SEDIMENT BASIN DESIGN REPORT

Proposed Phase-2 Office/Warehouse/Manufacturing Building

Prepared for

AUROBINDO PHARMA USA, INC.

279 Princeton-Hightstown Road
BLOCK 4, LOT 2, East Windsor Township
Mercer County, New Jersey

Prepared By:

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A. INTRODUCTION

Aurobindo Pharma USA, Inc. is proposing to develop the Phase-2 of the project and will construct a Pharmaceutical facility on the property as follow:

a) ±162,100 S.F. Warehouse/manufacturing Area
b) ±8,000 S.F. Office Area

The property is known as Lot 2, Block 4 in East Windsor Township, Mercer County, New Jersey. The total area of the subject property is ±59.56 acres. The site is located in R-O zoning district of East Windsor Township, a "Research Office" zone. Refer to Appendix A (Zoning Map).

B. EXISTING SITE CONDITIONS

The property is currently utilized as a pharmaceutical plant facility partially developed with a ±567,000 S.F. Office/warehouse/Manufacturing building and associated parking areas known as Phas-1. The remainder of the site is an overgrown wood grass combination with active trails and wooden bridges. The property is currently accessed from all fronting Roads. One driveway is off of Old Trenton Road, another one is off of Princeton-Hightstown Road, and the last one is off of Windsor Center Drive. The subject property borders Lots 28 & 28.01 in Block 87 on the west, Lot 1 in Block 4 and Lot 75 in Block 63 on the east, Lots 3, 3.01, 3.02, 10, 11 & 12 in Block 3, Lot 4 in Block 4 and Lot 27 in Block 5 on the north and Lots 28 in Block 87, Lot 117 in Block 63 and Lot 118 in Block 6 on the south side. The highest point of the site (±111.00') is located at the northern portion of the property along Old Trenton Road. Existing parking lot & open Space areas of Phase-1 runoff water is managed by the existing Basin #2. Existing Building of Phase-1 runoff water is managed by the existing Basin #1. The remainder of the property slopes in a westerly and southwesterly direction toward existing Basin #1 and Basin #2.

C. PROPOSED SITE IMPROVEMENTS

Aurobindo Pharma USA, Inc. is proposing to construct the Phase-2 building and associated parking areas to be utilized as an additional pharmaceutical plant facility on the same lot located in Township of East Windsor, NJ. Existing driveways will still be utilized and a new driveway will be constructed off of Windsor Center Drive to provide additional access to the Phase-2 facility as well. This Phase-2 project will be built in one phase. The total disturbed area is ±13.95 acres which includes ±7.3 acres of impervious surfaces.

The proposed Phase-2 development utilizes the following BMPs to address the above-stated stormwater requirements:

a. Three Detention Basins are previously designed as part of the overall development. Existing Basin #1 & Existing basin #2 will be utilized in developing Phase-2. The breakdown of the overall site development are as follow:
   1. Existing Basin #1 is designed to manage the roof area runoff water of existing Phase-1 &

proposed Phase-2 and also to satisfy the recharge requirements.

2. Existing Detention Basin #2 is designed to manage the parking lot and driveway areas runoff water of existing Phase-1 and proposed Phase-2. This basin is to provide BMP to address the Water Quality issues. The routed flow further treated to provide additional 80% TSS removal.
3. Existing Detention Basin #3 is designed to manage the stormwater runoff from the adjacent Lot 1, Block 4 property.

D. SEDIMENT BASIN DESIGN

±14 total acres drain into a planned sediment basin. The proposed sediment basin will be removed and the area to be graded as shown on the site plan drawings. ±14 acres will be cleared for construction of Phase-2 building, driveways, and parking lots. Failure of the sediment basin will not result in loss of life or damage to buildings, roads, railroads or utilities. It is estimated to take 18 months to develop the site. The sediment basin will be installed as the first item of construction and will be removed once all stormwater piping system are constructed and tied into the Existing Basin #1 & Basin #2. The ±14.0 acres contributing to this sediment basin will be bare for 12 months and covered with pavement or building for the last 6 months of construction. The soils are sandy to silty loam. The sediment pool will be normally wet.

The design of the basin follows Standard for Sediment Basin, "Standards for Soil Erosion and Sediment Control in New Jersey", January 2014 Edition.

This Basin is an excavated sediment basin. Its length is 300' and the width is 100'. Bottom elevation of the basin is 96.0 and the top elevation is 100'. The average depth is 4.0'.

Design Criteria

1. Shape and Depth: The ratio between effective flow length/effective flow width = 300'/100' = 3.00 > 2.0 (OK)

2. Required minimum width, $W = 10 \times (Q_5)^{½} = 10 \times (0.415)^{½} = 6.442'$. The proposed width = 100' > 6.442' (OK)

3. Conduit Outlet Protection has been designed in accordance with the Standard for Conduit Outlet Protection and shown in the Drainage Report.

Sediment Basin Sizing

Determine minimum basin volume to meet the 70% trap efficiency requirement.

Set trap efficiency at 70% as required by the standard in the section on Trap Efficiency.

Enter Curve 24-1 with 70%. Find C/I = 0.035 using Median curve for loamy sediments. From Figure 24-1, average annual surface runoff for the project site is 19 inches; I = (19 in) (1 ft/12 in) (14 ac) = 22.17 Ac-ft.

Therefore, C = (22.17 Ac-ft.) x (0.035) = 0.77 Ac-ft. = minimum volume in the sediment basin below emergency spillway elevation to obtain 70% trap efficiency with a wet pool.

