to reduce the flow from very small storms would very small. A very small outlet diameter, along with the underground location of the tanks, creates the potential for debris being caught in the outlet and resulting maintenance problems. Since it is necessary to control small runoff events (such as the runoff from a 1-inch storm) to improve water quality, it is generally infeasible to use tank storage for water quality and generally impractical to use it to protect stream channels.

Regional Variations

Arid or Semi-Arid Climates

In arid and semi-arid regions, some modifications might be needed to conserve scarce water resources. Any landscaping plans should prescribe drought-tolerant vegetation wherever possible. In addition, the wet forebay can be replaced with an alternative dry pretreatment, such as a detention cell. In regions with a distinct wet and dry season, as in many arid regions, regional detention ponds can possibly be used as a recreation area such as a ball field during the dry season.

Cold Climates

In cold climates, some additional design features can help to treat the spring snowmelt. One such modification is to increase the volume available for detention to help treat this relatively large runoff event. In some cases, dry facilities may be an option as a snow storage facility to promote some treatment of plowed snow. If a pond is used to treat road runoff or is used for snow storage, landscaping should incorporate salt-tolerant species. Finally, sediment might need to be removed from the forebay more frequently than in warmer climates (see Maintenance Considerations for guidelines) to account for sediment deposited as a result of road sanding.

Limitations

Although dry detention ponds are widely applicable, they have some limitations that might make other stormwater management options preferable:

Dry detention ponds have only moderate pollutant removal when compared to other structural stormwater practices, and they are ineffective at removing soluble pollutants (See Effectiveness)
Dry extended detention ponds may become a nuisance due to mosquito breeding if improperly maintained or if shallow pools of water form for more than 7 days
Although wet ponds can increase property values, dry ponds can actually detract from the value of a home (see Cost Considerations)

Dry detention ponds on their own only provide peak flow reduction and do little to control overall runoff volume, which could result in adverse downstream impacts.

Maintenance Considerations

In addition to incorporating features into the pond design to minimize maintenance, some regular maintenance and inspection practices are needed. Table 1 outlines some of these practices.

Table 1. Typical maintenance activities for dry ponds (Source: Modified from WMI, 1997)

Activity	Schedule
Note erosion of pond banks or bottom	Semiannual inspection
Inspect for damage to the embankment Monitor for sediment accumulation in the facility and forebay Examine to ensure that inlet and outlet devices are free of debris and operational	Annual inspection
Repair undercut or eroded areas Mow side slopes Manage pesticide and nutrients Remove litter and debris	Standard maintenance
Seed or sod to restore dead or damaged ground	Annual

cover	maintenance (as needed)
Remove sediment from the forebay	5- to 7-year maintenance
Monitor sediment accumulations, and remove sediment when the pond volume has been reduced by 25 percent	25- to 50-year maintenance

Effectiveness

Structural management practices can be used to achieve four broad resource protection goals: flood control, channel protection, ground water recharge, and pollutant removal. Dry detention basins can provide flood control and channel protection, as well as some pollutant removal.

Flood Control

One objective of stormwater management practices can be to reduce the flood hazard associated with large storm events by reducing the peak flow associated with these storms. Dry extended detention basins can easily be designed for flood control, and this is actually the primary purpose of most detention ponds.

Channel Protection

One result of urbanization is the geomorphic changes that occur in response to modified hydrology. Traditionally, dry detention basins have provided control of the 2-year storm (i.e., the storm that occurs, on average, once every 2 years) for channel protection. It appears that this control has been relatively ineffective, and research suggests that control of a smaller storm might be more appropriate (MacRae, 1996). Slightly modifying the design of dry detention basins to reduce the flow of smaller storm events might make them effective tools in reducing downstream erosion.

Pollutant Removal

Dry detention basins provide moderate pollutant removal, provided that the design features described in the Siting and Design Considerations section are incorporated. Although they can be effective at removing some pollutants through settling, they are less effective at removing soluble pollutants because of the absence of a permanent pool. A few studies are available on the effectiveness of dry detention ponds. Typical removal rates, as reported by Schueler (1997), are as follows:

Total suspended solids: 61%

Total phosphorus: 19%

Total nitrogen: 31%

Nitrate nitrogen: 9%

Metals: 26%-54%

There is considerable variability in the effectiveness of ponds, and it is believed that properly designing and maintaining ponds may help to improve their performance. The siting and design criteria presented in this sheet reflect the best current information and experience to improve the performance of wet ponds. A joint project of the American Society of Civil Engineers (ASCE) and the USEPA Office of Water might help to isolate specific design features that can improve performance. The National Stormwater Best Management Practice (BMP) database is a compilation of stormwater practices that includes both design information and performance data for various practices. As the database expands, inferences about the extent to which specific design criteria influence pollutant removal may be made. For more information on this database, access the BMP database [EXIT Disclaimer].

Cost Considerations

The construction costs associated with dry detention ponds range considerably. One recent study evaluated the cost of all pond systems (Brown and Schueler, 1997). Adjusting for inflation, the cost of dry extended detention ponds can be estimated with the equation

$C = 12.4V^{0.760}$

where:

C = Construction, design, and permitting cost, and

V = Volume needed to control the 10-year storm (ft^3).

Using this equation, typical construction costs are

$ 41,600 for a 1 acre-foot pond

$ 239,000 for a 10 acre-foot pond

$ 1,380,000 for a 100 acre-foot pond

Interestingly, these costs are generally slightly higher than the cost of wet ponds on a cost per total volume basis. Dry detention ponds are generally less expensive on a given site, because they are usually smaller than a wet pond design.

Ponds do not consume a large area compared to the total area treated (typically 2 to 3 percent of the contributing drainage area). It is important to note, however, that each pond is generally large. Other practices, such as filters or swales, may be "squeezed in" on relatively unusable land, but ponds need a relatively large continuous area.

For ponds, the annual cost of routine maintenance is typically estimated at about 3 to 5 percent of the construction cost. Alternatively, a community can estimate the cost of the maintenance activities outlined in the maintenance section. Finally, ponds are long-lived facilities (typically longer than 20 years). Thus, the initial investment into pond systems can be spread over a relatively long time period.

Another economic concern associated with dry ponds is that they might detract slightly from the value of adjacent properties. One study found that dry ponds can actually detract from the perceived value of homes adjacent to a dry pond by between 3 and 10 percent (Emmerling-Dinovo, 1995).

References

Design References:

Denver Urban Drainage and Flood Control District. 1992. *Urban Storm Drainage Criteria Manual-Volume 3: Best Management Practices*. Denver, CO.

Watershed Management Institute (WMI). 1997. *Operation, Maintenance, and Management of Stormwater Management Systems*. Prepared for U.S. Environmental Protection Agency, Office of Water. Washington, DC.

Other References:

Brown, W., and T. Schueler. 1997. *The Economics of Stormwater BMPs in the Mid-Atlantic Region*. Prepared for Chesapeake Research Consortium. Edgewater, MD. Center for Watershed Protection. Ellicott City, MD.

Emmerling-Dinovo, C. 1995. Stormwater Detention Basins and Residential Locational Decisions. *Water Resources Bulletin* 31(3): 515-521

Galli, J. 1990. *Thermal Impacts Associated with Urbanization and Stormwater Management Best Management Practices*. Metropolitan Washington Council of Governments. Prepared for Maryland Department of the Environment, Baltimore, MD.

MacRae, C. 1996. Experience from Morphological Research on Canadian Streams: Is Control of the Two-Year Frequency Runoff Event the Best Basis for Stream Channel Protection? In *Effects of Watershed Development and Management on Aquatic Ecosystems*. American Society of Civil Engineers. Edited by L. Roesner. Snowbird, UT. pp. 144-162.

Santana, F., J. Wood, R. Parsons, and S. Chamberlain. 1994. *Control of Mosquito Breeding in Permitted Stormwater Systems*. Prepared for Southwest Florida Water Management District, Brooksville, FL.

Schueler, T. 1997. Influence of Ground Water on Performance of Stormwater Ponds in Florida. *Watershed Protection Techniques* 2(4):525-528.

