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|---|---|---|---|
| Job Name | Otaihanaga Retirement Village | File Name | A25556-ED-SW-Rational-CW Method.xlsx |
| Job No. | A25556 | Sheet Name | PIPE CAPACITY |
| Date | 10/08/2026 | File Path | |
| By | LL | Checked | NP |

**Assumptions:**

*Runoff Coefficient (c):*
c=0.9 for roof
c=0.85 for driveway
c=0.6 for paved surafces
c=0.3 for permeable surafces

*Roughness factor (k):*
k = 0.6 for pipe diameter > 1000mm — 0.6 (PVC)
k = 1.5 for pipe diameter < 1000mm — 1.5 (Concrete)

Lot (Roof+Landscape) C : 0.700
Road (Pave + Grass) C : 0.850

$$V = -2\sqrt{2g \cdot D \cdot S_f} \cdot log\left(\frac{k_s}{3{,}70 \cdot D} + \frac{2{,}51 \cdot \upsilon}{D\sqrt{2g \cdot D \cdot S_f}}\right)$$

with $S_f = \frac{h_f}{L}$

| | | |
|---|---|---|
| $V$ = | mean velocity | [m/s] |
| D = | Hydraulic Diameter | [m] |
| $k_s$ = | surface roughness | [m] |
| $\upsilon$ = | Kinematic viscosity water, 20°C= 1,00 · $10^{-6}$ | [kg/ms] |
| $S_f$ = | slope of hydraulic gradient | [-] |
| $h_f$ = | frictional head loss | [m] |
| $L$ = | Length between the Head Loss | [m] |
| $g$ = | earths gravity | [m/s²] |

*Design rainfall:* 10yr 10min +CC — 99 mm/hr — From HIRDS

NOTE: This spreadsheet calculates peak flow rates using the Rational Formula and pipe capacities using the Colebrook-White Equation

| Catchment Name | Manhole Inlet | Line | Coverage | Area (ha) | C No. | Int (mm/hr) | Q = 2.78CiA | Roughness Factor | Pipe size(mm) | Pipe Slope (%) | V (m/sec) | Capacity (Q = VA) | Capacity ? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | MH 1-2 TO MH 1-1 | TOTAL CATCHMENT | 1.9629 | | | | | | | | | |
| | | | ROAD | 0.3864 | 0.850 | 99 | 90.5 | | | | | | |
| | | | LOT | 1.5765 | 0.700 | 99 | 304.0 | | | | | | |
| | | | | | | **Max.Flow (L/Sec)** | **394.5** | 1.5 | 600 | 0.50 | **1.5** | **433.1** | YES |
| 2 | | MH 2-1 TO MH 1-1 | TOTAL CATCHMENT | 0.97 | | | | | | | | | |
| | | | ROAD | 0.1729 | 0.850 | 99 | 40.5 | | | | | | |
| | | | LOT | 0.7971 | 0.700 | 99 | 153.7 | | | | | | |
| | | | | | | **Max.Flow (L/Sec)** | **194.2** | 1.5 | 450 | 0.50 | **1.3** | **202.5** | YES |
| 1 & 2 | OUTLET 1 | MH 1-1 TO OUTLET 1 | | | | | | | | | | | |
| | | | | | | **Max.Flow (L/Sec)** | **588.7** | 1.5 | 675 | 0.50 | **1.7** | **591.0** | YES |
| 3 | OUTLET 2 | MH 3-1 TO OUTLET 2 | TOTAL CATCHMENT | 4.9065 | | | | | | | | | |
| | | | ROAD | 0.8253 | 0.850 | 99 | 193.3 | | | | | | |
| | | | LOT | 4.0812 | 0.700 | 99 | 787.1 | | | | | | |
| | | | | | | **Max.Flow (L/Sec)** | **980.3** | 1.5 | 750 | 0.80 | **2.2** | **987.6** | YES |
| 4 | OUTLET 3 | MH 4-1 TO OUTLET 3 | TOTAL CATCHMENT | 3.582 | | | | | | | | | |
| | | | ROAD | 0.3975 | 0.850 | 99 | 93.1 | | | | | | |
| | | | LOT | 3.1845 | 0.700 | 99 | 614.1 | | | | | | |
| | | | | | | **Max.Flow (L/Sec)** | **707.2** | 1.5 | 675 | 0.80 | **2.1** | **748.1** | YES |