PRELIMINARY DRAINAGE STUDY FOR

# SUMMIT ESTATES TM

RECORD ID: PDS2019-TM-5635 & PDS2019-ER-19-08-004

**ESCONDIDO, CALIFORNIA**

**June 2020**

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06/01/2020

Date

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**Certification Page**

Project Name: Summit Estates TM

Project No: 1599.10

**Declaration of Responsible Charge**

I hereby declare that I am the Engineer of Work for this project, and that I have exercised responsible charge over the design of the project as defined in Section 6703 of the Business and Professions Code, and that the design is consistent with current standards.

I understand that the check of project drawings and specifications by the County of San Diego is confined to a review only and does not relieve me, as engineer of work, of my responsibilities for project design.

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06/01/2020

Date


Engineer's Stamp

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## I. PURPOSE

The purpose of this drainage study is to evaluate and compare the existing and proposed conditions, analyze the proposed difference in anticipated runoff, and provide a narrative discussion of methods by which storm water quality issues will be addressed with the development of the Summit Estates project.

## II. PROJECT DESCRIPTION

The project is located at 2510 Summit Drive in Escondido, California. Figure 1 illustrates the projects location. Currently the project site is mostly comprised a single residential home with accessory buildings and sloping hillside with light ground cover, covering about 21.5 acres. Most of the site is undeveloped. The Summit Estates project proposes to design and construct 20 estate lot residential homes and a residential road for access.

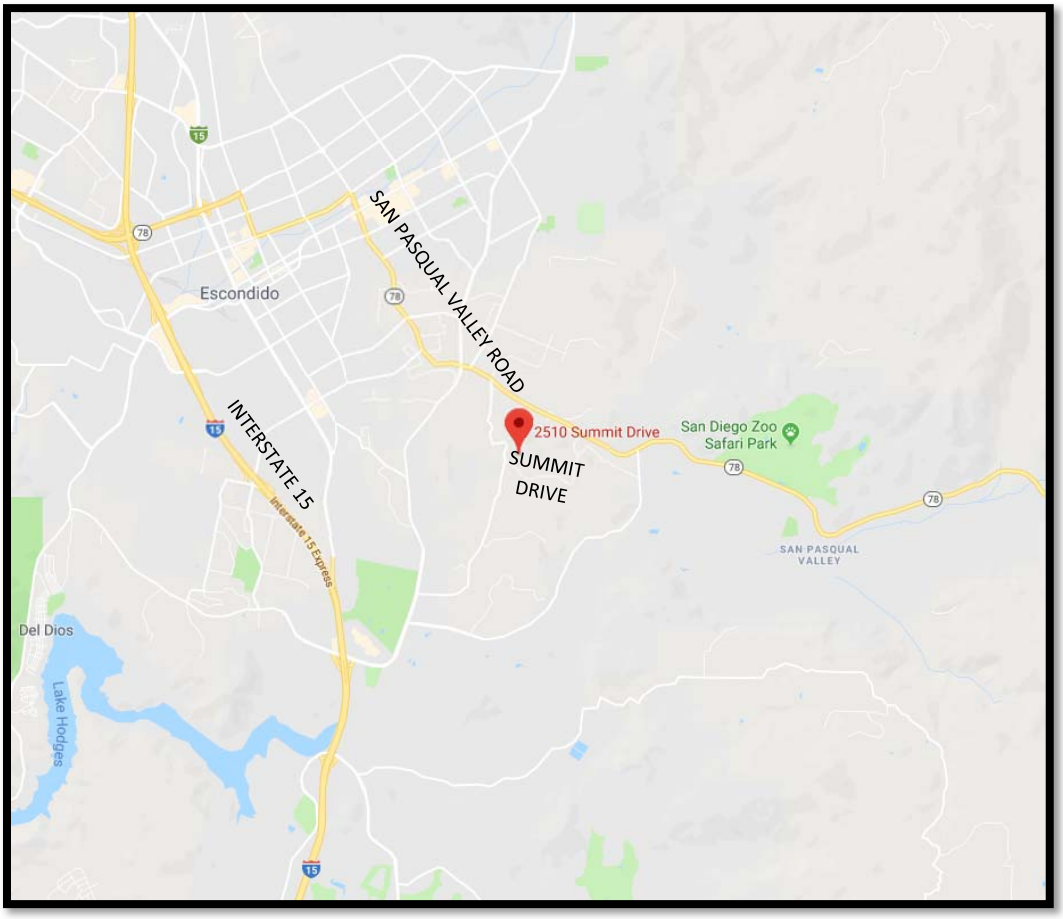


**Figure 1. Vicinity Map**

## III. METHODOLOGY

The estimate of the existing and proposed drainage flows has been performed in general conformance with the County of San Diego Guidelines. Drainage basins are less than one square mile and therefore the Rational Method was utilized to estimate runoff. The 100-year storm event has been used for runoff estimates.

### Runoff Coefficient:

For existing and proposed conditions, runoff coefficients were calculated using Section 3.1.2 and Table 3-1 of the San Diego County Hydrology Manual. A C-value of 0.9 was used for impervious areas. The site contains mainly Type D soil and some Type C soil. Per Table 3-1, a pervious C-value of 0.35 was used for areas with Type D soil, and 0.30 for areas with Type C soil. A composite C-value was calculated using these values. Table 3-1 is included in Appendix C for reference.

The percentages of impervious and pervious area used to calculate the composite C-value can be found in the calculations section in Appendices A and B. Please note, building pad areas assume 40% pervious and 60% impervious, therefore 0.57 is utilized for pad areas in Type D soil (0.9x0.4+0.35x0.6 = 0.57) and 0.54 for pad areas in Type C soil (0.9x0.4+0.30x0.6 = 0.54).

### Time of Concentration:

Time of concentration was calculated per Section 3.1.4 of the San Diego County Hydrology Manual.

Initial time of concentration values were computed using the Overland Time of Flow Nomograph, as shown on Figure 3-3 in the County of San Diego Drainage Design Manual, included in Appendix C. Overland flow length used for the calculation of initial travel time was restricted to the maximum values per Table 3-2.

Travel time was computed as the sum of the following items:

- For watersheds with flow in natural or pervious areas beyond the initial time of concentration length, the Kirpich Nomograph (Figure 3-4) was utilized.
- For flow paths in the street, the Gutter and Roadway Discharge - Velocity Chart (Figure 3-6) was utilized. An initial Q was assumed based on the area and C-value of the sub-basin, as well as an intensity calculated from the initial time of concentration. The assumed initial Q and the street grade were used to determine the flow velocity for concentrated flows in curb and gutters. Travel times were then determined by dividing the flow distance by the velocity of flow.
- For flow paths in ditches, Manning's Equation (Figure 3-7) was utilized to determine the velocity. As in the gutter velocity calculation, an initial Q was assumed based on the initial time of concentration. Travel times were then determined by dividing the flow distance by the velocity of flow.

Final times of concentration values for each basin were calculated by adding the initial and final travel times; with a minimum time of 5 minutes. Time of concentration calculations are shown in Appendices A and B for the existing and proposed conditions, respectively.

**Rainfall Intensity:**

The rainfall intensity was obtained from the "Intensity-Duration Design Chart" as shown in Figure 3-1 of the County of San Diego Guidelines, based on the 100-year $P_6$ and $P_{24}$ isopluvial maps, all included in Appendix C.

**Drainage Areas:**

The existing condition drainage basins were delineated from the base topographic map as shown on the Existing Hydrology Exhibit provided in Appendix A. The proposed condition drainage basins were delineated using the proposed grading plan as show on the Proposed Hydrology Exhibit provided in Appendix B. The overall boundaries for the existing and proposed conditions were set equal to allow for a comparison of the results.

**Autodesk SSA Computer Analysis**

Autodesk SSA was utilized to model the 100-year storm with the Rational Method parameters described above as it flows through the proposed storm drain system. It used the Hydrodynamic model for modeling hydraulic routing. This allows for an accurate peak flow calculation as it models the timing of flows across the sub-basins and through the storm drain system.

The sub-basin areas, runoff coefficients, and times of concentration were input into the program. The program references the County IDF values associated with a 100-year $P_6$ of 3.5 inches for our site. The program performs hydrology and hydraulic calculations across the sub-basins and through the proposed storm drain system. The analysis input parameters and results are provided in Appendices A and B.

**Storage Calculations:**

Storage calculations have been provided for each basin with an increase in peak flow from the existing condition to the proposed unmitigated condition. The proposed unmitigated condition conservatively treats biofiltration basins as junctions with no storage. The following method was then utilized to show that enough storage is provided in the basins to mitigate the increase in peak flow.

