



December 04, 2024

El Paso County
Planning & Community Development
2880 International Circle, Suite 110
Colorado Springs, CO 80910

Attn.: Project Manager

RE: Paint Brush Hills Filing No. 14

Dear Project Manager:

On behalf of The Landhuis Company, M&S Civil Consultants hereby requests that the street, storm sewer and BMP improvements installed as a part of Paint Brush Hills Filing No. 14 be accepted for County Maintenance. The as-built construction plans which include; street, storm sewer, and water quality and detention basin improvements are attached. It should be noted that the sidewalks for the subdivision are being constructed as the homes/lots are built/developed.

Street Improvements

The street improvements for Paint Brush Hills Filing No. 14 consist of asphalt paving, curb and gutter, cross pans, pedestrian ramps and street signage for the following streets:

- Keynes Drive – Sta: 1+00.00 – Sta: 25+61.12
- Devoncove Drive – Sta: 1+00.00 – Sta: 19+00.00
- Grace Manor Drive – Sta: 1+00.00 - Sta: 5+66.88
- Waterloo Drive – Sta: 1+00.00 - Sta: 11+50.92
- Finsbury Court – Sta: 1+00.00 - Sta: 6+32.40
- Kingsbury Drive – Sta: 1+00.00 – Sta: 18+21.19
- Country Manor Drive – Sta: 1+00.00 – Sta: 17+89.61
- Harwood Drive – Sta: 1+00.00 – Sta 15+89.51
- Minor offsite improvements along Keating and Londonderry Drive

Based upon this information gathered during periodic site visits to the project, M&S Civil Consultants, Inc. is of the opinion that the street improvements have been constructed in general compliance with the approved design plans, and specifications as filed with El Paso County.

On behalf of The Landhuis company, M&S Civil Consultants hereby requests that probationary inspection of these facilities by the County so that the warranty period may begin.

Storm Sewer Improvements

Per the approved construction drawings for "Paint Brush Hills Filing 14" drainage improvements were made to construct storm sewer infrastructure and a water quality and detention facility in compliance with the current El Paso County Drainage Criteria and with the approved Final Drainage Report for this project.



The drainage related improvements for Paint Brush Hills Filing No. 14 consist of:

- Type I and Type II manholes,
- 5', 10', 15' and 20' Type R inlet boxes
- 18", 24", 30", 36", 42", 48", 54", 60" and 66" Reinforced Concrete Pipe
- 18", 36" & 66" Reinforced Concrete Pipe Flared End Sections
- Water Quality and Detention Facility
 - Concrete Trickle Channel
 - Concrete Forebay w/ Riprap Apron
 - 24'x 10' Outlet Box w/ Micropool
 - Buried 'M' Soil Riprap Spillway
 - Maintenance Access Road

Based upon this information gathered during periodic site visits to the project, M&S Civil Consultants, Inc. is of the opinion that the street improvements have been constructed in general compliance with the approved design plans, and specifications as filed with El Paso County.

Statement of Engineer In Responsible Charge

To the best of my knowledge, information and belief, for the referenced project above, the improvements have been constructed in general compliance with the approved design plans and specifications as filed with El Paso County to provide the required storage volume and meet the required release rates documented by the SDI design form, the stage areas, elevations and outlet dimensions. In addition, to the best of my knowledge, information and belief, for the referenced project above, the site and adjacent properties (as affected by work performed under the County permit) are stable with respect to settlement and subsidence, sloughing of cut and fill slopes, revegetation or other ground cover, and that the improvements (public improvements, common development improvements, site grading and paving) meet or exceed the minimum design requirements.

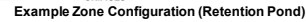
Respectfully submitted,



Virgil A. Sanchez
Colorado P.E. No.37160
For and on behalf of M&S Civil Consultants, Inc.