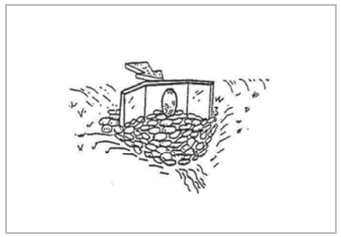
Information Resources

Center for Watershed Protection (CWP), Environmental Quality Resources, and Loiederman Associates. 1997. *Maryland Stormwater Design Manual*. Draft. Prepared for Maryland Department of the Environment, Baltimore, MD.

Center for Watershed Protection (CWP). 1997. *Stormwater BMP Design Supplement for Cold Climates*. Prepared for U.S. Environmental Protection Agency, Office of Wetlands, Oceans and Watersheds. Washington, DC.

U.S. Environmental Protection Agency (USEPA). 1993. *Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters*. EPA-840-B-92-002. U.S. Environmental Protection Agency, Office of Water, Washington, DC.

BMP: Outlet Protection — **OP** Construction



DESCRIPTION:
A rock outlet protection is a physical device composed of rock, grouted riprap, or concrete rubble which is placed at the outlet of a pipe to prevent scour of the soil caused by high pipe flow velocities, and to absorb flow energy to produce non-erosive velocities.

APPLICATIONS:
- Wherever discharge velocities and energies at the outlets of culverts, conduits, or channels are sufficient to erode the next downstream reach.
- Rock outlet protection is best suited for temporary use during construction because it is usually less expensive and easier to install than concrete aprons or energy dissipators.
- A sediment trap below the pipe outlet is recommended if runoff is sediment laden.
- Permanent rock riprap protection should be designed and sized by the engineer as part of the culvert, conduit or channel design.
- Grouted riprap should be avoided in areas of freeze and thaw because the grout will break up.

INSTALLATION/APPLICATION CRITERIA:
Rock outlet protection is effective when the rock is sized and placed properly. When this is accomplished, rock outlets do much to limit erosion at pipe outlets. Rock size should be increased for high velocity flows. Best results are obtained when sound, durable, angular rock is used.

LIMITATIONS:
- Large storms often wash away the rock outlet protection and leave the area susceptible to erosion.
- Sediment captured by the rock outlet protection may be difficult to remove without removing the rock.
- Outlet protection may negatively impact the channel habitat.

MAINTENANCE:
- Inspect after each significant rain for erosion and/or disruption of the rock, and repair immediately.
- Grouted or wire-tied rock riprap can minimize maintenance requirements.

Velocity Dissipation Devices — EC-10

Objectives

EC	Erosion Control
SE	Sediment Control
TR	Tracking Control
WE	Wind Erosion Control
NS	Non-Stormwater Management Control
WM	Waste Management and Materials Pollution Control

Legend:
O Primary Objective
!KI Secondary Objective

Targeted Constituents

Sediment
Nutrients
Trash
Metals
Bacteria
Oil and Grease
Organics

Potential Alternatives

None

Description and Purpose

Outlet protection is a physical device composed of rock, grouted riprap, or concrete rubble, which is placed at the outlet of a pipe or channel to prevent scour of the soil caused by concentrated, high velocity flows.

Suitable Applications

Whenever discharge velocities and energies at the outlets of culverts, conduits, or channels are sufficient to erode the next downstream reach. This includes temporary diversion structures to divel runon during construction.

- These devices may be used at the following locations:

  Outlets of pipes, drains, culverts, slope drains, diversion ditches, swales, conduits, or channels.

  Outlets located at the bottom of mild to steep slopes.

  Discharge outlets that carry continuous flows of water.

  Outlets subject to short, intense flows of water, such as flash floods.

  Points where lined conveyances discharge to unlined conveyances

Limitations

- Large storms or high flows can wash away the rock outlet protection and leave the area susceptible to erosion.

EC-10 Velocity Dissipation Devices

- Sediment captured by the rock outlet protection may be difficult to remove without removing the rock.
- Outlet protection may negatively impact the channel habitat.
- Grouted riprap may break up in areas of freeze and thaw.
- If there is not adequate drainage, and water builds up behind grouted riprap, it may cause the grouted riprap to break up due to the resulting hydrostatic pressure.

Implementation

General

Outlet protection is needed where discharge velocities and energies at the outlets of culverts, conduits or channels are sufficient to erode the immediate downstream reach. This practice protects the outlet from developing small eroded pools (plunge pools), and protects against gully erosion resulting from scouring at a culvert mouth.

Design and Layout

As with most channel design projects, depth of flow, roughness, gradient, side slopes, discharge rate, and velocity should be considered in the outlet design. Compliance to local and state regulations should also be considered while working in environmentally sensitive streambeds. General recommendations for rock size and length of outlet protection mat are shown in the rock outlet protection figure in this BMP and should be considered minimums. The apron length and rock size gradation are determined using a combination of the discharge pipe diameter and estimate discharge rate: Select the longest apron length and largest rock size suggested by the pipe size and discharge rate. Where flows are conveyed in open channels such as ditches and swales, use the estimated discharge rate for selecting the apron length and rock size. Flows should be same as the culvel or channel design flow but never the less than the peak 5 year flow for temporary structures planned for one rainy season, or the 10 year peak flow for temporary structures planned for two or three rainy seasons.

- There are many types of energy dissipaters, with rock being the one that is represented in the attached figure.
- Best results are obtained when sound, durable, and angular rock is used.
- Install riprap, grouted riprap, or concrete apron at selected outlet. Riprap aprons are best suited for temporary use during construction. Grouted or wired tied rock riprap can minimize maintenance requirements.
- Rock outlet protection is usually less expensive and easier to install than concrete aprons or energy dissipaters. It also serves to trap sediment and reduce flow velocities.
- Carefully place riprap to avoid damaging the filter fabric.

  Stone 4 in. to 8 in. may be carefully dumped onto filter fabric from a height not to exceed 12 in.

  Stone 8 in. to 12 in. must be hand placed onto filter fabric, or the filter fabric may be covered with 4 in. of gravel and the 8 in. to 12 in. rock may be dumped from a height not to exceed 16 in.

Velocity Dissipation Devices — EC-10

Stone greater than 12 in. shall only be dumped onto filter fabric protected with a layer of gravel with a thickness equal to one half the D_{50} rock size, and the dump height limited to twice the depth of the gravel protection layer thickness.

- For proper operation of apron: Align apron with receiving stream and keep straight throughout its length. If a curve is needed to fit site conditions, place it in upper section of apron.
- Outlets on slopes steeper than 10 percent should have additional protection.

Costs

Costs are low if material is readily available. If material is imported, costs will be higher. Average installed cost is $150 per device.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Inspect BMPs subjected to non-stormwater discharges daily while non-stormwater discharges occur.
- Inspect apron for displacement of the riprap and damage to the underlying fabric. Repair fabric and replace riprap that has washed away. If riprap continues to wash away, consider using larger material.
- Inspect for scour beneath the riprap and around the outlet. Repair damage to slopes or underlying filter fabric immediately.
- Temporary devices should be completely removed as soon as the surrounding drainage area has been stabilized or at the completion of construction.

References

County of Sacramento Improvement Standards, Sacramento County, May 1989.

Erosion and Sediment Control Handbook, S.J. Goldman, K. Jackson, T.A Bursztynsky, P.E., McGraw Hill Book Company, 1986.

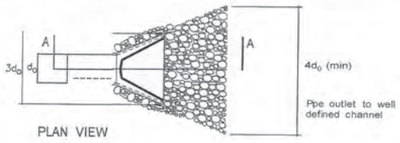
Handbook of Steel Drainage & Highway Construction, American Iron and Steel Institute, 1983.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, state of California Department of Transportation (Caltrans), November 2000.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

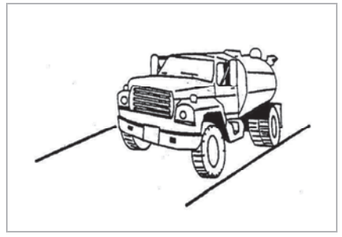


Pipe Diameter inches	Discharge ft.3/s	Apron Length, La ft	Rip Rap D_{50} Diameter Min inches
12	5	10	4
	10	13	6
18	10	10	6
	20	16	8
	30	23	12
	40	26	16
24	30	16	8
	40	26	8
	50	26	12
	60	30	16

For larger or higher flows consult a Registered Civil Engineer
Source: USDA - SCS

BMP: Dust Controls

DC Construction



DESCRIPTION:
Dust control measures are used to stabilize soil from wind erosion, and reduce dust by construction activities.