The 6-hour incremental hydrograph procedure per Section 6.2 of the San Diego County Hydrology manual was utilized to construct the time series for the 100-year 6-hour storm for each POC. This hydrograph for each POC was plotted using Autodesk SSA. Next the peak flow from the existing condition was plotted on descending arm of the 6-hour hydrograph for the proposed condition and a straight line was drawn from the origin to this point, essentially creating a modified hydrograph. The detention volume was

calculated as the area under the proposed hydrograph and above the modified hydrograph, resulting in a peak flow equal to the existing condition.

The storage volume for the biofiltration basins was then calculated. It was determined that the required pollutant control volume can be detained in the subsurface storage of the basins; therefore, the flood control storage volume is considered to be the volume above the basin surface and below the overflow riser. The volume was calculated as riser height multiplied by the basin area. This approach is conservative as it does not include volume above the side slopes. This storage volume was then compared with the storage volume required to mitigate the increase in 100-year peak flow at each POC. The calculations can be found in Appendix D.

**Summit Drive Pipe Sizing:**

All pipe capacities are analyzed using Autodesk SSA. The program shows which pipes are under pressure during the analysis. Those pipes were then increased in size to eliminate the pressurized condition.

Additional analysis is provided for the two pipes being replaced under Summit Drive. The total unmitigated peak flow for the proposed 100-year condition is used to size the pipes. The depth in the pipes was then calculated using Manning's Equation. The output from Autodesk Hydraflow Express, which performs Manning's Equation calculations for pipes and channels of specified sizes and configurations, is provided in Appendix E.

## IV. EXISTING CONDITION

The existing site runoff is divided into six separate drainage basins, which terminate in five separate discharge points (POCs). Refer to Table 1 for a summary of the drainage basin characteristics and peak flows.

POC 1: POC 1 is the discharge point to a natural channel running along the eastern edge of the site. It converges with the POC 5 channel about 500' downstream of the site. This natural channel eventually flows to Santa Ysabel Creek and then to Lake Hodges. The following sub-basins are tributary to POC 1.

Basin E.1

Basin E.1 consists of primarily undeveloped natural slopes. The basin drains easterly and discharges at POC 1.

Basin E.6

Basin E.6 is the offsite upstream area tributary to the project site and POC 1. It consists of primarily undeveloped natural slopes. Topographic information for the offsite drainage area was limited, and 3D Google Earth images were utilized to approximate the extents of this drainage area.

POC 2: POC 2 is the outlet of an existing 14”x22” CMPA pipe running under Summit Drive and discharging northwest of the site. Drainage from this POC eventually flows to Kit Carson Creek and then to Lake Hodges. The following basin is tributary to POC 2.

Basin E.2
Basin E.2 consists of primarily undeveloped natural slopes and half of Summit Drive. The basin drains northwesterly to an existing pipe running under Summit Drive and discharges at POC 2.

POC 3: POC 3 is the discharge point of surface drainage to Summit Drive at the south of the site. Drainage leaving this POC continues south along Summit Drive. It eventually flows to Santa Ysabel Creek and then to Lake Hodges. The following basin is tributary to POC 3.

Basin E.3
Basin E.3 consists of primarily undeveloped natural slopes and half of Summit Drive. The basin drains southerly and discharges at POC 3.

POC 4: POC 4 is the outlet of an existing 14”x22” CMPA pipe running under Summit Drive and discharging southwest of the site. Drainage from this POC eventually flows to Kit Carson Creek and then to Lake Hodges. The following basin is tributary to POC 4.

Basin E.4
Basin E.4 consists of primarily undeveloped natural slopes and half of Summit Drive. The basin drains southwesterly to an existing pipe running under Summit Drive and discharges at POC 4.

POC 5: POC 5 is the discharge point to a natural channel running along the southern edge of the site. It converges with the POC 1 channel about 500’ downstream of the site. This natural channel eventually flows to Santa Ysabel Creek and then to Lake Hodges. The following basin is tributary to POC 5.

Basin E.5
Basin E.5 consist of primarily undeveloped natural slopes. The basin drains easterly and discharges at POC 5.

## V. PROPOSED CONDITION

The proposed condition for the site consists of 20 residential estate lots and a road connecting to Summit Drive. The proposed improvements will modify the existing drainage basins but will utilize the same discharge points. Refer to Table 2 for a summary of the drainage basin characteristics and peak flows.

POC 1: POC 1 consists of Basins P.19, P.20, P.21, P.23, P.24, P.25, P.28, P.30, P.34, and E.6. Drainage from these basins will either be treated by a biofiltration basin (BMP 1) or flow directly to the discharge point.

Basin P.19
Basin P.19 consists of two estate lots where drainage will sheet flow to the cul-de-sac. It will enter a storm drain inlet and be routed to a biofiltration basin (BMP 1), which is sized for storm water requirements per the project SWQMP as well as flood routing. It will then be discharged to a natural hillside and flow to POC 1.

Basin P.20
Basin P.20 consists of one estate lot. Drainage will sheet flow to an area drain and will be routed to BMP 1. It will then be discharged to a natural hillside and flow to POC 1.

Basin P.21
Basin P.21 consists of one estate lot. Drainage will sheet flow to an area drain and will be routed to BMP 1. It will then be discharged to a natural hillside and flow to POC 1.

Basin P.23
Basin P.23 consists of a portion of Private Street B. Drainage will flow to the gutter and enter a storm drain inlet. It will be routed to BMP 1, discharged to a natural hillside, and flow to POC 1.

Basin P.24
Basin P.24 consists of one estate lot. Drainage will sheet flow to the private street and enter a storm drain inlet. It will be routed to BMP 1, discharged to a natural hillside, and flow to POC 1.

Basin P.25
Basin P.25 consists of two estate lots. Drainage will sheet flow to the cul-de-sac. It will enter a storm drain inlet and be routed to BMP 1. It will then be discharged to a natural hillside and flow to POC 1.

Basin P.28
Basin P.28 consists of one estate lot. Drainage will sheet flow to an area drain and will be routed to BMP 1. It will then be discharged to a natural hillside and flow to POC 1.

Basin P.30
Basin P.30 consists of graded and natural terrain where drainage will sheet flow until it is collected into natural channels and reaches POC 1.

Basin P.34
Basin P.34 consists of one estate lot. Drainage will sheet flow to an area drain and will be routed to BMP 1. It will then be discharged to a natural hillside and flow to POC 1.

Basin E.6
Basin E.6 is the offsite upstream area tributary to the project site and POC 1. It remains unchanged in the proposed condition.

POC 2: POC 2 consists of Basins P.1, P.2, P.3, P.4, P.5, P.6, P.7, P.8, P.9, P.35 and P.36. Drainage from these basins will either be treated by one of two biofiltration basins (BMPs 2 and 5) or will flow to the POC directly. The existing CMP pipe at POC 2 will be replaced by a 24" storm drain pipe.

Basin P.1

Basin P.1 consists of graded and natural terrain and will sheet flow towards the property line where the runoff will be gathered in a brow ditch. The brow ditch will flow west to a Type F inlet and enter the proposed storm drain running under Summit Drive.

Basin P.2

Basin P.2 consists of a portion of the Private Street D. Drainage will enter a storm drain inlet and be routed to a biofiltration basin (BMP 2), which is sized for storm water requirements per the project SWQMP as well as flood routing. BMP 2 will connect to the proposed storm drain running under Summit Drive.

Basin P.3 & P.4

Basin P.3 and P.4 consist of one estate lot each. Drainage will sheet flow to an area drain and enter a storm drain inlet. It will be routed to BMP 2, which connects to the proposed storm drain running under Summit Drive.

Basin P.5

Basin P.5 consists of graded and natural terrain and will sheet flow downhill to a brow ditch. The brow ditch will flow to a storm drain inlet, and will be outlet at a ditch on the westerly boundary of the property. This brow ditch will flow to a Type F inlet and enter the proposed storm drain running under Summit Drive.

Basin P.6

Basin P.6 consists of one estate lot. Drainage will sheet flow to an area drain and enter a storm drain inlet. It will be routed to BMP 2, which connects to the proposed storm drain running under Summit Drive.

Basin P.7

Basin P.7 consists of one estate lot. Drainage will sheet flow to the private street and enter a storm drain inlet. It will be routed to BMP 2, which connects to the proposed storm drain running under Summit Drive.

Basin P.8

Basin P.8 consists of one estate lot. Drainage will sheet flow to an area drain and enter a storm drain inlet. It will be routed to BMP 2, which connects to the proposed storm drain running under Summit Drive.

Basin P.9

Basin P.9 consists of graded and natural terrain and will sheet flow towards the property line where the runoff will be gathered in a brow-ditch. The brow ditch will

flow to a Type F inlet and enter the proposed storm drain running under Summit Drive.

Basin P.35
Basin P.35 consists of a portion of Summit Drive. Drainage flows along the curb and gutter. It will pass through a curb cut and enter the proposed storm drain running under Summit Drive.

