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STORM WATER DETENTION CALCULATIONS

Arkansas Storage Centers, IX, LLC

2615 Shady Pine

Bryant, Arkansas

August 1, 2021

(Revised December 20, 2021)

PROJECT DESCRIPTION

This project consists of a open storage area for RVs on an approximately 6.96 acre site. Approximately 4.18 acres will be disturbed. Area 1 containing 2.1 acres and Area 2 containing 1.86 acres will each have a detention pond.

DETENTION PLAN

The construction activity shall consist of grading approximately 3.96 acres of surface area by shaping the area with cuts and fills. Area 1 and area 2 will each contain a detention pond as shown on the Detention Plan.

Open storage units shall be constructed with gravel or crushed stone in-lieu of paving.

During grading hay bales and/or silt screen will be placed around the construction area as required.

DETENTION POND CALCULATIONS

The present runoff coefficient for the existing undisturbed area is about 0.44. The runoff coefficient of the site after construction is completed is expected to be 0.92 for the paved areas and the roof areas and 0.50 for graveled or crushed rock areas..

Total Area = 3.96 acres

Area 1 (2.10 acres)

Pre-development

Flow Dist. L = 300 LF @ 3% slope
Conc. Time (Tc) = 17 min.
Return Period = 10 years Intensity = 5.0 in/hr
Return Period = 25 years Intensity = 5.8 in/hr
Coefficient (undev) = 0.44
Road 0.19 ac
Not detained 0.06 ac

Q (undev) = Aci = (2.10- 0.19- 0.06) x 0.44 x 5.8 = 4.72 cfs
Q (undev) = Aci = (0.19) x 0.92 x 5.8 = 1.01 cfs
Total 5.73 cfs

Discharge Design (max. low flow)

Return Period = 10 years Intensity = 5.0 in/hr

Q (undev) = Aci = (2.10) x 0.44 x 5.0 = 4.62 cfs

Post Development

Conc. Time (Tc) = 5 min.
Return Period = 25 years Intensity = 8.5 in/hr
Coefficient (undev) = 0.44
Road + Roof Tops (0.19 + 0.51) = 0.70 ac
Gravel 1.27 ac
Not detained 0.06 ac

Q (undev) = Aci = 1.27 x 0.5 x 8.5 = 5.40 cfs
Q (undev) = Aci = 0.70 x 0.92 x 8.5 = 5.47 cfs
Total 10.87 cfs

Approximate Area which can not be detained is 0.06 acres.
Q (dev) = Aci = 0.06 x 0.44 x 5.8 = 0.15 cfs

Detention Pond Volume Required (Will use underground detention)

Diff. = 10.87 – 5.73 + 0.15 = 5.29 cfs

V = 5.29 x Tc x 60 = 5.29 x 5 x 60 = 1587 cu.ft. x 1.2 (SF) = 1904 CF

260 ft. of 36"dia. HDPE pipe at 7.07SF per foot = 1838 CF
50 ft. of 18" dia. HDPE pipe at 1.75 SF per foot = 88 CF
Junction and Inlet boxes = 50 CF
` Total Storage Volume 1976 CF > 1904 CF

Low Flow Pipe in Junction Box Weir

10 inch PVC pipe

$Q = CA\,(2gh)^{1/2} = 0.6(0..545)((2)(32.2)(3))^{1/2} = 4.5$ cfs < 4.62 cfs

Overflow Weir in Junction Box

Return Period 100 years Intensity = 10 in/hr
Q (undev) = Aci = 1.27 x 0.5 x 10 = 6.35 cfs
Q (undev) = Aci = 0.70 x 0.92 x 10 = 6.44 cfs
Total 12.79 cfs

12.79 – 4.62 = 8.17

4 LF with 9" deep flow = 8.32 cfs > 8.17 cfs cfs

Area 2 (1.86 acres)

Pre-development

Flow Dist. L = 400 LF @ 4% slope
Conc. Time (Tc) = 17 min.
Return Period = 10 years Intensity = 5.0 in/hr
Return Period = 25 years Intensity = 5.8 in/hr
Coefficient (undev) = 0.44
Not detained = 0.27 ac

Q (undev) = Aci = (1.86 - 0.27) x 0.44 x 5.8 = 4.06 cfs

Discharge Design (max. low flow)

Q (undev) = Aci = (1.86) x 0.44 x 5.0 = 4.09 cfs

Post Development Area 2 (1.86 acres)

Conc. Time (Tc) = 5 min.
Return Period = 25 years Intensity = 8.5 in/hr
Coefficient (undev) = 0.44
Roof Tops = 0.53 ac
Gravel 1.86 – 0.27 – 0.53 = 1.06 ac
Not detained = 0.27 ac

Q (undev) = Aci = 1.06 x 0.5 x 8.5 = 4.50 cfs
Q (undev) = Aci = 0.53 x 0.92 x 8.5 = 4.14 cfs
Total 8.65 cfs

Approximate Area which can not be detained is 0.27 acres.

Q (dev) = Aci = 0.27 x 0.44 x 5.8 = 0.69 cfs

Detention Pond Volumn Required

Diff. = 8.65 – 4.06 + 0.69 = 5.28 cfs

V = 5.28 x Tc x 60 = 5.28 x 5 x 60 = 1584 cu.ft. x 1.2 (SF) = 1900 CF

Use 2000 CF

Detention Pond 2 (2000 CF) Discharge

Allowable low flow discharge 4.09 cfs

10 inch PVC pipe

$Q = CA\,(2gh)^{1/2} = 0.6(0.545)((2)(32.2)(1.5))^{1/2} = 3.21$ cfs < 4.09 cfs

Detention Pond 2 Spillway

Return Period 100 years Intensity = 10 in/hr
Q (undev) = Aci = 1.06 x 0.5 x 10 = 5.30 cfs
Q (undev) = Aci = 0.53 x 0.92 x 10 = 4.88 cfs
Total 10.10 cfs

10.10 – 3.21 = 6.89 cfs
5 LF with 8" deep flow = 8.81 cfs > 6.89 cfs cfs

CONTRACTOR

The contractor has not been determined.

Respectfully submitted,

Charles F. Best, P.E.