APPLICATION:
Dust control is useful in any process area, loading and unloading area, material handling areas, and transfer areas where dust is generated. Street sweeping is limited to areas that are paved.

INSTALLATION/APPLICATION CRITERIA:
- Mechanical dust collection systems are designed according to the size of dust particles and the amount of air to be processed. Manufacturers' recommendations should be followed for installation (as well as the design of the equipment).
- Two kinds of street weepers are common: brush and vacuum. Vacuum sweepers are more efficient and work best when the area is dry.
- Mechanical equipment should be operated according to the manufacturers' recommendations and should be inspected regularly.

LIMITATIONS:
- Generally more expensive than manual systems.
- May be impossible to maintain by plant personnel (the more elaborate equipment).
- Labor and equipment intensive and may not be effective for all pollutants (street sweepers).

MAINTENANCE:
If water sprayers are used, dust-contaminated waters should be collected and taken for treatment. Areas will probably need to be resprayed to keep dust from spreading.

Waste Management

WM–5 Stockpile Management

Definition
Stockpile Management procedures and practices are designed to reduce or eliminate air and stormwater pollution from stockpiles of soil, paving materials such as Portland Cement Concrete (PCC) rubble, Asphalt Concrete (AC), asphalt concrete rubble, aggregate base, aggregate sub base or pre-mixed aggregate, asphalt minder (so called "cold mix" asphalt), and pressure treated wood.

Purpose
To prevent air and stormwater pollution from stockpiles of various construction materials.

Conditions Where the Practice Applies
Implement in all Projects that stockpile soil and other materials.

Specifications: Design and Installation
Protection of stockpiles is a year-round requirement. To properly manage stockpiles:
- Locate stockpiles a minimum of 50 feet away from concentrated flows of stormwater, stormdrain inlets, and the site perimeter.
- Protect all stockpiles from stormwater runon using a temporary perimeter sediment barrier such as gravel bags, fiber rolls, or cutback curb.
- Protect all stockpiles from stormwater and wind erosion by completely covering with some type of tarp or covering. Secure the tarp with stakes or gravel bags to ensure the tarp does not blow off or expose any portion of the stockpile. Stockpiles must be covered at all times.
- Implement wind erosion control practices as appropriate on all stockpiled material. For specific information, see WEC – 1 Dust Control.
- Manage stockpiles of contaminated soil in accordance with WM – 8 Contaminated Soil Management.
- Place bagged materials in the material storage area, in secondary containment, and under cover.

Protection of Non-Active Stockpiles

Non-active stockpiles of the identified materials should be protected further as follows:

Soil Stockpiles
- Soil stockpiles should be covered or protected with soil stabilization measures and a temporary perimeter sediment barrier at all times.

Stockpiles of Portland Cement Concrete Rubble, Asphalt Concrete, Asphalt Concrete Rubble, Aggregate Base, or Aggregate Sub Base
- The stockpiles should be covered or protected with soil stabilization measures and a temporary perimeter sediment barrier at all times.

Stockpiles of "Cold Mix"
- Soil stockpiles should be placed on and covered with plastic or comparable

Waste Management

WM–5 Stockpile Management

material at all times.

Stockpiles/Storage of Pressure Treated Wood with Copper, Chromium, and Arsenic or Ammonical, Copper, Zinc, and Arsenate
- Treated wood should be covered with plastic or comparable material at all times.

Protection of Active Stockpiles
- All stockpiles should be covered and protected with a temporary linear sediment barrier prior to the onset of precipitation.
- Stockpiles of "cold mix" should be placed on and covered with plastic or comparable material prior to the onset of precipitation.

Maintenance & Inspection
- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, and weekly throughout the life of the Project.
- Repair and/or replace perimeter controls and covers as needed to keep them functioning properly. Ensure stockpiles are covered at all times and that the covers are properly secured or weighted down.

BMP: Street Sweeping

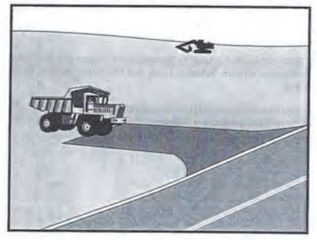
SS Construction

DESCRIPTION:
Reduce the discharges of pollutants to stormwater from street surfaces by conducting street cleaning on a regular basis.

APPROACH:
- Prioritize cleaning to use the most sophisticated sweepers, at the highest frequency, and in areas with the highest pollutant loading.
- Restrict street parking prior to and during sweeping.
- Increase sweeping frequency just before the rainy season.
- Proper maintenance and operation of sweepers greatly increase their efficiency.
- Keep accurate operation logs to track programs.
- Sweepers effective at removing smaller particles (less than 10 microns) may generate dust that would lead to concerns over worker and public safety.
- Equipment selection can be key for this particular BMP. There are two types used, the mechanical broom sweepers (more effective at picking up large debris and cleaning wet streets), and the vacuum sweepers (more effective at removing fine particles and associated heavy metals). Many communities find it useful to have a compliment of both types in their fleet.

LIMITATIONS:
- Conventional sweepers are not able to remove oil and grease.
- Mechanical sweepers are not effective at removing finer sediments.
- Effectiveness may also be limited by street conditions, traffic congestion, presence of construction projects, climatic conditions and condition of curbs.

MAINTENANCE:
- Replace worn parts as necessary.
- Install main and gutter brooms of the appropriate weight.



Objectives

EC	Erosion Control	[X]
SE	Sediment Control	[X]
TC	Tracking Control	O
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
O Primary Objective
[X] Secondary Objective

Description and Purpose
A stabilized construction access is defined by a point of entrance/exit to a construction site that is stabilized to reduce the tracking of mud and dilt onto public roads by construction vehicles.

Suitable Applications
Use at construction sites:
- Where dirt or mud can be tracked onto public roads.
- Adjacent to water bodies.
- Where poor soils are encountered.
- Where dust is a problem during dry weather conditions.

Limitations
- Entrances and exits require periodic top dressing with additional stones.
- This BMP should be used in conjunction with street sweeping on adjacent public right of way.
- Entrances and exits should be constructed on level ground only.
- Stabilized construction entrances are rather expensive to construct and when a wash rack is included, a sediment trap of some kind must also be provided to collect wash water runoff.

Targeted Constituents
Sediment
Nutrients
Trash
Metals
Bacteria
Oil and Grease
Organics

Potential Alternatives
None

Implementation

General

A stabilized construction entrance is a pad of aggregate underlain with filter cloth located at any point where traffic will be entering or leaving a construction site to or from a public right of way, street, alley, sidewalk, or parking area. The purpose of a stabilized construction entrance is to reduce or eliminate the tracking of sediment onto public rights of way or streets. Reducing tracking of sediments and other pollutants onto paved roads helps prevent deposition of sediments into local storm drains and production of airborne dust.

Where traffic will be entering or leaving the construction site, a stabilized construction entrance should be used. NPDES permits require that appropriate measures be implemented to prevent tracking of sediments onto paved roadways, where a significant source of sediments is derived from mud and dirt carried out from unpaved roads and construction sites.

Stabilized construction entrances are moderately effective in removing sediment from equipment leaving a construction site. The entrance should be built on level ground. Advantages of the Stabilized Construction Entrance/Exit is that it does remove some sediment from equipment and serves to channel construction traffic in and out of the site at specified locations. Efficiency is greatly increased when a washing rack is included as part of a stabilized construction entrance/exit.

Design and Layout
- Construct on level ground where possible.
- Select 3 to 6 in. diameter stones.
- Use minimum depth of stones of 8 in. or as recommended by soils engineer.
- Construct length of 50 ft minimum, and 30 ft minimum width.
- Rumble racks constructed of steel panels with ridges and installed in the stabilized entrance/exit will help remove additional sediment and to keep adjacent streets clean.
- Provide ample turning radii as pait of the entrance.
- Limit the points of entrance/exit to the construction site.
- Limit speed of vehicles to control dust.
- Properly grade each construction entrance/exit to prevent runoff from leaving the construction site.
- Route runoff from stabilized entrances/exits through a sediment trapping device before discharge.
- Design stabilized entrance/exit to support heaviest vehicles and equipment that will use it.
- Select construction access stabilization (aggregate, asphaltic concrete, concrete) based on longevity, required performance, and site conditions. Do not use asphalt concrete (AC) grindings for stabilized construction access/roadway.