Basin P.36
Basin P.36 consists of a portion of Summit Drive and will surface flow into a biofiltration basin (BMP 5), which is sized for storm water requirements per the project SWQMP. BMP 5 will connect to the proposed storm drain running under Summit Drive.

POC 3: POC 3 consists of Basins P.11, P.12, P.13, P.14, P.15, P.16, P.17, P.18, P.33, and P.38. Drainage from these basins will either be treated by one of two biofiltration basins (BMPs 3A and 3B) or will flow to the POC directly.

Basin P.11
Basin P.11 consists of two estate lots. Drainage will sheet flow to the private street. It will enter a storm drain inlet and be routed to BMP 3B, a biofiltration basin sized for storm water requirements per the project SWQMP as well as flood routing. It will then be discharged to a curb outlet at Summit Drive and will surface flow to the POC.

Basin P.12
Basin P.12 consists of a portion of the private street and immediately adjacent landscaped area. Drainage will flow in the to a storm drain inlet and will be routed to BMP 3B. It will then be discharged to a curb outlet at Summit Drive and will surface flow to the POC.

Basin P.13
Basin P.13 consists of graded and natural terrain and will sheet flow downhill to a brow ditch. The brow ditch will flow to a storm drain inlet. The storm drain will bypass the BMPs and will be routed to a curb outlet at Summit Drive. It will then surface flow along Summit Drive to the POC.

Basin P.14
Basin P.14 consists of a portion of Private Street A. Drainage will flow to the gutter and enter a storm drain inlet. It will be routed to BMP 3A, a biofiltration basin sized for storm water requirements per the project SWQMP as well as flood routing. It will then be discharged to a curb outlet at Summit Drive and will surface flow to the POC.

Basin P.15
Basin P.15 consists of two estate lots. Drainage will sheet flow to the private street.

It will enter a storm drain inlet and be routed to BMP 3A. It will then be discharged to a curb outlet at Summit Drive and will surface flow to the POC.

Basin P.16
Basin P.16 consists of a portion of the private street and immediately adjacent landscaped area. Drainage will flow in the to a storm drain inlet and will be routed to BMP 3A. It will then be discharged to a curb outlet at Summit Drive and will surface flow to the POC.

Basin P.17
Basin P.17 consists of one estate lot. Drainage will sheet flow to the private street. It will enter a storm drain inlet and be routed to BMP 3A. It will then be discharged to a curb outlet at Summit Drive and will surface flow to the POC.

Basin P.18
Basin P.18 consists of graded and natural terrain and a portion of the private street. Drainage will surface flow to the POC. A brow ditch will be used to route the flow around the BMP.

Basin P.33
Basin P.33 consists of graded and natural terrain and will sheet flow towards the property line where the runoff will be collected in a brow ditch. The brow ditch will connect to a curb outlet. Drainage will surface flow from the curb outlet to the POC.

Basin P.38
Basin P.38 consists of a portion of Summit Drive. Drainage will flow along the gutter to POC 3.

POC 4: POC 4 consists of Basins P.10, P.31, P.32, and P.37. Drainage from these basins will either be treated by a biofiltration basin (BMP 4) or will flow to the POC directly. The existing CMP pipe at POC 2 will be replaced by an 18" storm drain pipe.

Basin P.10
Basin P.10 consists of graded and natural terrain and will sheet flow towards the property line where the runoff will be collected in a brow ditch. The brow ditch will flow to a Type F inlet and enter the proposed storm drain running under Summit Drive.

Basin P.31
Basin P.31 consists of graded and natural terrain and will sheet flow to a brow ditch. The brow ditch will flow to an area drain. Drainage will be piped to the proposed storm drain running under Summit Drive.

Basin P.32
Basin P.32 consists of graded slope and will sheet flow to a brow ditch. The brow ditch will flow to an area drain. Drainage will be piped to the proposed storm drain running under Summit Drive.

Basin P.37

Basin P.37 consists of a portion of Summit Drive and will surface flow into a biofiltration basin (BMP 4), which is sized for storm water requirements per the project SWQMP. BMP 4 will connect to the proposed storm drain running under Summit Drive.

POC 5: POC 5 consists of Basins P.22, P.26, P.27, and P.29. Drainage from these basins will either be treated by BMP 5 or flow to the discharge point unmitigated.

Basin P.22

Basin P.22 consists of graded and natural terrain. Runoff will flow to a brow ditch and enter a storm drain inlet. The storm drain will discharge to a natural hillside and will eventually flow to POC 5.

Basin P.26 & P.27

Basin P.26 and P.27 consist of graded and natural terrain. Runoff will flow to a brow ditch and enter a storm drain inlet. The storm drain will discharge to a natural hillside and will eventually flow to POC 5.

Basin P.29

Basin P.29 consists of graded and natural terrain. Drainage will surface flow until it is collected in a natural channel and reaches POC 5.

## VI. DISCUSSION AND CONCLUSION

The Rational Method for the 100-year peak storm flow rates was used in the design of the proposed drainage systems. The hydrologic analysis of these systems was evaluated using the Autodesk Storm and Sanitary Analysis (SSA) Software as described in the Methodology Section. The results of the analysis are listed below in Tables 1 through 3.

**Table 1. Existing Condition**

| Basin | Area (AC) | Runoff Coefficient (C) | Time of Concentration (Min) | Intensity (I) (in/hour) | 100-year Peak Flow (CFS) |
|---|---|---|---|---|---|
| E.1 | 8.45 | 0.35 | 8.10 | 6.76 | 19.98 |
| E.2 | 5.32 | 0.35 | 10.60 | 5.68 | 10.58 |
| E.3 | 3.48 | 0.37 | 10.50 | 5.72 | 7.36 |
| E.4 | 1.60 | 0.38 | 7.00 | 7.42 | 4.51 |
| E.5 | 4.51 | 0.35 | 10.50 | 5.72 | 9.02 |
| E.6 | 10.30 | 0.37 | 9.70 | 6.02 | 22.93 |

**Table 2. Proposed Condition**

| Basin | Area (AC) | Runoff Coefficient (C) | Time of Concentration (Min) | Intensity (I) (in/hour) | 100-year Peak Flow (CFS) |
|---|---|---|---|---|---|
| P.1 | 0.71 | 0.33 | 9.40 | 6.14 | 1.44 |
| P.2 | 0.07 | 0.85 | 5.00 | 9.22 | 0.55 |
| P.3 | 0.31 | 0.57 | 9.60 | 6.06 | 1.07 |
| P.4 | 0.31 | 0.57 | 9.30 | 6.18 | 1.09 |
| P.5 | 0.68 | 0.35 | 6.30 | 7.94 | 1.89 |
| P.6 | 0.29 | 0.54 | 9.60 | 6.06 | 0.95 |
| P.7 | 0.71 | 0.68 | 9.60 | 6.06 | 2.92 |
| P.8 | 0.38 | 0.54 | 12.40 | 5.13 | 1.05 |
| P.9 | 1.13 | 0.30 | 5.00 | 9.22 | 3.13 |
| P.10 | 0.47 | 0.30 | 5.90 | 8.29 | 1.17 |
| P.11 | 0.91 | 0.58 | 10.50 | 5.72 | 3.02 |
| P.12 | 0.08 | 0.63 | 5.00 | 9.22 | 0.46 |
| P.13 | 0.43 | 0.35 | 5.00 | 9.22 | 1.39 |
| P.14 | 0.27 | 0.68 | 5.00 | 9.22 | 1.69 |
| P.15 | 0.95 | 0.59 | 9.40 | 6.14 | 3.44 |
| P.16 | 0.05 | 0.63 | 5.00 | 9.22 | 0.29 |
| P.17 | 0.38 | 0.58 | 9.30 | 6.18 | 1.36 |
| P.18 | 0.47 | 0.43 | 6.00 | 8.20 | 1.66 |
| P.19 | 1.04 | 0.59 | 9.80 | 5.98 | 3.67 |
| P.20 | 0.30 | 0.55 | 9.20 | 6.22 | 1.03 |
| P.21 | 0.25 | 0.55 | 8.90 | 6.36 | 0.87 |
| P.22 | 0.28 | 0.35 | 5.40 | 8.77 | 0.86 |
| P.23 | 0.13 | 0.68 | 5.00 | 9.22 | 0.82 |

| | | | | | |
|---|---|---|---|---|---|
| P.24 | 0.46 | 0.56 | 9.70 | 6.02 | 1.55 |
| P.25 | 1.20 | 0.61 | 9.40 | 6.14 | 4.49 |
| P.26 | 0.18 | 0.35 | 5.00 | 9.22 | 0.58 |
| P.27 | 0.39 | 0.35 | 14.20 | 4.70 | 0.64 |
| P.28 | 0.28 | 0.54 | 9.60 | 6.06 | 0.92 |
| P.29 | 2.76 | 0.35 | 8.60 | 6.50 | 6.28 |
| P.30 | 5.75 | 0.35 | 8.10 | 6.76 | 13.60 |
| P.31 | 0.06 | 0.35 | 5.00 | 9.22 | 0.19 |
| P.32 | 0.13 | 0.35 | 5.00 | 9.22 | 0.42 |
| P.33 | 0.36 | 0.33 | 5.00 | 9.22 | 1.10 |
| P.34 | 0.24 | 0.55 | 8.90 | 6.36 | 0.84 |
| P.35 | 0.15 | 0.81 | 5.00 | 9.22 | 1.12 |
| P.36 | 0.30 | 0.81 | 5.00 | 9.22 | 2.24 |
| P.37 | 0.30 | 0.81 | 7.80 | 6.92 | 1.68 |
| P.38 | 0.19 | 0.81 | 5.00 | 9.22 | 1.42 |
| E.6 | 10.30 | 0.37 | 9.70 | 6.02 | 22.93 |

