BIO-RETENTION AREA 'A' WATER QUALITY

Bio-Retention Volume Provided:

ELEVATION (ft)	AREAS (ft²)	VOL. (ft³)
574	752	0
574.8	1122	750
	TOTAL =	750 ft³

Forbay Volume Provided:

ELEVATION (ft)	AREAS (ft²)	VOL. (ft³)
574	839	0
574.8	3096	1574
	TOTAL =	1574 ft³

Soil Mix Storage Volume:

– SOIL MIX IN BOTTOM OF RAIN GARDEN IS WITHIN THE 474 CONTOUR LIMIT AND HAS A VOID RATIO OF 40% BY VOLUME.

Vmix = (732 (2.0 ft. deep)) (.4) = 602 ft³

Vtot = 750 + 1574 + 602 = 2926 ft³ (Total Water Quality Volume Provided)

Water Quality Volume Required:

WQv = (P) Rv (A) / 12 = Water Quality Volume Required
Rv = (0.05 + 0.009 (I))
P = 1.14 Inches of Rainfall
A = 1.03 Acres
I = Percent Inpervious Cover
WQv = ((1.14) (0.05 + 0.009 (58%)) (1.03) (43,560) / 12 = 2,438 ft³ Required

15 yr. 20 min. High Water Elevation

Q15 = 3.11 cfs
(2) 6" PVC Standpipes. Flow for each = 1.56 cfs
Q = C x L x H ^3/2 (Weir Calculation)
L = Weir Length of 6" PVC = 1.57'
C = Coefficient = 3
H = Depth of Water
H = 1.56 / 3 /1.57' ^2/3 = 0.48' (depth of water over top of pipe)
HW = 574.80' + 0.48' = 575.28' (15 yr. storm stays within basin)

BIO-RETENTION AREA 'B' WATER QUALITY

Bio-Retention Volume Provided:

ELEVATION (ft)	AREAS (ft²)	VOL. (ft³)
573.0	3366	0
573.8	4155	3008
	TOTAL =	3008 ft³

Forbay Volume Provided:

ELEVATION (ft)	AREAS (ft²)	VOL. (ft³)
573.0	1084	0
573.8	1880	1185
	TOTAL =	1185 ft³

Soil Mix Storage Volume:

– SOIL MIX IN BOTTOM OF RAIN GARDEN IS WITHIN THE 474 CONTOUR LIMIT AND HAS A VOID RATIO OF 40% BY VOLUME.

Vmix = (3366 (2.0 ft. deep)) (.4) = 2692 ft³

Vtot = 3008 + 1185 + 2692 = 6885 ft³ (Total Water Quality Volume Provided)

Water Quality Volume Required:

WQv = (P) Rv (A) / 12 = Water Quality Volume Required
Rv = (0.05 + 0.009 (I))
P = 1.14 Inches of Rainfall
A = 2.21 Acres
I = Percent Inpervious Cover
WQv = ((1.14) (0.05 + 0.009 (68%)) (2.21) (43,560) / 12 = 6,054 ft³ Required

15 yr. 20 min. High Water Elevation

Q15 = 7.13 cfs
(3) 10" PVC Standpipes. Flow for each = 7.13 cfs / 3 = 2.38 cfs per pipe
Q = C x L x H ^3/2 (Weir Calculation)
L = Weir Length of 10" PVC = 2.61'
C = Coefficient = 3
H = Depth of Water
H = 2.38 / 3 x/2.61' ^2/3 = 0.45' (depth of water over top of pipe)
HW = 573.80' + 0.45' = 574.25' (15 yr. storm stays within basin)

DRY SWALE 'C' WATER QUALITY

Swale Water Quality Volume:

AREA FROM 5573 TO 576 AT 6" MAX. DEPTH = 9,978 S.F.
VOLUME = 9778 X 0.5'DP = 4,889 C.F.