- If aggregate is selected, place crushed aggregate over geotextile fabric to at least 12 in. depth, or place aggregate to a depth recommended by a geotechnical engineer. A crushed aggregate greater than 3 in. but smaller than 6 in. should be used.
- Designate combination or single purpose entrances and exits to the construction site.
- Require that all employees, subcontractors, and suppliers utilize the stabilized construction access.
- Implement SE-7, Street Sweeping and Vacuuming, as needed.
- All exit locations intended to be used for more than a two-week period should have stabilized construction entrance/exit BMPs.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMPs are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect local roads adjacent to the site daily. Sweep or vacuum to remove visible accumulated sediment.
- Remove aggregate, separate and dispose of sediment if construction entrance/exit is clogged with sediment.
- Keep all temporary roadway ditches clear.
- Check for damage and repair as needed.
- Replace gravel material when surface voids are visible.
- Remove all sediment deposited on paved roadways within 24 hours.
- Remove gravel and filter fabric at completion of construction

Costs

Average annual cost for installation and maintenance may vary from $1,200 to $4,800 each, averaging $2,400 per entrance. Costs will increase with addition of washing rack, and sediment trap. With wash rack, costs range from $1,200 - $6,000 each, averaging $3,600 per entrance.

References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, USEPA Agency, 2002.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group Working Paper, USEPA, April 1992.

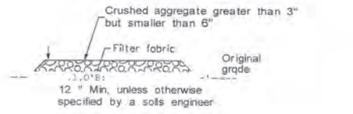
Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

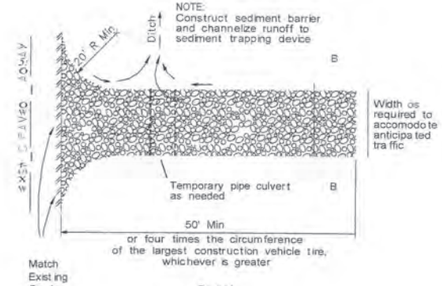
Virginia Erosion and Sedimentation Control Handbook, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 1991.

Guidance Specifying Management Measures for Nonpoint Pollution in Coastal Waters, EPA 840-B-9-002, USEPA, Office of Water, Washington, DC, 1993.

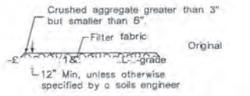
Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.



SECTION B-B
NTS



PLAN
NTS



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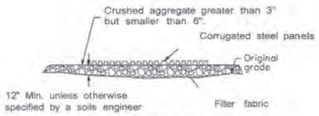
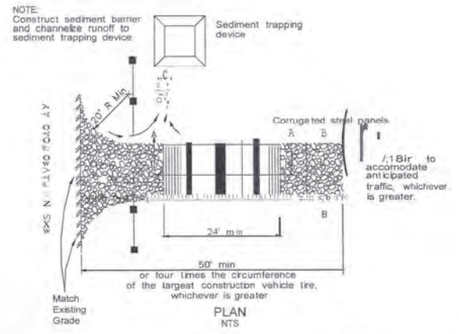
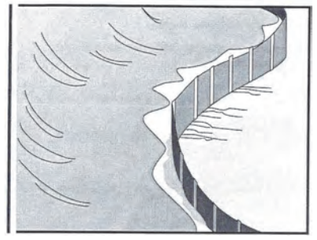


SECTION A-A
NOT TO SCALE



PLAN
NTS

Silt Fence SE-1



Objectives	
EC	Erosion Control
SE	Sediment Control
TR	Tracking Control
WE	Wind Erosion Control
NS	Non-Stormwater Management Control
WM	Waste Management and Material; Pollution Control

Legend:
0 Primary Objective
IKI Secondary Objective

Targeted Constituents

Sediment
Nutrients
Trash
Metals
Bacteria
Oil and Grease
Organics

Potential Alternatives

SE-5 Fiber Rolls
SE-6 Gravel Bag Berm
SE-8 Sandbag Barrier
SE-9 Straw Bale Barrier

Description and Purpose

A silt fence is made of a filter fabric that has been entrenched, attached to supporting poles, and sometimes backed by a plastic or wire mesh for support. The silt fence detains sediment-laden water, promoting sedimentation behind the fence.

Suitable Applications

Silt fences are suitable for perimeter control, placed below areas where sheet flows discharge from the site. They should also be used as interior controls below disturbed areas where runoff may occur in the form of sheet and rill erosion. Silt fences are generally ineffective in locations where the flow is concentrated and are only applicable for sheet or overland flows. Silt fences are most effective when used in combination with erosion controls. Suitable applications include:

- Along the perimeter of a project.
- Below the toe or down slope of exposed and erodible
- Along streams and channels.
- Around temporary spoil areas and stockpiles.
- Below other small cleared areas.

Limitations

- Do not use in streams, channels, drain inlets, or anywhere flow is concentrated.

- Do not use in locations where ponded water may cause flooding.
- Do not place fence on a slope, or across any contour line. Lf not installed at the same elevation throughout, silt fences will create erosion.
- Filter fences will create a temporary sedimentation pond on the upstream side of the fence and may cause temporary flooding. Fences not constructed on a level contour will be overtopped by concentrated flow resulting in failure of the filter fence.
- Improperly installed fences are subject to failure from undercutting, overlapping, or collapsing.

  Not effective unless trenched and keyed in.

  Not intended for use as mid-slope protection on slopes greater than 4:1

  Do not allow water depth to exceed 1.5 ft. at any point.

Implementation

General

A silt fence is a temporary sediment barrier consisting of filter fabric stretched across and attached to supporting posts, entrenched, and, depending upon the strength of fabric used, supported with plastic or wire mesh fence. Silt fences trap sediment by intercepting and detaining small amounts of sediment-laden runoff from disturbed areas in order to promote sedimentation behind the fence.

Silt fences are preferable to straw bale barriers in many cases. Laboratory work at the Virginia Highway and Transportation Research Council has shown that silt fences can trap a much higher percentage of suspended sediments than can straw bales. While the failure rate of silt fences is lower than that of straw bale barriers, there are many instances where silt fences have been improperly installed. The following layout and installation guidance can improve performance and should be followed:

- Use principally in areas where sheet flow occurs.
- Don't use in streams, channels, or anywhere flow is concentrated. Don't use silt fences to divert flow.
- Don't use below slopes subject to creep, slumping, or landslides.
- Select filter fabric that retains 85% of soil by weight, based on sieve analysis, but that is not finer than an equivalent opening size of 70.
- Install along a level contour, so water does not pond more than 1 ft at any point along the silt fence.
- The maximum length of slope draining to any point along the silt fence should be 200 ft or less.
- The maximum slope perpendicular to the fence line should be 1:1.

- Provide sufficient room for runoff to pond behind the fence and to allow sediment removal equipment to pass between the silt fence and toes of slopes or other obstructions. About 1200 ft2 of ponding area should be provided for every acre draining to the fence.
- Turn the ends of the filter fence uphill to prevent stormwater from flowing around the fence.
- Leave an undisturbed or stabilized area immediately down slope from the fence where feasible.
- Silt fences should remain in place until the disturbed area is permanently stabilized.

Design and Layout

Selection of a filter fabric is based on soil conditions at the construction site (which affect the equivalent opening size (EOS) fabric specification) and characteristics of the supp0lt fence (which affect the choice of tensile strength). The designer should specify a filter fabric that retains the soil found on the construction site yet that it has openings large enough to permit drainage and prevent clogging. The following criteria is recommended for selection of the equivalent opening size:

1. If 50 percent or less of the soil, by weight, will pass the U.S. Standard Sieve No. 200, select the EOS to retain 85% of the soil. The EOS should not be finer than EOS 70.
2. For all other soil types, the EOS should be no larger than the openings in the U.S. Standard Sieve No. 70 except where direct discharge to a stream, lake, or wetland will occur, then the EOS should be no larger than Standard Sieve No. 100.