MHFD-Detention, Version 4.03 (May 2020)

Basin ID: FSD Pond C



Location for 1-hr Rainfall Depths = User Input

Approximate 100-yr Detention Volume = 9.664 acre-feet

....., 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 2680, 2681, 2682, 2683, 2684, 2685, 2686, 26

Calculated Total Basin Volume (V_{total}) = acre-feet

DIFFERS FROM AS DESIGNED

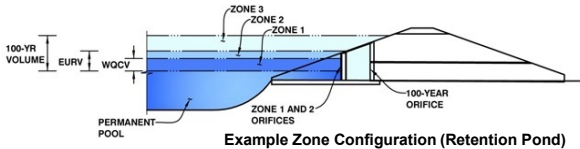
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DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project: Paint Brush Hills Filing No.14

Basin ID: FSD Pond C



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	4.00	1.834	Orifice Plate
Zone 2 (EURV)	5.78	2.831	Orifice Plate
Zone 3 (100-year)	8.37	5.000	Weir&Pipe (Restrict)
Total (all zones)		9.664	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth = N/A ft (distance below the filtration media surface)
 Underdrain Orifice Diameter = N/A inches

Calculated Parameters for Underdrain
 Underdrain Orifice Area = N/A ft²
 Underdrain Orifice Centroid = N/A feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice = 0.00 ft (relative to basin bottom at Stage = 0 ft)
 Depth at top of Zone using Orifice Plate = 5.56 ft (relative to basin bottom at Stage = 0 ft)
 Orifice Plate: Orifice Vertical Spacing = N/A inches
 Orifice Plate: Orifice Area per Row = N/A inches

Calculated Parameters for Plate
 WQ Orifice Area per Row = N/A ft²
 Elliptical Half-Width = N/A feet
 Elliptical Slot Centroid = N/A feet
 Elliptical Slot Area = N/A ft²

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	2.13	3.85					
Orifice Area (sq. inches)	6.62	6.62	6.62					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

Invert of Vertical Orifice = Not Selected ft (relative to basin bottom at Stage = 0 ft)
 Depth at top of Zone using Vertical Orifice = Not Selected ft (relative to basin bottom at Stage = 0 ft)
 Vertical Orifice Diameter = Not Selected inches

Calculated Parameters for Vertical Orifice
 Vertical Orifice Area = Not Selected ft²
 Vertical Orifice Centroid = Not Selected feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Gate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe))

Overflow Weir Front Edge Height, H_o = 5.48 ft (relative to basin bottom at Stage = 0 ft)
 Overflow Weir Front Edge Length = 8.50 feet
 Overflow Weir Gate Slope = 0.00 H:V
 Horiz. Length of Weir Sides = 2.90 feet
 Overflow Gate Open Area % = 70%
 Debris Clogging % = 50%

Calculated Parameters for Overflow Weir
 Height of Gate Upper Edge, H_t = 5.48 feet
 Overflow Weir Slope Length = 2.90 feet
 Gate Open Area / 100-yr Orifice Area = 1.37
 Overflow Gate Open Area w/o Debris = 17.26 ft²
 Overflow Gate Open Area w/ Debris = 8.63 ft²

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

Depth to Invert of Outlet Pipe = 0.10 ft (distance below basin bottom at Stage = 0 ft)
 Outlet Pipe Diameter = 48.00 inches
 Restrictor Plate Height Above Pipe Invert = 48.00 inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate
 Outlet Orifice Area = 12.57 ft²
 Outlet Orifice Centroid = 2.00 feet
 Half-Central Angle of Restrictor Plate on Pipe = 3.14 radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage = 9.11 ft (relative to basin bottom at Stage = 0 ft)
 Spillway Crest Length = 63.62 feet
 Spillway End Slopes = 11.50 H:V
 Freeboard above Max Water Surface = 1.00 feet

Calculated Parameters for Spillway
 Spillway Design Flow Depth = 1.08 feet
 Stage at Top of Freeboard = 11.19 feet
 Basin Area at Top of Freeboard = 2.37 acres
 Basin Volume at Top of Freeboard = 13.45 acre-ft