Soil Mix Storage Volume:

– SOIL MIX IN BOTTOM OF SWALE IS WITHIN THE LIMITS BETWEEN CHECK DAM 573 TO CHECKDAM 575 AND HAS A VOID RATIO OF 40% BY VOLUME.

Vmix = (5032 (2.0 ft. deep)) (.4) = 4025 ft³

Vtot = 4889 + 4025 = 8914 ft³ (Total Water Quality Volume Provided)

Water Quality Volume Required:

WQv = (P) Rv (A) / 12 = Water Quality Volume Required
Rv = (0.05 + 0.009 (I))
P = 1.14 Inches of Rainfall
A = 3.03 Acres
I = Percent Inpervious Cover
WQv = ((1.14) (0.05 + 0.009 (63%)) (3.03) (43,560) / 12 = 7,737 ft³ Required

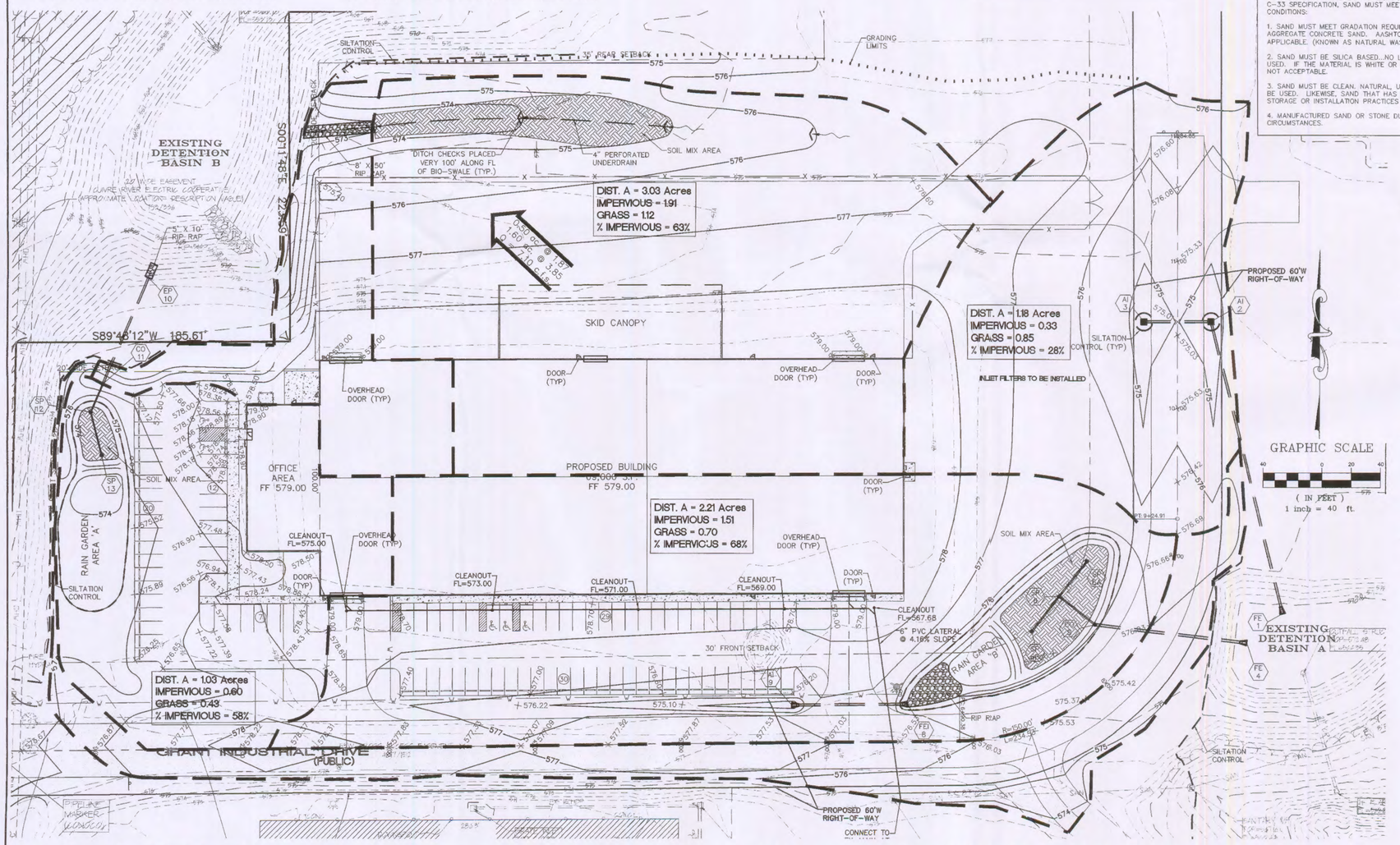
15 yr. 20 min. High Water Elevation

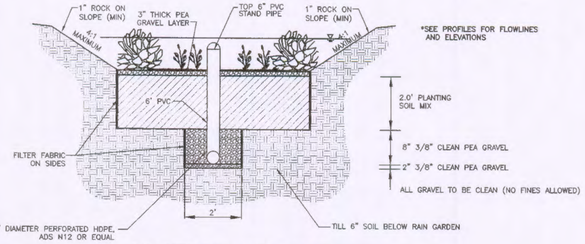
TQ15 = 7.10 cfs AT CHECK DAM 573
V = 0.62 fps
D = 1.41'
High Water = 574.41
Top of Bank = 575.0
Freeboard = 0.59'

SPILL AND SITE POLLUTION:

Should an accidental spill occur refer to material safety data sheets. Any spills of hazardous materials in quantities in excess of reportable quantities as defined by EPA or the state agency regulations, shall be immediately reported to the EPA National Response Center (800–424–8802) and Missouri Department of Natural Resources (573–634–2436). Reportable spills for petroleum products