To reduce the chance of clogging, it is preferable to specify a fabric with openings as large as allowed by the criteria. No fabric should be specified with an EOS smaller than U.S. Standard Sieve No. 100. If 85% or more of a soil, by weight, passes through the openings in a No. 200 sieve, filter fabric should not be used. Most of the particles in such a soil would not be retained if the EOS was too large and they would clog the fabric quickly if the EOS were small enough to capture the soil.

The fence should be supported by a plastic or wire mesh if the fabric selected does not have sufficient strength and bursting strength characteristics for the planned application (as recommended by the fabric manufacturer). Filter fabric material should contain ultraviolet inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0 °F to 120 °F.

- Layout in accordance with attached figures.
- For slopes steeper than 2:1 (H:V) and that contain a high number of rocks or large dirt clods that tend to dislodge, it may be necessary to install additional protection immediately adjacent to the bottom of the slope, prior to installing silt fence. Additional protection may be a chain link fence or a cable fence.
- For slopes adjacent to sensitive receiving waters or Environmentally Sensitive Areas (ESAs), silt fence should be used in conjunction with erosion control BMPs.

Materials

- Silt fence fabric should be woven polypropylene with a minimum width of 36 in. and a minimum tensile strength of 100 lb force. The fabric should conform to the requirements in ASTM designation D4632 and should have an integral reinforcement layer, The reinforcement layer should be a polypropylene, or equivalent, net provided by the manufacturer. The permittivity of the fabric should be between 0.1 sec^{-1} and 0.15 sec^{-1} in conformance with the requirements in ASTM designation D449i.
- Wood stakes should be commercial quality lumber of the size and shape shown on the plans. Each stake should be free from decay, splits or cracks longer than the thickness of the stake or other defects that would weaken the stakes and cause the stakes to be structurally unsuitable.
- Staples used to fasten the fence fabric to the stakes should be not less than 1.75 in. long and should be fabricated from 15 gauge or heavier wire. The wire used to fasten the tops of the stakes together when joining two sections of fence should be 9 gauge or heavier wire. Galvanizing of the fastening wire will not be required.
- There are new products that may use prefabricated plastic holders for the silt fence and use bar reinforcement instead of wood stakes. If bar reinforcement is used in lieu of wood stakes, use number four or greater bar. Provide end-protection for any exposed bar reinforcement.

Installation Guidelines

Silt fences are to be constructed on a level contour. Sufficient area should exist behind the fence for ponding to occur without flooding or overtopping the fence.

- A trench should be excavated approximately 6 in. wide and 6 in. deep along the line the proposed silt fence.
- Bottom of the silt fence should be keyed-in a minimum of 12 in.
- Posts should be spaced a maximum of 6 ft. apart and driven securely into the ground a minimum of 18 in. or 12 in. below the bottom of the trench.
- When standard strength filter fabric is used, a plastic or wire mesh support fence should be fastened securely to the upslope side of posts using heavy-duty wire staples at least 1in. long. The mesh should extend into the trench. When extra-strength filter fabric and closer post spacing are used, the mesh support fence may be eliminated. Filter fabric should be purchased in a long roll, then cut to the length of the barrier. When joints are necessary, filter cloth should be spliced together only at a support post, with a minimum 6 in. overlap and both ends securely fastened to the post.
- The trench should be backfilled with compacted native material.
- Construct silt fences with a setback of at least 3 ft. from the toe of a slope. Where a silt fence is determined to be not practicable due to specific site conditions, the silt fence may be constructed at the toe of the slope, but should be constructed as far from the toe of the slope as practicable. Silt fences close to the toe of the slope will be less effective and difficult to maintain.

- Construct the length of each reach so that the change in base elevation along the reach does not exceed *V3* the height of the barrier; in no case should the reach exceed 500 ft.

Costs

- Average annual cost for installation and maintenance (assumes 6 month useful life): $7 per lineal foot ($850 per drainage acre). Range of cost is $3.50 - $9.10 per lineal foot.

Inspection and Maintenance

- Inspect-BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Repair undercut silt fences.
- Repair or replace split, torn, slumping, or weathered fabric. The lifespan of silt fence fabric is generally 5 to 8 months.
- Silt fences that are damaged and become unsuitable for the intended purpose should be removed from the site of work, disposed of, and replaced with new silt fence barriers.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed at an appropriate location.
- Silt fences should be left in place until the upstream area is permanently stabilized. Until then, the silt fence must be inspected and maintained.
- Holes, depressions, or other ground disturbance caused by the removal of the silt fences should be backfilled and repaired.

References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group-Working Paper, USEPA, April 1992.

Sedimentation and Erosion Control Practices, and Inventory of Current Practices (Draft), UESPA, 1990.

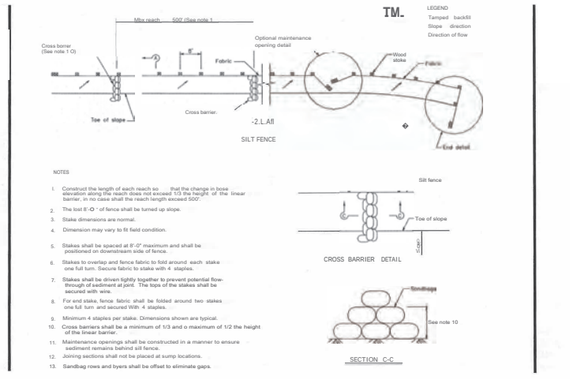
Southeastern Wisconsin Regional Planning Commission (SWRPC). Costs of Urban Nonpoint Source Water Pollution Control Measures. Technical Repo I No. 31. Southeastern Wisconsin Regional Planning Commission, Waukesha, WI. 1991

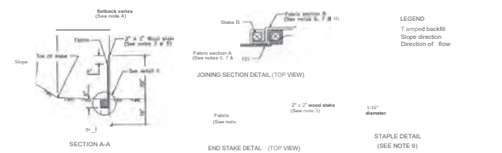
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

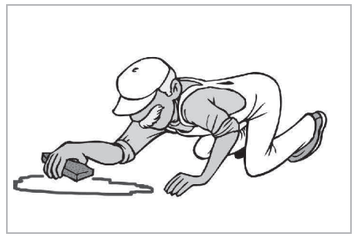
Stormwater Management Manual for The Puget Sound Basin, Washington State Department of Ecology, Public Review Draft, 1991.

U.S. Environmental Protection Agency (USEPA). Stormwater Management for Industrial Activities: Developing Pollution Prevention Plans and Best Management Practices. U.S. Environmental Protection Agency, Office of Water, Washington, DC, 1992.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.







DESCRIPTION:
Practices to clean-up leakage/spillage of on-site materials that may be harmful to receiving waters.

APPLICATION:
All sites

GENERAL:
- Store controlled materials within a storage area.
- Educate personnel on prevention and clean-up techniques.
- Designate an Emergency Coordinator responsible for employing preventative practices and for providing spill response.
- Maintain a supply of clean-up equipment on-site and post a list of local response agencies with phone numbers.

METHODS:
- Clean-up spills/leaks immediately and remediate cause.
- Use as little water as possible. NEVER HOSE DOWN OR BURY SPILL CONTAMINATED MATERIAL.
- Use rags or absorbent material for clean-up. Excavate contaminated soils. Dispose of clean-up material and soil as hazardous waste.
- Document all spills with date, location, substance, volume, actions taken and other pertinent data.
- Contact the Salt Lake County Health Department (313-6700) for any spill of reportable quantity.

Secondary Containment

Minimum Measure: Prevent accidental releases or spills

Subcategory: Fuels and Oils / Hazardous Materials

Secondary Containment

Secondary containment is a safeguard measure used to prevent accidental releases or spills of toxic or hazardous substances to the environment (water, soil & air). Secondary containment can be a structure that is chemically compatible to hold a release and remain liquid tight until clean up occurs. Secondary containment can also be an engineered means to redirect a spill away from water or other sensitive receptor to a temporary diversion system.

I. What is required?

Fuel tanks stored on site must have secondary containment and all other spill sources that may be a threat to human health or the environment must have secondary containment. The phrase "may be a threat" is subjective, and without prescriptive regulatory guidance, PEs and Ecology inspectors use professional judgment to determine the necessary and reasonable secondary containment requirements that fit each individual circumstance.