**Table 3. Peak Flows and Storage**

| POC | Existing Peak Flow (CFS) | Proposed Peak Flow (CFS) (Unmitigated)* | V100 (Unmitigated) in Upstream Pipe (FPS) | Required Storage (CF) | Provided Storage (CF) | Storage Provided by |
|---|---|---|---|---|---|---|
| 1 | 39.35 | 46.22 | 15.0 | 565 | 12,810 | BMP 1 |
| 2 | 10.55 | 12.47 | 5.5 | 152 | 2,560 | BMP 2 |
| 3 | 7.36 | 11.36 | 7.9 | 1,239 | 3,000 | BMPs 3A and 3B |
| 4 | 4.49 | 2.95 | 4.0 | N/A – Flow decreased | N/A | N/A |
| 5 | 9.02 | 7.32 | 8.1 | N/A – Flow decreased | N/A | N/A |

* Peak flow is not the sum of the tributary sub-basins as the model accounts for routing time.

Per Table 3, the Summit Estates project results in an increase of peak flow in the unmitigated condition, which disregards any storage in the biofiltration basins. However, the provided storage volume in the biofiltration basins far exceeds the volume needed to mitigate the increase in peak flow, meaning the mitigated peak flow will be less than the existing peak flow. Further analysis of the mitigated peak flow will be provided in final engineering. The flood control storage volume is considered to be the volume from the basin surface to the overflow riser as the pollutant control volume requirement is met in the subsurface storage. Per County standards, one foot of freeboard is proposed above the riser.

As a result, the Summit Estates development will not increase peak flow to any of the POCs, and will therefore not alter existing downstream drainage conditions. Existing drainage patterns onsite are maintained to the maximum extent feasible. Therefore, natural channels will not experience any increase in erosion or siltation as a result of the project.

The proposed drainage system is adequately sized for the project as can be seen in the SSA output report, which shows no pipes under pressure. The existing pipes running under Summit Drive will be replaced and have been adequately sized.

There are no onsite areas of mapped 100-year flood hazard area per FEMA. Therefore, no structures will be placed within a mapped 100-year flood hazard area. As the project will not increase 100-year flow, it is anticipated that water levels in the natural channels during the 100-year storm will not increase as a result of the project. The project will not expose people or structures to any significant risk of loss or injury resulting from flooding.

No dams or levees exist or are proposed onsite. As the project will not increase peak flow, it will not pose a risk to any downstream levees or dams. Therefore, the project will not expose people or structures to any significant risk of loss, injury, or death involving from flooding as the result of the failure of a levee or dam.

In conclusion, the Summit Estates development will have no adverse drainage impacts. The grading and storm drain system have been designed to maintain existing drainage patterns and protect structures and life from flooding.

## Appendix A

Existing Conditions Drainage Map and Calculations

POC 2
*Q100 = 10.55 CFS

EX. CSPA PIPE

SUMMIT DRIVE

SEE SHEET 2

E6
10.30 | 22.93
AC | CFS

E2
5.32 | 10.58
AC | CFS

E1
8.45 | 19.98
AC | CFS

PVT DRIVEWAY

E4
1.60 | 4.51
AC | CFS

E3
3.48 | 7.36
AC | CFS

E5
4.51 | 9.02
AC | CFS

POC 1
*Q100 = 39.35 CFS

POC 4
*Q100 = 4.49 CFS

MARY LANE

EX. CSPA PIPE

SUMMIT DRIVE

POC 5
*Q100 = 9.02 CFS

POC 3
*Q100 = 7.36 CFS

## LEGEND

- WATERSHED BOUNDARY
- PATH OF TC
- POINT OF COMPLIANCE — POC 1
- FLOW PATH
- JUNCTION/LINK NODE — J# | L#
- BASIN INFORMATION — BASIN | AC | Q100 CFS

## NOTE:

*PEAK FLOW AT EACH POC ACCOUNTS FOR ROUTING TIME

N

0 25 50 100 150
( IN FEET )
1 inch = 50 ft.

# SUMMIT ESTATES
# EXISTING DRAINAGE AREAS

SCALE: 1" = 50'
DRAWN BY: LZ
DATE: 4/10/2020
CHECKED BY: GP
JOB NO.: 1599.10
SHEET: 1 OF 2

latitude 33
PLANNING & ENGINEERING
9668 Hibert Street 2nd Floor, San Diego, CA 92131
Tel 858.751.0633

H:\1500\1599.10 – McNamara Ventures – 23 Acre Prelim Eng\Engineering\Reports\Drainage\Exhibits\Existing Conditions.dwg
4/14/2020 9:23:28 AM

E6
10.3
22.93
AC
CFS

## LEGEND

WATERSHED BOUNDARY

PATH OF TC

POINT OF COMPLIANCE — POC 1

FLOW PATH

JUNCTION/LINK NODE — J#  L#

BASIN INFORMATION — BASIN, AC, Q100, CFS

N

0 25 50 100 150

( IN FEET )
1 inch = 50 ft.

# SUMMIT ESTATES
# EXISTING DRAINAGE AREAS

SCALE: 1" = 50'
DRAWN BY: LZ
DATE: 4/10/2020
CHECKED BY: GP
JOB NO.: 1599.10
SHEET: 2 OF 2

latitude 33
PLANNING & ENGINEERING
9668 Hibert Street, 2nd Floor, San Diego, CA 92131
Tel 858.751.0633

Existing Conditions

Autodesk® Storm and Sanitary Analysis 2016 - Version 12.0.42 (Build 0)

---

**********
Project Description
**********
File Name ..... Existing.SPF
Description ..... H:\1500\1599.10 - McNamara Ventures - 23 Acre Prelim Eng\Engineering\Reports\Drainage\SSA\Existing Parcels.dwg

**********
Analysis Options
**********
Flow Units ..... cfs
Subbasin Hydrograph Method. Rational
Time of Concentration..... User-Defined
Return Period..... 100-year, P6=3.5
Link Routing Method ..... Hydrodynamic
Storage Node Exfiltration.. Constant flow
Starting Date ..... MAY-23-2019 00:00:00
Ending Date ..... MAY-23-2019 04:00:00
Report Time Step ..... 00:00:10

**********
Element Count
**********
Number of subbasins ..... 6
Number of nodes ..... 7
Number of links ..... 2

**********

Subbasin Summary

| Subbasin ID | Total Area acres |
|---|---|
| {Site 1}.E1 | 8.45 |
| {Site 1}.E2 | 5.32 |
| {Site 1}.E3 | 3.48 |
| {Site 1}.E4 | 1.60 |
| E5 | 4.51 |
| E6 | 10.30 |

Node Summary

| Node ID | Element Type | Invert Elevation ft | Maximum Elev. ft | Ponded Area ft² | External Inflow |
|---|---|---|---|---|---|
| J01 | JUNCTION | 776.50 | 778.50 | 0.00 | |
| J02 | JUNCTION | 786.70 | 788.70 | 0.00 | |
| POC01 | OUTFALL | 685.00 | 685.00 | 0.00 | |
| POC02 | OUTFALL | 774.50 | 775.67 | 0.00 | |
| POC03 | OUTFALL | 785.00 | 785.00 | 0.00 | |
| POC04 | OUTFALL | 783.70 | 784.87 | 0.00 | |
| POC05 | OUTFALL | 684.00 | 684.00 | 0.00 | |

Link Summary

| Link ID | From Node | To Node | Element Type | Length ft | Slope % | Manning's Roughness |
|---|---|---|---|---|---|---|
| Link-01 | J01 | POC02 | CONDUIT | 40.6 | 4.9261 | 0.0220 |
| Link-02 | J02 | POC04 | CONDUIT | 60.1 | 4.9917 | 0.0220 |