is greater than 50 gallons. All other reportable hazardous materials and their quantities may be found on the web site at http://www.dnr.mo.gov an the local number is 573–840–9750. Federal law requires the responsible party to report any release of oil if it reaches or threatens a sewer, lake, creek, stream, river, groundwater, wetlands, or area like a road ditch, that drains into the above.

An emergency spill kit is required to be onsite for all potential spills.





BIO-RETENTION CROSS-SECTION
NOT TO SCALE

MAINTENANCE SCHEDULE:

1. THE PROPERTY OWNER WILL MAINTAIN THE RAIN GARDENS IN GOOD WORKING ORDER AND WILL BE INSPECTED EVERY 6 MONTHS FOR THE FOLLOWING:
   A. SAID AREA SHALL BE CLEANED SHORTLY AFTER THE PROJECT IS COMPLETED AND EROSION CONTROL HAS BEEN REMOVED AND VEGETATION HAS BEEN ESTABLISHED.
   B. AREA SHALL BE CLEANED OF ANY WEEDS, UNDERBRUSH, WILD GROWTH, DEBRIS OR LITTER.
   C. PLANTINGS WILL BE EVALUATED AND ANY DEAD PLANT SHALL BE REPLACED.
   D. IF ACCUMULATED SEDIMENT HAS CLOGGED THE SURFACE PORES OF THE RAIN GARDEN, THEN DRILLING OR PUNCHING SMALL HOLES INTO THE SURFACE LAYER SHALL BE DONE TO RESTORE INFILTRATION CAPACITY OF THE SOIL.