Permit or specification language does not have exemption language that allows projects to deviate from the requirements when secondary containment is impractical. However, PEs has the authority to modify Standard Specification requirements as reasonably necessary, whether to allow for deviations or to increase protection measures in high risk situations.

II. What needs secondary containment?

Requirements

Secondary containment requirements are not straightforward and regulatory guidance is not black and white. This is a good thing, because secondary containment should be adjusted to match site specific conditions without unnecessarily increasing project costs.

The NPDES Permit **requires** secondary containment for:

1. On-site fueling tanks (except double walled tanks)
   NOTE: Even though "Doubled-walled tanks do not require additional secondary containment," extra preventative measures may still be necessary with high risk construction activities in environmentally sensitive areas.
2. Chemicals, liquid products, petroleum products, and other materials that ***have the potential*** to pose a threat to human health or the environment. (*This is a* ***subjective and left to interpretation*** *based on Other Factors described below).*

The 401 or HPA Permits ***may*** **require more stringent** secondary containment for in water or over water work activities.

Regulatory inspectors in the Northwest Region typically expect the following materials and work activities to always have secondary containment:

- Fuel tanks (single walled)
- Fuel transfer activities, for both mobile and stationary areas
- Volumes of stored or used liquid located adjacent/up gradient to water, where there is a reasonable potential of a worst case scenario spill could reach water. Examples such as:
  - Large volumes stored in drums and tanks
  - Large volumes used in large generators and pumps, hydraulic power packs
  - Moderate volumes located directly near water (within 5-10 ft) or unprotected drainage system that directly discharges to water
- Storage of material that may potentially pose a threat to human health or the environment that is not in constant or regular daily use (i.e., general good housekeeping practices following Ecology's BMPs)

Single Walled Fuel Tanks

Material Storage

Fuel Transfers

Other Factors

Multiple other factors must be considered when deciding what needs secondary containment. To assess spill risks, evaluate the project and the surrounding environment and consider worst case scenarios. Consider how things could fail and how to prevent or protect in event of a failure. Consider the location, type and quantity of stored materials or any risky construction activities (e.g., fueling) and take into account the topography (slope and gradient) and the proximity to water or other environmentally sensitive areas. Could a worst case scenario spill reach water?

Apply practicality and use common sense when enforcing secondary containment requirements. Use "worst case" to assess risk, but apply the knowledge listed below to establish reasonable means to manage the risk. Recognize that there is only so much energy, time, and money to expend to achieve full compliance on a project. Make a good faith effort to control pollution sources and require what is reasonable based on the project specific circumstances and environmental conditions.

Consider the following factors when making a judgment call pertaining to secondary containment:

1. Surrounding environment
2. Timeframe in use
3. Condition of equipment
4. Security and vandalism
5. Weather
6. Available manpower
7. Equipment and materials

Surrounding Environment

1. Is the work located over water, or below the Ordinary High Water Line?
2. Is the work or storage area located near environmentally sensitive areas, such as
   a) stormwater systems and ditches that discharge directly to water or wetlands?
   b) shallow groundwater or protected drinking water aquifers?
3. What is the distance of the nearest waterway or drainage system?
4. Will rain/stormwater come in contact with chemicals, fuels, or other hazardous materials used or stored on the project

Spill + Water = BIG/MULTIPLE FINES

If the project is near water or other sensitive receptor, you may need to apply increased protections. It is not *only* about secondary containment, because other measures like using pristine equipment, increased maintenance and inspection, enhanced security, and increased man power should also be considered in lieu of or together with varied levels of secondary containment needs.

Timeframe in Use

1. Will the spill source be on the project for a long period of time?
2. Would the containment structure become susceptible to wear and tear?

Long Term Project = Increased Risk

Depending on the project location, increased security of the project, storage and staging areas (i.e., fencing & lightening) may be needed. Don't forget the IFC requirements for fittings, devices and padlocks that prevent malicious tampering or siphoning.

Consider increasing the robustness of containment to increase the durability and resistance of wear and tear and exposure to weather elements over time. Or, ensure regular inspection, maintenance and replacement of containment throughout the entire project.

Condition of Equipment

1. Is equipment relatively new and/or in good condition?
2. Based on experience, is there a reasonable potential for equipment failure?
3. Does the equipment have unprotected high pressure hoses and valves?
4. Could high vibrations or friction cause increase wear and tear on containment structure?

Portable Pump

Equipment Must Be Maintained

Secondary containment is not an option for leaking equipment. Equipment should always be inspected and maintained; otherwise it should be removed from the job site. Leaking equipment usually results in violations.

Many spills are a result of sprays from hydraulic hoses due to damage, chaffing, sharp bend points, broken fittings or maintenance /testing. Hoses should be protected from damage. Some hydraulic power packs have built in secondary containment.

Inspections, tests, maintenance and repair are the first lines of defense against spills. If these are not performed appropriately, or the nature of the work is in environmentally sensitive areas, add or increase secondary containment protection measures. Otherwise, if the first lines of defense are faithfully carried out, secondary containment of equipment may not be necessary.

Security and Vandalism

1. Is the project located in an area easily accessible by pedestrians?
2. Is there a high rate of crime in the project area?
3. Does the project and designated areas have adequate fencing and lighting?
4. Does equipment and storage tanks have protection measures, such as
   a) devices, such as Power Cord and Plug Locks, oil pump starters
   b) padlocks on pumps or hoses to secure to hanger
   c) anti-siphoning device
   d) self closing nozzles
   e) automatic shut off valves
   f) locks on drain or other valves

Fencing

Electrical Locks

AST Fill Port Lock

Alarm Systems

Cap Lock

Emergency Shut-Off Valve

Locking Container

Weather

1. Is construction work occurring during the raining season?
2. Could extreme hot or cold temperatures cause plastic or structures to become brittle or fracture

Weathered Plastic

Plastic Cover

Cover with Containment Pallet

How's the Weather?

Increase protection measures to prevent storm water from coming in contact with hazardous substances stored or used on the project. Otherwise, storm water polluted with chemicals must be diverted with drainage controls, contained, and sampled to determine proper disposal (See Ecology BMP C153, page 4-46).

Ecology BMP C153, page 4-46 directs that during the wet weather season (Oct 1 – April 30), each secondary containment facility shall be covered during non-working days, prior to and during rain events.

Areas with increased rainfalls (e.g., Quillayute & Quinault) must consider whether the 110% containment capacity can adequately hold a spill plus precipitation. A cover system may be a more effective means of protection.

Extreme cold or hot temperatures may cause some plastics to crack or melt. If unexpected extreme weather conditions occur, increase the frequency of inspections, maintenance, repair and replacement of plastic secondary containment systems. If extreme conditions are typical for the project area (i.e., summer months in Yakima or winter months in Spokane), then contact product manufactures for recommendations on materials that are capable of withstanding those conditions. Learn the minimum and maximum temperatures the material can tolerate.

Available Manpower

1. Is there a commitment of man power to conduct regular frequent inspections?
2. Is there staff on hand who are trained and experienced in spill response?

Trained staff on hand?

Increase protective measures if there is a lack of staff or expertise to conduct inspections, maintenance, documentation, and spill response actions. Consider stronger durability, increased capacity, fail safe diversions, cover, added spill kits, and increased security.

Equipment and Materials

1. Is there an adequate supply of equipment and materials to quickly control and remove any quantity of spills?
2. Is the equipment and materials located where they are immediately available?

Enough materials on hand?

Equipment available?

Secondary containment methods must be added or enhanced to compensate for the lack of equipment or materials that are used to immediately control, contain, and/or remove spilled product and associated contaminated media.

Secondary containment should be appropriately constructed based on the surrounding environment and specific project circumstances. Sometimes, other preventative measures can be used in lieu of secondary containment, as approved by the PE. Following the same rational described in the IFC Section 3404.2.10, secondary containment can be altered or even waived based on site specific circumstances. For example, secondary containment can be avoided all together if materials are not stored on the project and only brought on site for immediate use on an as needed basis (e.g., mobile fuel trucks instead of temporary above ground tanks). On the other hand, although not required, secondary containment may be reasonable for double-walled fuel tanks, such as a tank located in a high construction traffic zone, with little or no security and placed immediately up gradient and adjacent to a water body.