**********
Cross Section Summary
**********

| Link ID | Shape | Depth/ Diameter ft | Width ft | No. of Barrels | Cross Sectional Area ft² | Full Flow Hydraulic Radius ft | Design Flow Capacity cfs |
|---|---|---|---|---|---|---|---|
| Link-01 | ARCH | 1.17 | 1.83 | 1 | 1.69 | 0.35 | 12.52 |
| Link-02 | ARCH | 1.17 | 1.83 | 1 | 1.69 | 0.35 | 12.61 |

| ********** Runoff Quantity Continuity ********** | Volume acre-ft | Depth inches |
|---|---|---|
| Total Precipitation ..... | 2.709 | 0.966 |
| Continuity Error (%) ..... | 0.643 | |

| ********** Flow Routing Continuity ********** | Volume acre-ft | Volume Mgallons |
|---|---|---|
| External Inflow ..... | 0.000 | 0.000 |
| External Outflow ..... | 0.966 | 0.315 |
| Initial Stored Volume .... | 0.000 | 0.000 |
| Final Stored Volume ..... | 0.000 | 0.000 |
| Continuity Error (%) ..... | 0.000 | |

**********
Runoff Coefficient Computations Report
**********

---
Subbasin {Site 1}.E1
---

| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 8.45 | - | 0.35 |
| Composite Area & Weighted Runoff Coeff. | 8.45 | | 0.35 |

---
Subbasin {Site 1}.E2
---

| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 0.21 | - | 0.90 |
| - | 2.66 | - | 0.35 |
| - | 2.45 | - | 0.30 |
| Composite Area & Weighted Runoff Coeff. | 5.32 | | 0.35 |

---
Subbasin {Site 1}.E3
---

| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 0.10 | - | 0.90 |
| - | 3.38 | - | 0.35 |
| Composite Area & Weighted Runoff Coeff. | 3.48 | | 0.37 |

---
Subbasin {Site 1}.E4
---

| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 0.11 | - | 0.90 |
| - | 0.29 | - | 0.30 |
| - | 1.20 | - | 0.35 |
| Composite Area & Weighted Runoff Coeff. | 1.60 | | 0.38 |

---
Subbasin E5
---

| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 4.51 | - | 0.35 |
| Composite Area & Weighted Runoff Coeff. | 4.51 | | 0.35 |

---
Subbasin E6
---

| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 0.31 | - | 0.90 |
| - | 9.99 | - | 0.35 |
| Composite Area & Weighted Runoff Coeff. | 10.30 | | 0.37 |

**********
Subbasin Runoff Summary
**********

| Subbasin ID | Accumulated Precip in | Rainfall Intensity in/hr | Total Runoff in | Peak Runoff cfs | Weighted Runoff Coeff | Time of Concentration days | Time of Concentration hh:mm:ss |
|---|---|---|---|---|---|---|---|
| {Site 1}.E1 | 0.92 | 6.76 | 0.32 | 19.98 | 0.350 | 0 | 00:08:06 |
| {Site 1}.E2 | 1.01 | 5.68 | 0.35 | 10.58 | 0.350 | 0 | 00:10:36 |
| {Site 1}.E3 | 1.00 | 5.72 | 0.37 | 7.36 | 0.370 | 0 | 00:10:30 |
| {Site 1}.E4 | 0.87 | 7.42 | 0.33 | 4.51 | 0.380 | 0 | 00:07:00 |
| E5 | 1.00 | 5.72 | 0.35 | 9.02 | 0.350 | 0 | 00:10:30 |
| E6 | 0.97 | 6.02 | 0.36 | 22.93 | 0.370 | 0 | 00:09:42 |

**********

Node Depth Summary
**********

| Node ID | Average Depth Attained ft | Maximum Depth Attained ft | Maximum HGL Attained ft | Time of Max Occurrence days | Time of Max Occurrence hh:mm | Total Flooded Volume acre-in | Total Time Flooded minutes | Retention Time hh:mm:ss |
|---|---|---|---|---|---|---|---|---|
| J01 | 0.05 | 0.97 | 777.47 | 0 | 00:10 | 0 | 0 | 0:00:00 |
| J02 | 0.02 | 0.46 | 787.16 | 0 | 00:07 | 0 | 0 | 0:00:00 |
| POC01 | 0.00 | 0.00 | 685.00 | 0 | 00:00 | 0 | 0 | 0:00:00 |
| POC02 | 0.04 | 0.77 | 775.27 | 0 | 00:10 | 0 | 0 | 0:00:00 |
| POC03 | 0.00 | 0.00 | 785.00 | 0 | 00:00 | 0 | 0 | 0:00:00 |
| POC04 | 0.02 | 0.43 | 784.13 | 0 | 00:07 | 0 | 0 | 0:00:00 |
| POC05 | 0.00 | 0.00 | 684.00 | 0 | 00:00 | 0 | 0 | 0:00:00 |

**********
Node Flow Summary
**********

| Node ID | Element Type | Maximum Lateral Inflow cfs | Peak Inflow cfs | Time of Peak Inflow Occurrence days | Time of Peak Inflow Occurrence hh:mm | Maximum Flooding Overflow cfs | Time of Peak Flooding Occurrence days | Time of Peak Flooding Occurrence hh:mm |
|---|---|---|---|---|---|---|---|---|
| J01 | JUNCTION | 10.57 | 10.57 | 0 | 00:10 | 0.00 | | |
| J02 | JUNCTION | 4.51 | 4.51 | 0 | 00:07 | 0.00 | | |
| POC01 | OUTFALL | 39.35 | 39.35 | 0 | 00:08 | 0.00 | | |
| POC02 | OUTFALL | 0.00 | 10.55 | 0 | 00:10 | 0.00 | | |
| POC03 | OUTFALL | 7.36 | 7.36 | 0 | 00:10 | 0.00 | | |
| POC04 | OUTFALL | 0.00 | 4.49 | 0 | 00:07 | 0.00 | | |
| POC05 | OUTFALL | 9.02 | 9.02 | 0 | 00:10 | 0.00 | | |

**********

Outfall Loading Summary
**********

| Outfall Node ID | Flow Frequency (%) | Average Flow cfs | Peak Inflow cfs |
|---|---|---|---|
| POC01 | 8.05 | 19.90 | 39.35 |
| POC02 | 9.78 | 4.81 | 10.55 |
| POC03 | 8.75 | 3.68 | 7.36 |
| POC04 | 6.89 | 1.91 | 4.49 |
| POC05 | 8.75 | 4.51 | 9.02 |
| System | 8.44 | 34.82 | 66.68 |

**********
Link Flow Summary
**********

| Link ID | Element Type | Time of Peak Flow Occurrence days hh:mm | Maximum Velocity Attained ft/sec | Length Factor | Peak Flow during Analysis cfs | Design Flow Capacity cfs | Ratio of Maximum /Design Flow | Ratio of Maximum Flow Depth | Total Reported Condition minutes |
|---|---|---|---|---|---|---|---|---|---|
| Link-01 | CONDUIT | 0 00:10 | 7.43 | 1.00 | 10.55 | 12.52 | 0.84 | 0.74 | 0 Calculated |
| Link-02 | CONDUIT | 0 00:07 | 6.40 | 1.00 | 4.49 | 12.61 | 0.36 | 0.38 | |

```
      0  Calculated


*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.


Analysis began on:  Fri Apr 10 12:08:07 2020
Analysis ended on:  Fri Apr 10 12:08:07 2020
Total elapsed time: < 1 sec
```

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| E1 | Existing | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | |
|---|---|---|
| Flow Length, D | ft | 100 |
| Change in Elevation, ΔE | ft | 17 |
| Land Slope, S | ft/ft | 0.170 |
| Runoff Coefficient, C | | 0.35 |
| Travel Time, Ti | min | 5.3 |
| A for Ti, to calculate Tt | Ac | |
| I calculated from Ti | in/hr | |
| Q for Ti, to calculate Tt | CFS | |

Ti (min) = 5.3

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | |
|---|---|---|
| Flow Length, D | ft | 800 |
| Change in Elevation, ΔE | ft | 110 |
| Travel Time, Ti | hr | 0.048 |

Tt (min) = 2.9

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Land Slope, S | ft/ft | |
| Manning's n | | |
| Q from Ti | CFS | |
| R | ft | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Street Grade | % | |
| Q from Ti | CFS | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

Combined Travel Time, $T_t$ (min) = 2.9

**Time of Concetration, $T_c$ (min) = *8.1***

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| E2 | Existing | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | | | |
|---|---|---|---|---|
| Flow Length, D | ft | 100 | | |
| Change in Elevation, ΔE | ft | 4.5 | | |
| Land Slope, S | ft/ft | 0.045 | | |
| Runoff Coefficient, C | | 0.35 | | |
| Travel Time, Ti | min | 8.2 | Ti (min) = | 8.2 |
| A for Ti, to calculate Tt | Ac | | | |
| I calculated from Ti | in/hr | | | |
| Q for Ti, to calculate Tt | CFS | | | |