SAND SPECIFICATIONS:

WASHED ASTM C33 FINE AGGREGATE CONCRETE SAND IS UTILIZED FOR STORMWATER MANAGEMENT APPLICATIONS. IN ADDITION TO THE ASTM C–33 SPECIFICATION, SAND MUST MEET ALL OF THE FOLLOWING CONDITIONS:

1. SAND MUST MEET GRADATION REQUIREMENTS FOR ASTM C–33 FINE AGGREGATE CONCRETE SAND. AASHTO M–6 GRADATION IS ALSO APPLICABLE. (KNOWN AS NATURAL WASHED CONCRETE SAND)

2. SAND MUST BE SILICA BASED...NO LIMESTONE BASED PRODUCTS MAY BE USED. IF THE MATERIAL IS WHITE OR GRAY IN COLOR IT IS PROBABLY NOT ACCEPTABLE.

3. SAND MUST BE CLEAN. NATURAL, UNWASHED SAND DEPOSITS MAY NOT BE USED. LIKEWISE, SAND THAT HAS BEEN CONTAMINATED BY IMPROPER STORAGE OR INSTALLATION PRACTICES WILL BE REJECTED.

4. MANUFACTURED SAND OR STONE DUST IS NOT ACCEPTABLE UNDER ANY CIRCUMSTANCES.

BIO-RETENTION NOTES:

1. PERMEABLE SOIL LAYER SHOULD CONSIST OF 50% TOPSOIL, 25% SAND AND 25% COMPOST OR LEAF MULCH. TOPSOIL MUST HAVE NO MORE THAN 10% CLAY CONTENT.
2. AFTER CONSTRUCTION, WATER PLANTS FOR 14 CONSECUTIVE DAYS UNLESS THERE IS SUFFICIENT RAINFALL.
3. ALL PLANT MATERIAL SHALL BE NATIVE PLANTS AND SELECTED FROM MSD'S "LANDSCAPE GUIDE FOR STORMWATER BEST MANAGEMENT PRACTICE DESIGN".
4. CONTRACTOR MUST VERIFY LOCATION OF ANY POTENTIAL UNDERGROUND UTILITIES IN THE VICINITY OF THE PROPOSED RAIN GARDEN AND ADJUST LAYOUT IF NEEDED TO AVOID ANY CONFLICTS OR DAMAGE TO UTILITY LINES.
5. PLANT SPACING TO BE APPROXIMATELY 24".
6. THE BIO–RETENTION BASIN WILL NOT BE CONSTRUCTED UNTIL THE SITE IS STABILIZED AND NO CONSTRUCTION DEBRIS OR SILT WILL BE TRANSPORTED TO THE BASIN DURING A STORM EVENT.

BIO–RETENTION PLANT LIST:

INTERSPERSE BIO–RETENTION AREA WITH A SELECTION OF GRASSES/SEDGES AND FORBS.

GRASSES/SEDGES:	FORBS:
TOLLWAY SEDGE	SHINING BLUESTAR
SHORTS SEDGE	NEW ENGLAND ASTER
BUR SEDGE	ROSE TURTLEHEAD
FOX SEDGE	MIST FLOWER
	ROSE MALLOW
	SOUTHERN BLUEFLAG IRIS

STORM WATER POLLUTION PREVENTION PLAN

A. PURPOSE:

The Storm Water Pollution Prevention Plan (SWPPP) shall meet the following objections:

- Prevent erosion where construction activities shall occur.
- Prevent pollutants from mixing with storm water.
- Prevent pollutants from being discharged by trapping them on–site, before they can affect the receiving waters.

B. PROJECT DESCRIPTION:

The project is located in the Peruque Creek watershed in St. Charles County, Missouri. The project disturbs approximately 8.3 acres.

The project activities consist of clearing and grading the site for future industrial development. The site will be protected with the various erosion protection measures listed below:

1. Silt Barriers: The perimeter of the project that allows storm water to exit will have silt barriers installed. These barriers shall be composed of mulch from onsite clearing operations. Details of these devices are depicted on the construction plans prepared by Bax Engineering Company, Inc.
2. Re–vegetation: The site will consist of varying ground slopes upon completion of the grading activities and will be seeded and strawed to stabilize the slope and prevent erosion.
3. Storm Water Quality: Construction of Bio–Retention areas and Bio–Swales along with inlet filters will be utilized for storm water protection.