PEs and inspectors must rely on their professional judgment and use their discretion to determine what is reasonable. HazMat Specialists are available to assess spill risks and provide recommendations. If the PE determines that secondary containment is not practical or necessary, the PE should be prepared to present a rational argument that demonstrates the PE is aware of the circumstance and has considered the predicted flow direction, rate of flow, and total quantity and whether the worst case scenario spill could reasonably be expected to reach a water body; And/or describe alternative measures that provide equivalent environmental protection.

III. How should secondary containment be built and maintained?

It isn't always easy to assess whether secondary containment is adequate. The proper method of secondary containment is a matter of good engineering practice, thus there is no approved specific method. A few pointers are provided to help evaluate a containment system's ability to effectively hold a spill for at least 72 hours. Types of secondary containment are driven by the following primary variables:

1. Chemical Type
2. 72 Hour Spill Holding Timeframe
3. Quantity
4. Surface Topography
5. Vibration Damage
6. Frequency of Inspection and Maintenance

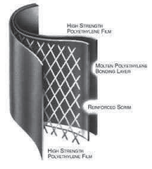
Chemical Type

The type of chemical dictates what material is chemically compatible to hold a spill without disintegrating or breaking through, thus being considered "impervious." Vendors of spill response and containment equipment can help determine products that will properly contain various chemical substances.

Petroleum products (gasoline, diesel, hydraulic oil, etc.) are the primary chemicals stored or used on most projects. Typical products used to contain petroleum spills include temporary structures such as pop-up pools or materials like plastic sheeting used as a liner in containment systems.

Chemically Compatible?

Extra Heavy Duty Liner



Plastic sheeting is made in various thicknesses. A thickness of 20-25 mil is recommended for temporary containment liners that is expected to last one to two years. A 6 mil thickness punctures or tears easily, but it may be effective for short term durations, with little wear and tear and not exposed to extreme hot or cold environments.

Polyvinyl Chloride (PVC) plastic sheeting liners can be made to resist oils, alcohols, hydrocarbons, waste products and other corrosive liquids. PVC liners are lightweight, flexible and best used where soil conditions are stable with minimal amount of sharp rocks. PVC's flexibly allows for stretching to help prevent stress cracking, which may occur with High Density Polyethylene (HPDE). PVC has a wide range of thicknesses available, from 6 to 45 mils or more.

High Density Polyethylene (HDPE) essentially does the same as PVC, but is slightly stiffer which may provide increased durability and resistance properties.

72-Hour Spill Holding Timeframe

Ecology's BMP C153 requires that containment must hold a spill for at least **72 hours** in order to be considered "sufficiently impervious." The 72 hour standard first came from EPA's attempt to define "sufficiently impervious" in 40 CFR Part 112 (Oil Pollution Prevention regulation). The rationale was that a containment system that is impervious to oil for 72 hours would allow time for discovery and removal of an oil discharge in most cases. In the 2002 rule revisions the proposed EPA 72 hour standard was withdrawn; however Ecology continues to maintain the 72 hour standard per BMP C153. Ecology expects spill cleanup work to start immediately once a spill is discovered and in most cases be completely cleaned up within 72 hours.

BMP C153

"Secondary containment facilities shall be impervious to the materials stored therein for a minimum contact time of 72 hours"

For storage of large quantities of chemicals other than petroleum, consider asking the product supplier to specify in writing that the containment system meets Ecology's 72 hour impermeability standard. If there is a justifiable reason that clean up cannot feasibly occur within 72 hours of a spill (highly uncommon), provide additional protection measures (i.e., increased inspections, limit quantities stored, etc.) and then consider more robust products that exceed the 72 hour standard.

Quantity

The NPDES permit and amended Specification 1-07.15(1) requires the capacity to equal 110% of the volume contained in the largest tank (or container) within the containment structure. The extra 10% is intended to accommodate precipitation and a safeguard against miscalculations.

Ecology's Spill Prevention, Preparedness and Response Program began creating a new Excel tool to help calculate containment volumes. For more information or a copy of this calculation tool, contact the Ecology Spills Program at 360-407-6458. For area calculations, see EPA example at: http://www.epa.gov/region6/6sf/sfsites/oil/samppln.htm

EPA Example Calculation

Formula: **(volume of single largest tank + 10%) x 0.1337 cubic feet/gallon**

Question: **What is the area of the minimum containment volume for a 25,000 gallon fuel tank?**

Calculation:
25,000 gal + 10% = 27,500

27,500 x 0.1337 = 3676.75

Surface Topography

Secondary containment should be as level as possible. If using plastic sheeting, the surface should be clear of rocks and debris that could puncture the material. If a containment structure must be placed on a slope, the downhill slide of the structure wall must be taller. Ecology's Excel tool (mentioned above) also helps calculate dimensions of secondary containment walls on slopes.

Sloped Surfaces

Vibration Damage

Increase protection if operating equipment is subject to vibration. Use thicker material, vibration dampening, and require more frequent inspections.

Hydraulic Hoses Subject to Vibration Damage

Maintenance Schedule Log

Frequent Inspections

Frequency of Inspection and Maintenance
The frequency of inspection and maintenance depends on several variables as described above. Inspection and maintenance should be regular, routine and documented as necessary.

IV. What encourages compliance?

Good communication is the best means to encourage compliance. When a regulatory inspector is assigned to a project, increase your chances of a positive outcome by clarifying gray areas in advance with respect to how the inspector might interpret the permit conditions. Ask for clarifications. Inspections are designed to help and the Contractor maintain legal compliance. Do not be afraid to ask for technical assistance, whether it be from Ecology or your HazMat Specialist. Working together is important and discussions to improve the situation are encouraged.

To prevent the most common spill violations, projects should

i) follow their Spill Prevention, Control and Countermeasures (SPCC) Plan,

ii) give more attention to secondary containment needs, and

iii) encourage better housekeeping practices.

Unfortunately sometimes, there is a lack of resources or commitment to comply with the requirements. Some projects lack the manpower, equipment and material to expeditiously follow the SPCC plan or permit requirements. When a contractor fails to comply with a PE's repeated attempts to correct a problem, here are a few suggestions.

i) Remind staff and Contractors about the significant costs and fines associated with spills. In addition to construction delays and clean up costs, there are significant fines. Under water quality regulations, a spill to water is $10,000 to $100,000 per day **per violation.** Damage to habitat may also result in a Natural Resource Damage Assessment fine. For habitat protected under the Endangered Species Act, damage or "taking" of habitat may result in civil penalties up to $25,000 per violation. There can by many violations in a single spill incident.

ii) Call the HazMat Specialist to conduct an internal assessment, where the specialist works directly with the PE and then the PE uses the report to communicate and encourage compliance

iii) Call local fire marshal, who enforces the International Fire Code

iv) Call Ecology's spill prevention program to request an informal assessment

v) Utilize some of the following Standard Specification "hammers" to contractually force compliance:

vi) **1-05.1 Authority of the Engineer** – The Engineer and Project Engineer can suspend all or part of the Contract Work. can also use other resources to complete the Work.

vii) **1-05.2 Authority of Assistants and Inspectors** –Inspectors are not authorized to accept or approve any Work not meeting the intent of the Contract. Inspectors have the authority to reject defective material and suspend Work that is being done improperly, subject to the final decision of the PE.

- Compliance with environmental laws and regulations is part of the Contract.

viii) **1-05.6 Inspection of Work and Materials** – The Engineer can order the Contractor to remove and replace materials used without inspection. The Contractor shall correct any substandard Work or materials. The Engineer will reject unsuitable Work or materials or materials even though previously inspected or paid for.

- This condition allows to reject secondary containment structures, systems or BMPs that are not installed properly.

ix) **1-05.7 Removal of Defective and Unauthorized Work** – will not pay for unauthorized or defective Work. This is anything that doesn't conform to the Contract, Work done beyond the lines and grades set by the Plans or Engineer, or extra Work and materials furnished without the Engineer's approval.

- This applies to improper secondary containment structures, systems or BMPs.

x) **1-05.13 Superintendents, Labor, and Equipment of Contractor** – The Engineer can, with written statement, remove a superintendent from the project for failing repeatedly to follow the Engineers written or oral orders, directions, instructions, or determinations. This also applies to other employees of the Contractor.