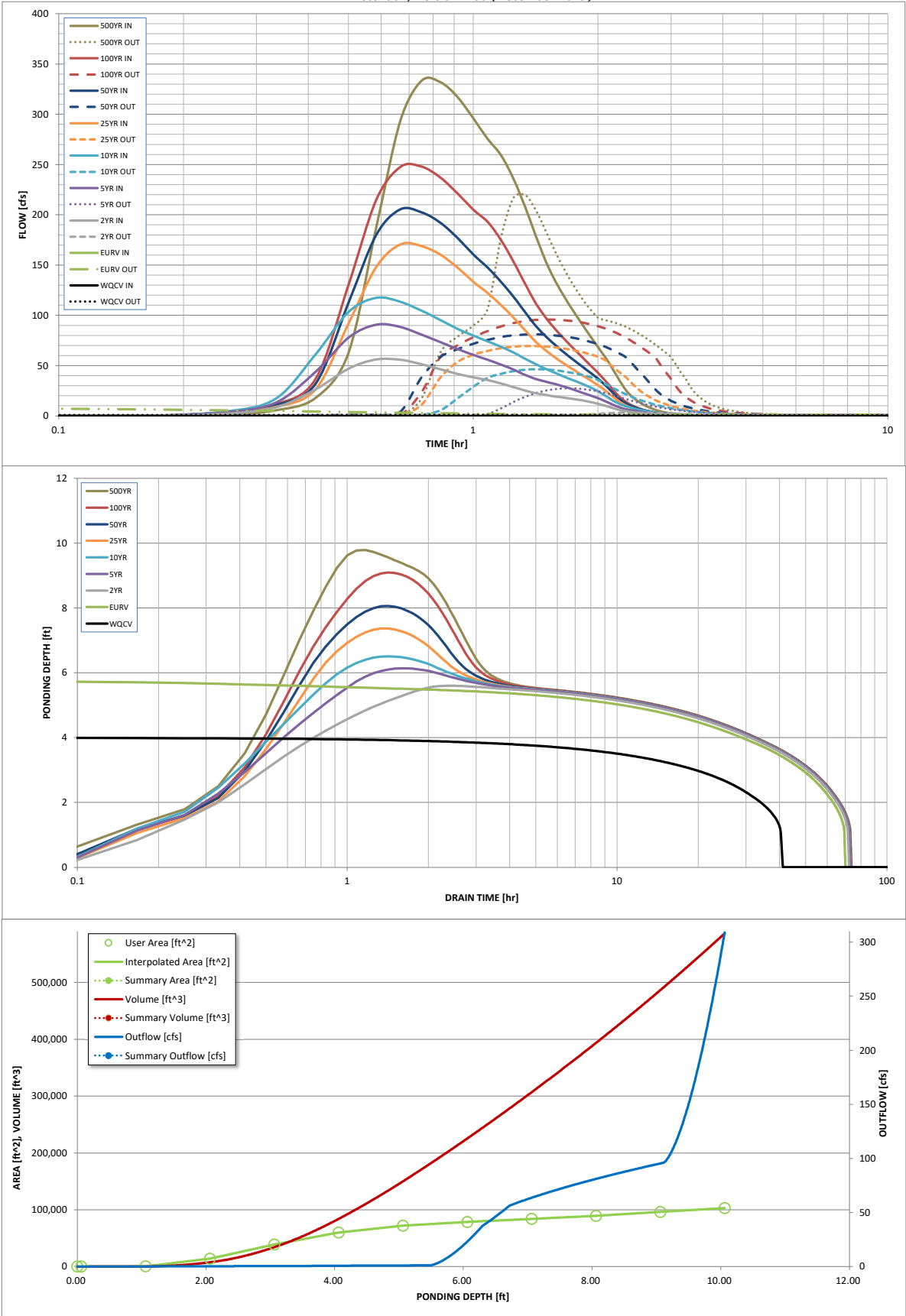
Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
One-Hour Rainfall Depth (in) =	1.834	4.664	4.688	7.414	9.906	13.603	16.440	20.186	27.480
CUHP Runoff Volume (acre-ft) =	N/A	N/A	4.688	7.414	9.906	13.603	16.440	20.186	27.480
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	13.4	37.5	57.3	104.5	131.2	167.6	233.6
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.10	0.27	0.42	0.76	0.95	1.22	1.70
Peak Inflow Q (cfs) =	N/A	N/A	56.0	90.7	117.3	170.5	205.3	248.0	333.2
Peak Outflow Q (cfs) =	0.8	8.5	3.2	27.3	46.4	69.4	81.0	95.8	219.8
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.7	0.8	0.7	0.6	0.6	0.9
Structure Controlling Flow =	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Spillway
Max Velocity through Gate 1 (fps) =	N/A	0.47	0.12	1.5	2.6	3.9	4.6	5.4	5.9
Max Velocity through Gate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	64	66	64	62	59	57	55	51
Time to Drain 99% of Inflow Volume (hours) =	40	68	70	69	69	67	66	65	63
Maximum Ponding Depth (ft) =	4.00	5.78	5.60	6.13	6.51	7.36	8.06	9.09	9.78
Area at Maximum Ponding Depth (acres) =	1.35	1.76	1.74	1.82	1.86	1.97	2.05	2.22	2.32
Maximum Volume Stored (acre-ft) =	1.842	4.672	4.339	5.299	5.979	7.624	9.011	11.231	12.798