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | | | |
|---|---|---|---|---|
| Flow Length, D | ft | 590 | | |
| Change in Elevation, ΔE | ft | 71 | | |
| Travel Time, Ti | hr | 0.040 | Tt (min) = | 2.4 |

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | | | |
|---|---|---|---|---|
| Flow Length, D | ft | | | |
| Change in Elevation, ΔE | ft | | | |
| Land Slope, S | ft/ft | | | |
| Manning's n | | | | |
| Q from Ti | CFS | | | |
| R | ft | | | |
| Velocity | ft/sec | | | |
| Travel Time, Ti | min | | Tt (min) = | |

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | | | |
|---|---|---|---|---|
| Flow Length, D | ft | | | |
| Change in Elevation, ΔE | ft | | | |
| Street Grade | % | | | |
| Q from Ti | CFS | | | |
| Velocity | ft/sec | | | |
| Travel Time, Ti | min | | Tt (min) = | |

Combined Travel Time, $T_t$ (min) = 2.400

**Time of Concetration, $T_c$ (min) =** ***10.6***

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| E3 | Existing | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | |
|---|---|---|
| Flow Length, D | ft | 100 |
| Change in Elevation, ΔE | ft | 4.5 |
| Land Slope, S | ft/ft | 0.045 |
| Runoff Coefficient, C | | 0.37 |
| Travel Time, Ti | min | 8.0 |
| A for Ti, to calculate Tt | Ac | |
| I calculated from Ti | in/hr | |
| Q for Ti, to calculate Tt | CFS | |

Ti (min) = 8.0

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | |
|---|---|---|
| Flow Length, D | ft | 580 |
| Change in Elevation, ΔE | ft | 61 |
| Travel Time, Ti | hr | 0.042 |

Tt (min) = 2.5

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Land Slope, S | ft/ft | |
| Manning's n | | |
| Q from Ti | CFS | |
| R | ft | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Street Grade | % | |
| Q from Ti | CFS | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

Combined Travel Time, $T_t$ (min) = 2.495

**Time of Concetration, $T_c$ (min) = *10.5***

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| E4 | Existing | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | |
|---|---|---|
| Flow Length, D | ft | 100 |
| Change in Elevation, ΔE | ft | 16 |
| Land Slope, S | ft/ft | 0.160 |
| Runoff Coefficient, C | | 0.38 |
| Travel Time, Ti | min | 5.1 |
| A for Ti, to calculate Tt | Ac | 1.600 |
| I calculated from Ti | in/hr | 9.1 |
| Q for Ti, to calculate Tt | CFS | 5.51 |

Ti (min) = 5.1

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | |
|---|---|---|
| Flow Length, D | ft | 250 |
| Change in Elevation, ΔE | ft | 48 |
| Travel Time, Ti | hr | 0.017 |

Tt (min) = 1.0

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Land Slope, S | ft/ft | |
| Manning's n | | |
| Q from Ti | CFS | |
| R | ft | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | |
|---|---|---|
| Flow Length, D | ft | 100 |
| Change in Elevation, ΔE | ft | 0.5 |
| Street Grade | % | 0.005 |
| Q from Ti | CFS | 5.51 |
| Velocity | ft/sec | 2.000 |
| Travel Time, Ti | min | 0.8 |

Tt (min) = 0.833

Combined Travel Time, $T_t$ (min) = 1.868

**Time of Concetration, $T_c$ (min) = *7.0***

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| E5 | Existing | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | | | |
|---|---|---|---|---|
| Flow Length, D | ft | 100 | | |
| Change in Elevation, ΔE | ft | 10 | | |
| Land Slope, S | ft/ft | 0.100 | | |
| Runoff Coefficient, C | | 0.35 | | |
| Travel Time, Ti | min | 6.3 | Ti (min) = | 6.3 |
| A for Ti, to calculate Tt | Ac | | | |
| I calculated from Ti | in/hr | | | |
| Q for Ti, to calculate Tt | CFS | | | |

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | | | |
|---|---|---|---|---|
| Flow Length, D | ft | 1250 | | |
| Change in Elevation, ΔE | ft | 157 | | |
| Travel Time, Ti | hr | 0.070 | Tt (min) = | 4.2 |

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | | | |
|---|---|---|---|---|
| Flow Length, D | ft | | | |
| Change in Elevation, ΔE | ft | | | |
| Land Slope, S | ft/ft | | | |
| Manning's n | | | | |
| Q from Ti | CFS | | | |
| R | ft | | | |
| Velocity | ft/sec | | | |
| Travel Time, Ti | min | | Tt (min) = | |

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | | | |
|---|---|---|---|---|
| Flow Length, D | ft | | | |
| Change in Elevation, ΔE | ft | | | |
| Street Grade | % | | | |
| Q from Ti | CFS | | | |
| Velocity | ft/sec | | | |
| Travel Time, Ti | min | | Tt (min) = | |

Combined Travel Time, $T_t$ (min) = 4.2

**Time of Concetration, $T_c$ (min) = *10.5***

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| E6 | Existing | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | |
|---|---|---|
| Flow Length, D | ft | 100 |
| Change in Elevation, ΔE | ft | 15 |
| Land Slope, S | ft/ft | 0.150 |
| Runoff Coefficient, C | | 0.37 |
| Travel Time, Ti | min | 5.3 |
| A for Ti, to calculate Tt | Ac | |
| I calculated from Ti | in/hr | |
| Q for Ti, to calculate Tt | CFS | |

Ti (min) = 5.3

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | |
|---|---|---|
| Flow Length, D | ft | 1160 |
| Change in Elevation, ΔE | ft | 116 |
| Travel Time, Ti | hr | 0.072 |

Tt (min) = 4.3

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Land Slope, S | ft/ft | |
| Manning's n | | |
| Q from Ti | CFS | |
| R | ft | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Street Grade | % | |
| Q from Ti | CFS | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

Combined Travel Time, $T_t$ (min) = 4.3

**Time of Concetration, $T_c$ (min)** = ***9.7***

## Appendix B

Proposed Conditions Drainage Map and Calculations

POC 2
*Q100 = 12.47 CFS
(UNMITIGATED)

EX. CMPA PIPE TO BE REPLACED W/ 24" RCP

BMP 2 (PR-1) BIOFILTRATION BASIN

BMP 5 (PR-1) BIOFILTRATION BASIN

SUMMIT DRIVE

N59°26'36"W 629.99'

SEE SHEET 2 OF EXISTING DRAINAGE AREAS EXHIBIT

N32°17'45"E 463.82'

N52°26'58"W 581.21'

SEE SHEET 2 OF EXISTING DRAINAGE AREAS EXHIBIT

N16°38'02"W 443.92'

BMP 1 (BF-1) BIOFILTRATION BASIN

PVT DRIVEWAY

PVT STREET A

PVT STREET B

PVT STREET C

PVT STREET D

POC 1
*Q100 = 46.22 CFS
(UNMITIGATED)

S54°09'W 211.11'

POC 5
*Q100 = 7.32 CFS
(UNMITIGATED)

POC 4
*Q100 = 2.95 CFS
(UNMITIGATED)

MARY LANE

EX. CMPA PIPE TO BE REPLACED W/ 18" RCP

BMP 4 (PR-1) BIOFILTRATION BASIN

SUMMIT DRIVE

BMP 3A (PR-1) BIOFILTRATION BASIN

BMP 3B (PR-1) BIOFILTRATION BASIN

POC 3
*Q100 = 11.36 CFS
(UNMITIGATED)

N72°36'55"E 842.80'

| | AC | CFS |
|---|---|---|
| E6 | 10.30 | 22.93 |
| P1 | 0.71 | 1.44 |
| P2 | 0.07 | 0.55 |
| P3 | 0.31 | 1.07 |
| P4 | 0.31 | 1.09 |
| P5 | 0.68 | 1.89 |
| P6 | 0.29 | 0.95 |
| P7 | 0.71 | 2.92 |
| P8 | 0.38 | 1.05 |
| P9 | 1.13 | 3.13 |
| P10 | 0.47 | 1.17 |
| P11 | 0.91 | 3.02 |
| P12 | 0.08 | 0.46 |
| P13 | 0.43 | 1.39 |
| P14 | 0.27 | 1.69 |
| P15 | 0.95 | 3.44 |
| P16 | 0.05 | 0.29 |
| P17 | 0.38 | 1.36 |
| P18 | 0.47 | 1.66 |
| P19 | 1.04 | 3.67 |
| P20 | 0.30 | 1.03 |
| P21 | 0.25 | 0.87 |
| P22 | 0.28 | 0.86 |
| P23 | 0.13 | 0.82 |
| P24 | 0.46 | 1.55 |
| P25 | 1.20 | 4.49 |
| P26 | 0.18 | 0.58 |
| P27 | 0.39 | 0.64 |
| P28 | 0.28 | 0.92 |
| P29 | 2.76 | 6.28 |
| P30 | 5.75 | 3.60 |
| P31 | 0.06 | 0.19 |
| P32 | 0.13 | 0.42 |
| P33 | 0.36 | 1.10 |
| P34 | 0.24 | 0.84 |
| P35 | 0.15 | 1.12 |
| P36 | 0.30 | 2.24 |
| P37 | 0.30 | 1.68 |
| P38 | 0.19 | 1.42 |

## LEGEND

- WATERSHED BOUNDARY
- PATH OF TC
- POINT OF COMPLIANCE — POC 1
- FLOW PATH
- JUNCTION/LINK NODE — J# L#
- BASIN INFORMATION — BASIN AC Q100 CFS
- PROPOSED STORM DRAIN LINE — SD

## NOTE:

*PEAK FLOW AT EACH POC ACCOUNTS FOR ROUTING TIME

N

0 25 50 100 150

( IN FEET )
1 inch = 50 ft.