- Poor environmental performance caused by the Contractor, whether chronic or acute, does not have to be tolerated.

xi) **1-08.1 Subcontracting** – Approval to subcontract shall not relieve the Contractor's responsibility to carry out the Contract or to relieve the Contractor of any obligation or liability under the Contract. In addition, the Engineer can request the Subcontractor to be removed from the project.

xii) **1-08.6 Suspension of Work** – The Engineer may suspend all or any part of the Work if unsuitable weather prevents satisfactory and timely performance of the Work, if the Contractor does not comply with the Contract, or it is in the public interest.

Suspending work is usually a last resort effort, but it does catch the Contractor's attention because they are responsible for any lost working days.

*Information obtained from Washington State Department of Transportation

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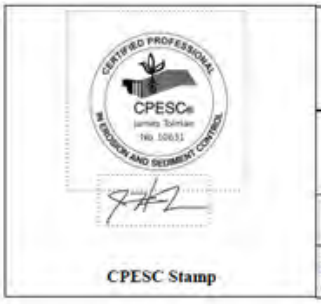


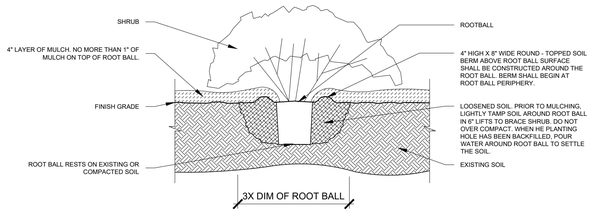
CPESC Stamp

Alvarado Roofing Headquarters	PROJECT TITLE
ALBUQUERQUE, NM, BERNALILLO COUNTY	CITY, COUNTY, STATE
05/20/2024	DATE
B. Henriksen / J. Tolman	DRAWN BY

INSPECTIONS PLUS

PLANT SCHEDULE

SYMBOL	BOTANICAL NAME	COMMON NAME	QTY	SIZE	NOTES
	ARCTOSTAPHYLOS PUNGENS	POINTLEAF MANZANITA	2	5 GAL	EVERGREEN SHRUB, SUN/SHADE
	NASSELLA SYN. STIPA TENUISSIMA	THREADGRASS	2	3 GAL	ORNAMENTAL GRASS, FULL SUN
	EUONYMOUS KLAUTSCHOVIOUS	MANHATTAN EUONYMUS	4	5 GAL	EVERGREEN SHRUB, SUN/SHADE
	LEYMUS CINEREUS	GREAT BASIN WILDRYE	11	3 GAL	ORNAMENTAL GRASS, SUN/SHADE
	AMELANCHIER UTAHENSIS	UTAH SERVICEBERRY	5	3 GAL	DECIDUOUS SHRUB, FULL SUN



NOTES:
1. SHRUBS SHALL BE OF QUALITY PRESCRIBED IN THE ROOT OBSERVATIONS DETAIL AND SPECIFICATIONS.
2. SEE SPECIFICATIONS FOR FURTHER REQUIREMENTS RELATED TO THIS DETAIL.
3. ALL PLANTINGS DRAWN AT MATURE SIZE.
4. DROUGHT-TOLERANT PLANTINGS TO BE IRRIGATED FOR FIRST GROWING SEASON, OR UNTIL ESTABLISHED. FURTHER MAINTENANCE REQUIRED ON AS-NEEDED BASIS.

1 TYP. PLANTING SECTION DETAIL
SCALE: NOT TO SCALE

LANDSCAPE LEGEND:

EXISTING LANDSCAPE AREA TO REMAIN

NEW LANDSCAPE AREA

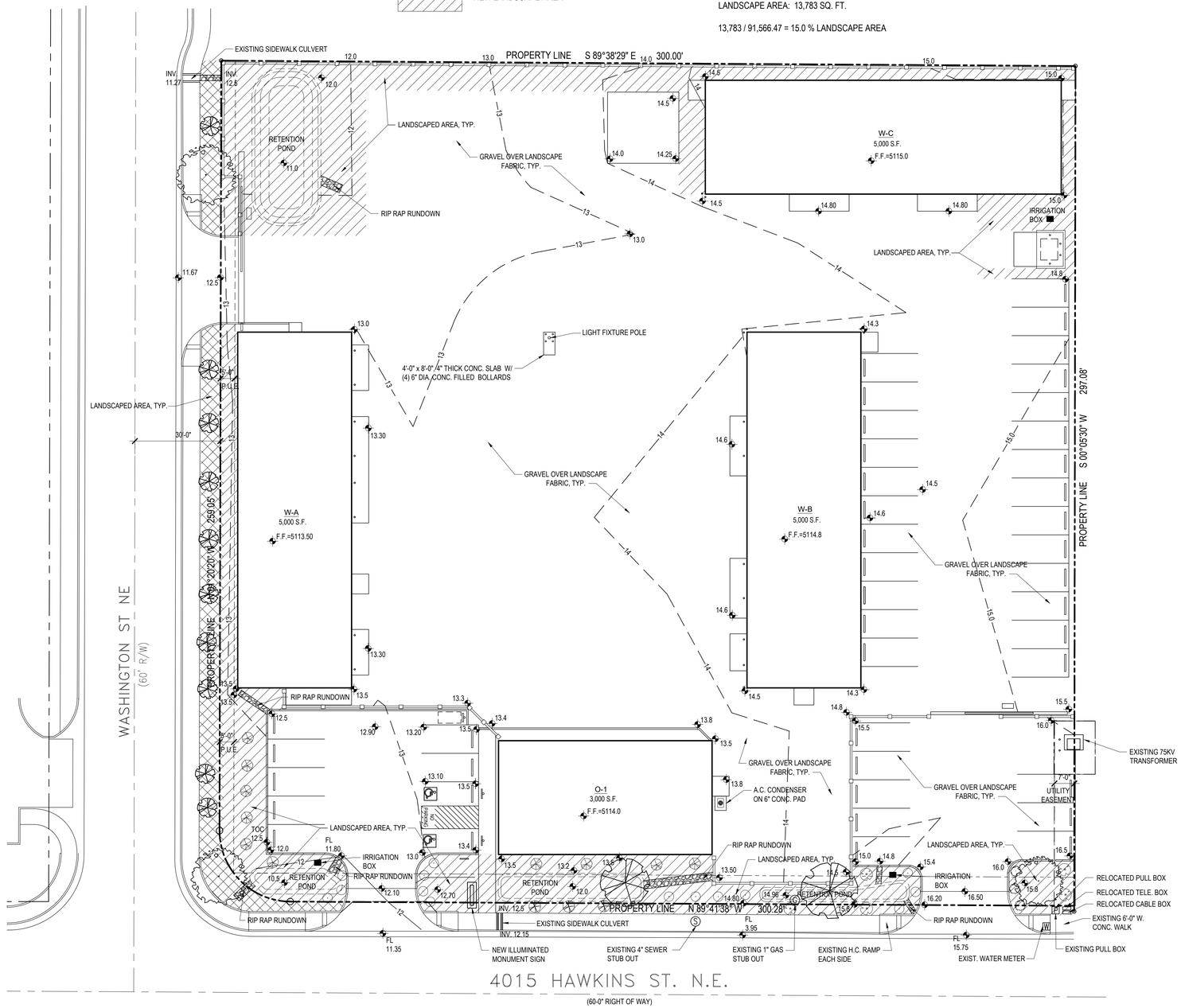
TOTAL PARKING = 37 REGULAR AND 2 HANDICAP SPACES (39 TOTAL)

BUILDING AREA: 18,000 SQ. FT.

SITE AREA: 91 566.47 SQ. FT. (2.102 ACRES)

LANDSCAPE AREA: 13,783 SQ. FT.

13,783 / 91,566.47 = 15.0 % LANDSCAPE AREA



A LANDSCAPE PLAN
SCALE: 1" = 20'-0"

NORTH

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505.830.3125

STATE OF NEW MEXICO
DAVID W. GREEN
No. 1890
REGISTERED ARCHITECT

Stamp: David Green

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ALBUQUERQUE, N.M. 87109

Project:

Revision:	Date:
1	
2	
3	
4	

Date: 05-01-24

Sheet Title:
LANDSCAPE PLAN

Sheet Number:
L-1