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)



S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

AS-BUILT

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

Time Interval	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.02	0.76
	0:15:00	0.00	0.00	1.99	3.30	4.11	2.78	3.64	3.44	5.44
	0:20:00	0.00	0.00	8.39	12.96	16.93	8.92	10.64	11.40	17.91
	0:25:00	0.00	0.00	26.34	43.86	61.18	26.51	31.98	36.78	62.34
	0:30:00	0.00	0.00	46.89	77.60	103.21	91.54	112.33	129.91	186.76
	0:35:00	0.00	0.00	56.03	90.69	117.31	147.73	179.60	214.31	293.25
	0:40:00	0.00	0.00	55.89	88.40	113.46	170.46	205.33	247.53	333.19
	0:45:00	0.00	0.00	51.40	80.81	104.73	168.89	202.47	247.99	331.98
	0:50:00	0.00	0.00	46.26	73.36	95.32	160.35	192.08	237.03	317.04
	0:55:00	0.00	0.00	41.79	66.43	86.57	147.49	176.88	221.13	296.05
	1:00:00	0.00	0.00	38.32	60.66	79.87	133.52	160.62	205.25	275.59
	1:05:00	0.00	0.00	35.54	55.78	74.18	122.18	147.46	192.91	259.37
	1:10:00	0.00	0.00	32.24	51.05	68.61	110.22	133.37	174.99	235.99
	1:15:00	0.00	0.00	28.66	46.02	63.14	97.87	118.67	153.56	208.13
	1:20:00	0.00	0.00	25.26	40.78	56.89	85.20	103.34	131.53	178.84
	1:25:00	0.00	0.00	22.59	36.73	51.34	73.54	89.28	111.80	152.80
	1:30:00	0.00	0.00	20.71	33.87	46.59	64.78	78.71	97.18	133.00
	1:35:00	0.00	0.00	19.22	31.46	42.38	57.46	69.84	85.54	117.05
	1:40:00	0.00	0.00	17.90	28.74	38.58	51.21	62.21	75.55	103.28
	1:45:00	0.00	0.00	16.63	25.84	35.08	45.53	55.27	66.53	90.81
	1:50:00	0.00	0.00	15.37	23.03	31.74	40.37	48.95	58.19	79.29
	1:55:00	0.00	0.00	13.79	20.34	28.29	35.41	42.88	50.31	68.41
	2:00:00	0.00	0.00	12.05	17.68	24.48	30.63	37.05	42.90	58.19
	2:05:00	0.00	0.00	10.01	14.54	20.00	25.20	30.41	34.96	47.12
	2:10:00	0.00	0.00	7.91	11.30	15.51	19.47	23.40	26.68	35.70
	2:15:00	0.00	0.00	6.02	8.54	11.97	14.18	16.98	19.11	25.69
	2:20:00	0.00	0.00	4.64	6.66	9.58	10.33	12.53	13.93	19.12
	2:25:00	0.00	0.00	3.75	5.40	7.83	7.79	9.55	10.40	14.47
	2:30:00	0.00	0.00	3.06	4.41	6.40	5.99	7.38	7.78	10.92
	2:35:00	0.00	0.00	2.52	3.61	5.20	4.63	5.71	5.79	8.18
	2:40:00	0.00	0.00	2.05	2.93	4.18	3.59	4.43	4.27	6.05
	2:45:00	0.00	0.00	1.66	2.35	3.31	2.77	3.41	3.09	4.40
	2:50:00	0.00	0.00	1.34	1.86	2.60	2.13	2.61	2.25	3.22
	2:55:00	0.00	0.00	1.08	1.47	2.03	1.65	2.02	1.76	2.51
	3:00:00	0.00	0.00	0.89	1.16	1.59	1.31	1.60	1.41	1.99
	3:05:00	0.00	0.00	0.71	0.90	1.24	1.03	1.26	1.13	1.59
	3:10:00	0.00	0.00	0.56	0.69	0.95	0.80	0.97	0.88	1.24
	3:15:00	0.00	0.00	0.42	0.51	0.72	0.60	0.73	0.66	0.93
	3:20:00	0.00	0.00	0.31	0.36	0.51	0.44	0.53	0.48	0.66
	3:25:00	0.00	0.00	0.21	0.24	0.34	0.30	0.36	0.32	0.44
	3:30:00	0.00	0.00	0.13	0.16	0.21	0.19	0.23	0.20	0.26
	3:35:00	0.00	0.00	0.07	0.09	0.11	0.11	0.12	0.10	0.13
	3:40:00	0.00	0.00	0.03	0.04	0.04	0.04	0.05	0.04	0.04
	3:45:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