Determine minimum basin volume to meet the requirements for sediment storage and temporary floodwater storage.

1. Determine volume for sediment storage using Method 2 in the standard under Sediment Storage Capacity.

   a. Determine DA (Drainage Area) and A (Annual Erosion)

1st year

Construction Area
(DA) (A) = 14 acres x 50 tons = 700 tons/yr

Total, Construction Areas, (DA) (A) = 700 tons for the 1st yr.

2nd year

Developed Areas
(DA) (A) = 14 ac x 1.0 tons/ac/yr = 14 tons/yr

Total, Developed Areas, (DA) (A) = 14 (1/2) = 7 tons for 6 months period of the 2nd yr.

(DA) (A) = 700+14 = 714 tons for the life of the basin.

b. Determine DR, delivery ratio
14/640 = 0.0219 sq. mi. from Curve 24-2 for a sandy-silty loam, DR = 58%

c. Determine density of the sediment. From Table 24-1 the density of submerged sand-silt mixture (equal parts) is 75-95 lbs/ cf. Use = 80 lbs/cf.

d. Determine minimum volume for sediment storage for the planned life of the structure.

$V = \underline{[(DA)\ (A)]}\ (DR)\ (TE)\ (1/\gamma_S)\ (2{,}000\ lbs/ton)\ (1/43{,}560\ sq.\ ft./ac.)$
$V = \underline{[714]}\ (0.58)\ (0.70)\ (1/80)\ (2{,}000)\ (1/43{,}560)$
V = minimum volume for sediment storage for the planned life of the structure = 0.166 Ac. ft.

Determine minimum volume for temporary floodwater storage.

a. The standard requires at least 1 foot between the crest of the principal spillway and the crest of the emergency spillway. The standard also requires that the runoff from the 2 year frequency 24 hour duration storm not cause flow in the emergency spillway.

b. The 2-year 24-hour rainfall is 3.3 inches and the hydrologic soil group is B.

c. From "Urban Hydrology for Small Watersheds", the average runoff curve number during construction is 85 (14 acres of open space with poor cover @ CN= 85).

d. The size of principal spillway pipe selected will have an effect on the volume of temporary floodwater storage required. For this site, a 24" CMP riser with a 12" CMP outlet was selected.

e. Using the above principal spillway and Stage-Storage-Discharge routing methods (see Hydraflow-Hydrograph output attached), the 2-year high water elevation is 98.95'. The basin storage volume below this elevation is 14,689 cf. ft. (or 0.337 ac.-ft).

f. **The minimum basin volume to meet the requirement for sediment storage capacity and temporary floodwater storage is 0.166 ac-ft. + 0.337 ac-ft. = <u>0.503 ac-ft.</u>**

The standard under <u>Sediment Basin Volume</u> requires the proposed volume to be the larger of the two values calculated above. The volume for 70% trap efficiency is 0.77 ac-ft. The volume for sediment and temporary floodwater storage is 0.503 ac-ft. Therefore, the minimum required sediment storage volume below the crest of the emergency spillway should be at least 0.77 ac-ft. The proposed principal spillway elevation was set at 98.50' which provides a storage volume of 78,465 c.f. (1.801 ac-ft) > 0.77 ac-ft. (OK)

<u>Sediment Basin Outlets</u>

1. Dewatering Hole: The elevation of the hole is set for 50% actual trap efficiency in the basin. From Curve 24-1 and 50% trap efficiency and median curve, C/I = 0.015. The

average annual surface runoff from Figure 24-1 converted into units of acre feet is 110.83 ac-ft. C/I=C/110.83=0.015. Therefore, C=110.83 x 0.015 = 1.552 ac-ft, or 67,588 c.f. Based on pond data (see attached Hydraflow-Hydrograph output), the elevation corresponding to this volume is 98.25'. The invert of the dewatering hole (4"Ø) is set at 97.50'.

2. Principal Spillway Crest Elevation – Top of Temporary Sediment Riser: The principal spillway crest elevation is the lower of:

   a. one (1) foot below the emergency spillway crest elevation, which is (99.75' – 1.00' = 98.75'), or
   b. The elevation that provides the required temporary floodwater storage for a 2-year frequency, 24-hour duration, Type III storm (based on Hydraflow-Hydrograph output attached, the volume for a 2-year storm = 14,689 c.f. and the corresponding elevation for such storage is 98.95'.

   Therefore, the principal spillway crest elevation = 98.75'.

3. Emergency Spillway: The emergency spillway for this excavated sediment basin is set at the elevation of 99.75'. Its width is 150'. The downstream slope is flatter than 5 to 1 and is vegetated. No addition soil erosion control is warranted downstream of this emergency spillway. Because the drainage area is ±14.00 acres, this emergency spillway must be able to pass the peak flow of a 100-year storm event without the help of principal spillway and the sediment cleanout orifice. Q_{100} = 60.65 cfs. The emergency spillway capacity = $CLH^{1.5}$ = (3.33) x (150.00) x $(H)^{1.5}$ = 60.65 cfs. Solve for H= 0.24'.
   The 100-year emergency spillway flood elevation = 100.00'.

Riser Counter-buoyancy Design

Buoyance on the 24" CMP riser when water surface elevation is below the dewatering hole (elevation 98.50') = (π/4) $(2')^2$ (98.50'-94.50') (62.4 lbs/cf.) = 784 lbs.

Deadweight for counter-buoyancy = 4'x4'x8" concrete mat which submerged weight is computed as: (4'x4'x.67') (150 lbs/cf. - 62.4 lbs/cf.) = 939 lbs > 784 lbs (OK).