# SUMMIT ESTATES
# PROPOSED DRAINAGE AREAS

SCALE: 1" = 50'
DRAWN BY: LZ
DATE: 4/10/2020
CHECKED BY: GP
JOB NO.: 1599.10
SHEET: 1 OF 1

latitude 33
PLANNING & ENGINEERING
9668 Hibert Street 2nd Floor, San Diego, CA 92131
Tel 858.751.0633

H:\1500\1599.10 - McNamara Ventures - 23 Acre Prelim Eng\Engineering\Reports\Drainage\Exhibits\Proposed Conditions.dwg
4/14/2020 5:16:12 PM

Proposed Conditions

Autodesk® Storm and Sanitary Analysis 2016 - Version 13.2.147 (Build 0)
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**********
Project Description
**********
File Name ..... Proposed Rd2.SPF
Description ..... H:\1500\1599.10 - McNamara Ventures - 23 Acre Prelim Eng\Engineering\Reports\Drainage\SSA\Proposed Parcels.dwg

**********
Analysis Options
**********
Flow Units ..... cfs
Subbasin Hydrograph Method. Rational
Time of Concentration..... User-Defined
Return Period..... 100 year, P6=3.5
Link Routing Method ..... Hydrodynamic
Storage Node Exfiltration.. Constant flow
Starting Date ..... JUN-17-2019 00:00:00
Ending Date ..... JUN-17-2019 06:00:00
Report Time Step ..... 00:00:10

**********
Element Count
**********
Number of subbasins ..... 39
Number of nodes ..... 71
Number of links ..... 65

**********
Subbasin Summary

**********

| Subbasin ID | Total Area acres |
|---|---|
| {Site 1}.P01 | 0.71 |
| {Site 1}.P02 | 0.07 |
| {Site 1}.P03 | 0.31 |
| {Site 1}.P04 | 0.31 |
| {Site 1}.P05 | 0.68 |
| {Site 1}.P06 | 0.29 |
| {Site 1}.P07 | 0.71 |
| {Site 1}.P08 | 0.38 |
| {Site 1}.P09 | 1.13 |
| {Site 1}.P10 | 0.47 |
| {Site 1}.P11 | 0.91 |
| {Site 1}.P12 | 0.08 |
| {Site 1}.P13 | 0.43 |
| {Site 1}.P14 | 0.27 |
| {Site 1}.P15 | 0.95 |
| {Site 1}.P16 | 0.05 |
| {Site 1}.P17 | 0.38 |
| {Site 1}.P18 | 0.47 |
| {Site 1}.P19 | 1.04 |
| {Site 1}.P20 | 0.30 |
| {Site 1}.P21 | 0.25 |
| {Site 1}.P22 | 0.28 |
| {Site 1}.P23 | 0.13 |
| {Site 1}.P24 | 0.46 |
| {Site 1}.P25 | 1.20 |
| {Site 1}.P26 | 0.18 |
| {Site 1}.P27 | 0.39 |
| {Site 1}.P28 | 0.28 |
| E6 | 10.30 |
| P29 | 2.76 |
| P30 | 5.75 |
| P31 | 0.06 |
| P32 | 0.13 |

| | |
|---|---|
| P33 | 0.36 |
| P34 | 0.24 |
| P35 | 0.15 |
| P36 | 0.30 |
| P37 | 0.30 |
| P38 | 0.19 |

**********
Node Summary
**********

| Node ID | Element Type | Invert Elevation ft | Maximum Elev. ft | Ponded Area ft² | External Inflow |
|---|---|---|---|---|---|
| J01 | JUNCTION | 835.00 | 840.00 | 0.00 | |
| J02 | JUNCTION | 833.00 | 842.00 | 0.00 | |
| J03 | JUNCTION | 833.50 | 843.00 | 0.00 | |
| J04 | JUNCTION | 833.50 | 841.00 | 0.00 | |
| J06 | JUNCTION | 815.00 | 820.00 | 0.00 | |
| J07 | JUNCTION | 814.00 | 820.00 | 0.00 | |
| J08 | JUNCTION | 806.00 | 812.00 | 0.00 | |
| J09 | JUNCTION | 807.00 | 812.00 | 0.00 | |
| J10 | JUNCTION | 812.00 | 818.00 | 0.00 | |
| J11 | JUNCTION | 780.25 | 787.00 | 0.00 | |
| J14 | JUNCTION | 812.00 | 816.00 | 0.00 | |
| J15 | JUNCTION | 812.00 | 816.00 | 0.00 | |
| J16 | JUNCTION | 811.00 | 816.00 | 0.00 | |
| J17 | JUNCTION | 808.00 | 812.50 | 0.00 | |
| J18 | JUNCTION | 801.00 | 808.00 | 0.00 | |
| J19 | JUNCTION | 806.00 | 812.00 | 0.00 | |
| J20 | JUNCTION | 802.00 | 808.00 | 0.00 | |
| J21 | JUNCTION | 802.00 | 808.00 | 0.00 | |
| J22 | JUNCTION | 793.00 | 798.00 | 0.00 | |
| J23 | JUNCTION | 792.50 | 798.00 | 0.00 | |
| J24 | JUNCTION | 788.25 | 794.00 | 0.00 | |
| J26 | JUNCTION | 794.00 | 798.00 | 0.00 | |
| J27 | JUNCTION | 821.00 | 826.00 | 0.00 | |

| | | | | |
|---|---|---|---|---|
| J28 | JUNCTION | 820.00 | 825.00 | 0.00 |
| J29 | JUNCTION | 818.00 | 824.00 | 0.00 |
| J30 | JUNCTION | 818.50 | 822.00 | 0.00 |
| J31 | JUNCTION | 819.00 | 824.00 | 0.00 |
| J32 | JUNCTION | 792.50 | 798.00 | 0.00 |
| J33 | JUNCTION | 792.00 | 798.00 | 0.00 |
| J34 | JUNCTION | 790.00 | 796.00 | 0.00 |
| J35 | JUNCTION | 791.00 | 796.00 | 0.00 |
| J36 | JUNCTION | 791.00 | 796.00 | 0.00 |
| J37 | JUNCTION | 761.00 | 777.00 | 0.00 |
| J38 | JUNCTION | 767.00 | 771.00 | 0.00 |
| J39 | JUNCTION | 784.00 | 791.00 | 0.00 |
| J40 | JUNCTION | 762.50 | 768.00 | 0.00 |
| J41 | JUNCTION | 763.00 | 767.00 | 0.00 |
| J43 | JUNCTION | 759.00 | 765.00 | 0.00 |
| J44 | JUNCTION | 744.00 | 750.00 | 0.00 |
| J45 | JUNCTION | 724.00 | 730.00 | 0.00 |
| J46 | JUNCTION | 711.50 | 720.00 | 0.00 |
| J48 | JUNCTION | 777.00 | 789.00 | 0.00 |
| J49 | JUNCTION | 814.00 | 820.00 | 0.00 |
| J50 | JUNCTION | 808.00 | 814.00 | 0.00 |
| J51 | JUNCTION | 830.00 | 838.00 | 0.00 |
| J52 | JUNCTION | 814.00 | 818.00 | 0.00 |
| J53 | JUNCTION | 790.00 | 796.00 | 0.00 |
| J54 | JUNCTION | 784.40 | 790.00 | 0.00 |
| J55 | JUNCTION | 0.00 | 6.00 | 0.00 |
| J56 | JUNCTION | 800.00 | 806.00 | 0.00 |
| J57 | JUNCTION | 785.50 | 793.00 | 0.00 |
| J59 | JUNCTION | 805.00 | 810.00 | 0.00 |
| J60 | JUNCTION | 802.00 | 808.00 | 0.00 |
| J61 | JUNCTION | 789.70 | 795.70 | 0.00 |
| J62 | JUNCTION | 768.00 | 772.00 | 0.00 |
| J63 | JUNCTION | 766.00 | 778.00 | 0.00 |
| J64 | JUNCTION | 744.00 | 750.00 | 0.00 |
| J65 | JUNCTION | 724.00 | 730.00 | 0.00 |
| J66 | JUNCTION | 765.00 | 773.00 | 0.00 |
| J67 | JUNCTION | 760.00 | 768.00 | 0.00 |
| J68 | JUNCTION | 776.75 | 781.00 | 0.00 |

| | | | | |
|---|---|---|---|---|
| J69 | JUNCTION | 784.50 | 789.00 | 0.00 |
| J70 | JUNCTION | 774.90 | 778.80 | 0.00 |
| J71 | JUNCTION | 791.40 | 794.00 | 0.00 |
| J73 | JUNCTION | 686.00 | 776.00 | 0.00 |
| J76 | JUNCTION | 784.50 | 790.00 | 0.00 |
| POC01 | OUTFALL | 684.00 | 704.50 | 0.00 |
| POC02 | OUTFALL | 774.50 | 776.50 | 0.00 |
| POC03 | OUTFALL | 784.00 | 788.00 | 0.00 |
| POC04 | OUTFALL | 783.70 | 785.20 | 0.00 |
| POC05 | OUTFALL | 685.00 | 689.00 | 0.00 |