MHFD-Detention, Version 4.03 (May 2020)

Basin ID: FSD Pond C



Watershed Information

[illegible]

Optional User Overrides

	acre-feet
	acre-feet
1.19	inches
1.50	inches
1.75	inches
2.00	inches
2.25	inches
2.52	inches
	inches

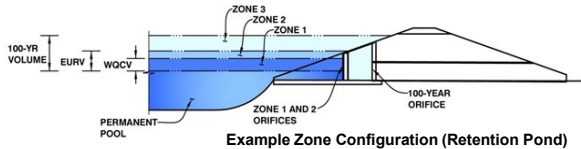
Zone 1 Volume (WQCV) =	1.834	acre-feet
Zone 2 Volume (EURV - Zone 1) =	2.831	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	5.000	acre-feet
Total Detention Basin Volume =	9.664	acre-feet
Initial Surcharge Volume (ISV) =	user	ft ³
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project: Paint Brush Hills Filing No.14

Basin ID: FSD Pond C



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.79	1.834	Orifice Plate
Zone 2 (EURV)	5.56	2.831	Orifice Plate
Zone 3 (100-year)	8.09	5.000	Weir&Pipe (Restrict)
Total (all zones)		9.664	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth = ft (distance below the filtration media surface)

Underdrain Orifice Diameter = inches

Calculated Parameters for Underdrain

Underdrain Orifice Area = ft²

Underdrain Orifice Centroid = feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice = 0.00 ft (relative to basin bottom at Stage = 0 ft)

Depth at top of Zone using Orifice Plate = 5.56 ft (relative to basin bottom at Stage = 0 ft)

Orifice Plate: Orifice Vertical Spacing = 22.20 inches

Orifice Plate: Orifice Area per Row = 6.62 sq. inches (use rectangular openings)

Calculated Parameters for Plate

WQ Orifice Area per Row = 4.597E-02 ft²

Elliptical Half-Width = N/A feet

Elliptical Slot Centroid = N/A feet

Elliptical Slot Area = N/A ft²

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.85	3.71					
Orifice Area (sq. inches)	6.62	6.62	6.62					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

Invert of Vertical Orifice = Not Selected Not Selected ft (relative to basin bottom at Stage = 0 ft)

Depth at top of Zone using Vertical Orifice = Not Selected Not Selected ft (relative to basin bottom at Stage = 0 ft)

Vertical Orifice Diameter = Not Selected Not Selected inches

Calculated Parameters for Vertical Orifice

Vertical Orifice Area = Not Selected Not Selected ft²

Vertical Orifice Centroid = Not Selected Not Selected feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Gate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe))

Overflow Weir Front Edge Height, H_o = 5.57 Not Selected ft (relative to basin bottom at Stage = 0 ft)

Overflow Weir Front Edge Length = 8.50 Not Selected feet

Overflow Weir Gate Slope = 0.00 Not Selected H:V

Horiz. Length of Weir Sides = 2.90 Not Selected feet

Overflow Gate Open Area % = 70% Not Selected %, gate open area/total area

Debris Clogging % = 50% Not Selected %

Calculated Parameters for Overflow Weir

Height of Gate Upper Edge, H_t = 5.57 Not Selected feet

Overflow Weir Slope Length = 2.90 Not Selected feet

Gate Open Area / 100-yr Orifice Area = 1.37 Not Selected

Overflow Gate Open Area w/o Debris = 17.26 Not Selected ft²

Overflow Gate Open Area w/ Debris = 8.63 Not Selected ft²

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

Depth to Invert of Outlet Pipe = 0.25 Not Selected ft (distance below basin bottom at Stage = 0 ft)

Outlet Pipe Diameter = 48.00 Not Selected inches

Restrictor Plate Height Above Pipe Invert = 48.00 Not Selected inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

Outlet Orifice Area = 12.57 Not Selected ft²

Outlet Orifice Centroid = 2.00 Not Selected feet

Half-Central Angle of Restrictor Plate on Pipe = 3.14 Not Selected radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage = 8.97 Not Selected ft (relative to basin bottom at Stage = 0 ft)