C. MAINTENANCE AND INSPECTION:

Regular Maintenance: Weekly inspections of the project will include: (a) The repair of any sediment (silt) mulch barriers not well shaped or out of place; (b) The removal of any accumulated trash and/or debris: (c) The clearing of debris, weeds and wild growth and the removal of vegetation where necessary to allow the storm water quality items to perform effectively; and (d) The removal of any externally deposited waste materials.

Periodic Inspections: Following each rain of more than 0.50 inch, the site will be inspected within 24 hours, and any necessary maintenance will be provided for a period of one year following the completion of the above remediation measures.

Maintenance and Inspections Summary: Summaries of the maintenance and the inspections will be maintained and shall be available from the Owner. An inspection report should be filed and kept on site for every inspection. The report should detail the findings of the inspection and if any action was required. The inspection form needs to include: name of site, name of inspector, permit number, date of inspection, major observations, actions taken to correct problems and the signature of inspector. The inspection reports need to kept in an accessible onsite location. The reports must be kept on file by the permitee for three years after the project is completed.

The field inspections will be conducted in a systematic manner to minimize the possibility of any significant feature being overlooked. A detailed checklist will be developed and followed for the examination. Particular attention will be given to detecting evidence of erosion, slope instability, undue settlement, displacement, and tilting. Photographs and drawings will be used freely to record conditions in order to minimize descriptions. The field inspection will include appropriate features and items, including potential hazards to human life or property.

The condition of the slopes and vegetative cover will be evaluated and examined for erosion. If required basins will be examined for excessive sedimentation and increase in sediment loods, which will reduce the basins capacity.

Measures will be taken to promote the growth of vegetation and repair of damage caused by erosion and sedimentation. The inspection will also provide recommendotions for measures that need to be undertaken immediately, based on the experience and judgment of the inspector. Necessary follow up inspections will be made as necessary to verify that any maintenance, alteration, or repair measures are accomplished by methods acceptable by standard engineering practice.

Table 60-5 Soil Stabilization Schedule

Soil Disturbance Activity or Condition	Required Stabilization Time
Soil disturbance has ceased in areas greater than 2,000 square feet.	14 days
After construction of dikes, swales, diversions, and other concentrated flow areas	5 days
When slopes are steeper than 3 horizontal to1 vertical	7 days
When slopes are greater than 3% and longer than 150 feet.	14 days
Perimeter controls around soil stockpiles.	End of workday
Stabilization or covering of inactive stockpiles.	30 days
When land disturbance is completed, permanent soil stabilization must be installed.	30 days

THIS SHEET FOR DRAINAGE PURPOSES ONLY. NOT TO BE USED FOR CONSTRUCTION.

PROJECT TITLE: PHOENIX METALS

Bax Project #01-1169D | Issue Date: 09/06/2013

ENGINEERING PLANNING SURVEYING
221 Point West Blvd.
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636-928-5502
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DISCLAIMER OF RESPONSIBILITY
I hereby specify that the documents intended to be authenticated by my seal are limited to this sheet, and I hereby disclaim any responsibility for all other Drawings, Specifications, Estimates, Reports or other documents or instruments relating to or intended to be used for any part or parts of the architectural or engineering project.

STATE OF MISSOURI
CLIFFORD L. HEITMANN
NUMBER E-29817
PROFESSIONAL ENGINEER
Clifford L. Heitmann
Civil Engineer
E29817

REVISIONS

11/20/13	CITY/OWNER REVISIONS
01/29/14	CITY COMMENTS
02/03/14	CITY COMMENTS

Developer / Owner:
MJSM, L.L.C.
2209 DROSTE ROAD
ST. CHARLES, MO 63301
636-949-0680

STORM WATER POLLUTION PREVENTION PLAN

P+Z No.
#1407.05 & 1407.05.01
Approved May 2, 2013

City No.
#

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