Spillway Crest Length = 96.00 Not Selected feet

Spillway End Slopes = 8.33 Not Selected H:V

Freeboard above Max Water Surface = 1.00 Not Selected feet

Calculated Parameters for Spillway

Spillway Design Flow Depth = 0.87 Not Selected feet

Stage at Top of Freeboard = 10.84 Not Selected feet

Basin Area at Top of Freeboard = 2.42 Not Selected acres

Basin Volume at Top of Freeboard = 13.83 Not Selected acre-ft

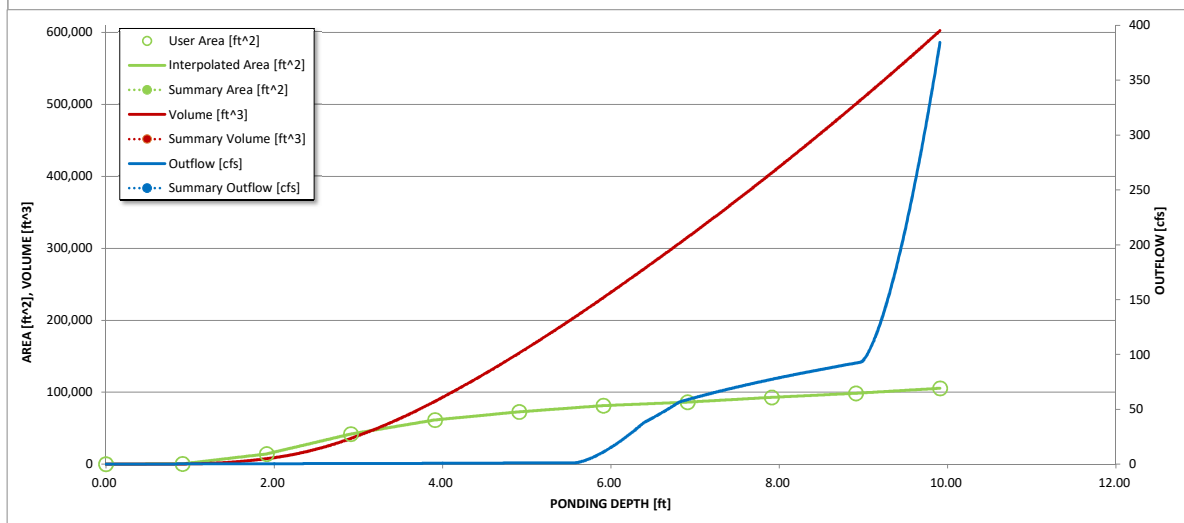
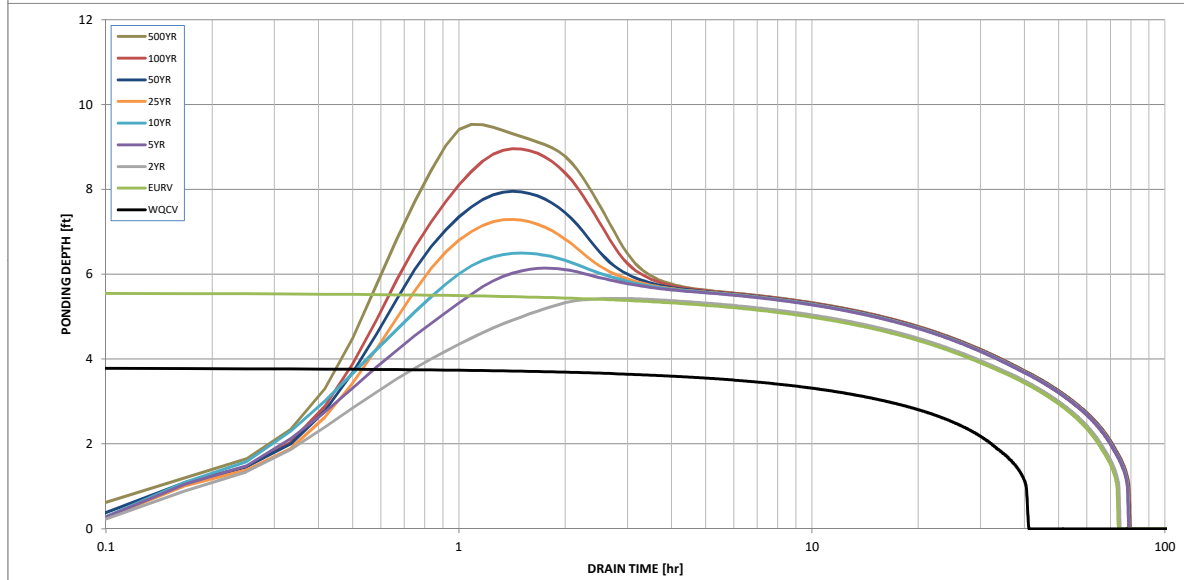
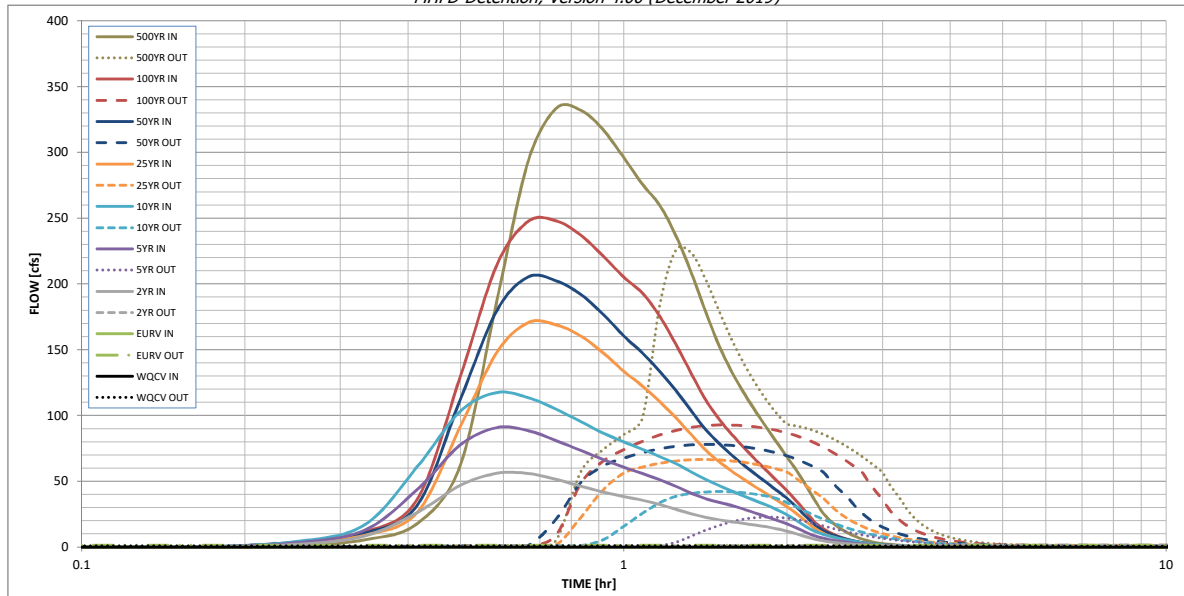
Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	1.834	4.664	4.688	7.414	9.906	13.603	16.440	20.186	27.480
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	4.688	7.414	9.906	13.603	16.440	20.186	27.480
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	13.4	37.5	57.3	104.5	131.2	167.6	233.6
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.10	0.27	0.42	0.76	0.95	1.22	1.70
Peak Inflow Q (cfs) =	N/A	N/A	56.0	90.7	117.3	170.5	205.3	248.0	333.2
Peak Outflow Q (cfs) =	0.8	1.2	1.2	22.6	42.3	66.5	78.0	92.8	226.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.6	0.7	0.6	0.6	0.6	1.0
Structure Controlling Flow =	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Spillway
Max Velocity through Gate 1 (fps) =	N/A	N/A	N/A	1.2	2.4	3.8	4.4	5.3	5.7
Max Velocity through Gate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	67	68	70	68	65	63	61	57
Time to Drain 99% of Inflow Volume (hours) =	40	71	72	75	74	73	72	71	69
Maximum Ponding Depth (ft) =	3.79	5.56	5.43	6.14	6.50	7.29	7.95	8.96	9.53
Area at Maximum Ponding Depth (acres) =	1.36	1.80	1.77	1.89	1.93	2.04	2.14	2.27	2.36
Maximum Volume Stored (acre-ft) =	1.839	4.673	4.423	5.747	6.417	8.002	9.380	11.583	12.925

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)



S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			