**********
Link Summary
**********

| Link ID | From Node | To Node | Element Type | Length ft | Slope % | Manning's Roughness |
|---|---|---|---|---|---|---|
| Link-01 | J01 | J02 | CONDUIT | 75.1 | 2.6631 | 0.0150 |
| Link-02 | J03 | J02 | CONDUIT | 8.1 | 6.1728 | 0.0150 |
| Link-03 | J04 | J02 | CONDUIT | 8.1 | 6.1728 | 0.0150 |
| Link-04 | J02 | J06 | CONDUIT | 105.7 | 17.0293 | 0.0150 |
| Link-06 | J06 | J07 | CONDUIT | 62.3 | 1.6051 | 0.0150 |
| Link-07 | J07 | J08 | CONDUIT | 22.8 | 35.0877 | 0.0150 |
| Link-08 | J09 | J08 | CONDUIT | 19.9 | 5.0251 | 0.0150 |
| Link-09 | J10 | J08 | CONDUIT | 29.3 | 20.4778 | 0.0150 |
| Link-10 | J08 | J11 | CONDUIT | 140.5 | 14.9466 | 0.0150 |
| Link-11 | J11 | J48 | CONDUIT | 35.0 | 9.2857 | 0.0150 |
| Link-13 | J14 | J16 | CONDUIT | 5.2 | 19.2308 | 0.0150 |
| Link-14 | J15 | J16 | CONDUIT | 14.8 | 6.7568 | 0.0150 |
| Link-15 | J16 | J17 | CONDUIT | 42.7 | 7.0208 | 0.0150 |
| Link-16 | J17 | J56 | CONDUIT | 150.9 | 5.3015 | 0.0150 |
| Link-17 | J59 | J60 | CONDUIT | 42.5 | 7.0588 | 0.0150 |
| Link-18 | J20 | J18 | CONDUIT | 14.0 | 7.1429 | 0.0150 |
| Link-19 | J21 | J18 | CONDUIT | 17.1 | 5.8480 | 0.0150 |
| Link-20 | J18 | J22 | CONDUIT | 74.6 | 10.7239 | 0.0150 |
| Link-21 | J26 | J22 | CONDUIT | 17.0 | 5.8824 | 0.0150 |
| Link-22 | J22 | J23 | CONDUIT | 3.0 | 16.6667 | 0.0150 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Link-23 | J23 | J24 | CONDUIT | 41.5 | 1.2048 | 0.0150 |
| Link-26 | J27 | J28 | CONDUIT | 45.3 | 2.2075 | 0.0150 |
| Link-27 | J28 | J29 | CONDUIT | 71.6 | 2.7933 | 0.0150 |
| Link-28 | J30 | J29 | CONDUIT | 20.6 | 2.4272 | 0.0150 |
| Link-29 | J31 | J29 | CONDUIT | 8.0 | 12.5000 | 0.0150 |
| Link-30 | J29 | J35 | CONDUIT | 165.2 | 16.3438 | 0.0150 |
| Link-31 | J35 | J34 | CONDUIT | 7.0 | 14.2857 | 0.0150 |
| Link-32 | J32 | J33 | CONDUIT | 16.9 | 2.9586 | 0.0150 |
| Link-33 | J33 | J61 | CONDUIT | 52.0 | 4.4231 | 0.0150 |
| Link-34 | J36 | J34 | CONDUIT | 17.0 | 5.8824 | 0.0150 |
| Link-35 | J34 | J37 | CONDUIT | 195.3 | 14.8490 | 0.0150 |
| Link-37 | J41 | J40 | CONDUIT | 35.0 | 1.4286 | 0.0150 |
| Link-38 | J40 | J37 | CONDUIT | 123.0 | 1.2195 | 0.0150 |
| Link-39 | J39 | J62 | CONDUIT | 30.7 | 52.1173 | 0.0150 |
| Link-41 | J37 | J43 | CONDUIT | 86.1 | 2.3229 | 0.0150 |
| Link-42 | J43 | J44 | CONDUIT | 82.8 | 18.1159 | 0.0150 |
| Link-43 | J44 | J45 | CONDUIT | 99.8 | 20.0401 | 0.0150 |
| Link-44 | J45 | J46 | CONDUIT | 68.3 | 8.7848 | 0.0150 |
| Link-48 | J24 | J76 | CONDUIT | 23.0 | 1.0870 | 0.0150 |
| Link-49 | J46 | POC01 | CONDUIT | 73.4 | 11.5804 | 0.0150 |
| Link-50 | J48 | J70 | CONDUIT | 7.3 | 28.7671 | 0.0150 |
| Link-51 | J49 | J50 | CONDUIT | 100.5 | 5.9719 | 0.0150 |
| Link-52 | J50 | J48 | CONDUIT | 122.0 | 16.3934 | 0.0150 |
| Link-54 | J51 | J52 | CONDUIT | 30.6 | 52.2876 | 0.0150 |
| Link-55 | J52 | J53 | CONDUIT | 199.0 | 12.0597 | 0.0150 |
| Link-56 | J53 | J54 | CONDUIT | 147.6 | 3.7940 | 0.0150 |
| Link-57 | J54 | POC04 | CONDUIT | 88.6 | 0.7901 | 0.0150 |
| Link-58 | J56 | J71 | CONDUIT | 119.2 | 7.2148 | 0.0150 |
| Link-61 | J19 | J59 | CONDUIT | 6.2 | 16.1290 | 0.0150 |
| Link-62 | J57 | J76 | CONDUIT | 31.7 | 3.1546 | 0.0150 |
| Link-63 | J60 | J76 | CONDUIT | 175.0 | 8.0000 | 0.0150 |
| Link-64 | J61 | J73 | CONDUIT | 117.2 | 12.5427 | 0.0150 |
| Link-65 | J62 | J38 | CONDUIT | 19.5 | 5.1282 | 0.0150 |
| Link-66 | J38 | J63 | CONDUIT | 56.3 | 1.7762 | 0.0150 |
| Link-67 | J63 | J64 | CONDUIT | 168.9 | 13.0255 | 0.0150 |
| Link-68 | J64 | J65 | CONDUIT | 99.8 | 20.0401 | 0.0150 |
| Link-69 | J65 | J73 | CONDUIT | 59.2 | 3.3784 | 0.0150 |
| Link-70 | J66 | J43 | CONDUIT | 21.0 | 14.2857 | 0.0150 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Link-71 | J67 | J43 | CONDUIT | 13.0 | 7.6923 | 0.0150 |
| Link-72 | J68 | J70 | CONDUIT | 198.8 | 0.9306 | 0.0150 |
| Link-73 | J69 | J54 | CONDUIT | 2.0 | 5.0000 | 0.0150 |
| Link-74 | J70 | POC02 | CONDUIT | 43.0 | 0.9302 | 0.0150 |
| Link-75 | J71 | J57 | CONDUIT | 39.0 | 1.1538 | 0.0150 |
| Link-77 | J73 | POC05 | CONDUIT | 10.0 | 10.0000 | 0.0150 |
| Link-79 | J76 | POC03 | CONDUIT | 10.0 | 5.0000 | 0.0150 |

**********
Cross Section Summary
**********

| Link ID | Shape | Depth/ Diameter ft | Width ft | No. of Barrels | Cross Sectional Area ft² | Full Flow Hydraulic Radius ft | Design Flow Capacity cfs |
|---|---|---|---|---|---|---|---|
| Link-01 | CIRCULAR | 1.50 | 1.50 | 1 | 1.77 | 0.38 | 14.86 |
| Link-02 | CIRCULAR | 1.00 | 1.00 | 1 | 0.79 | 0.25 | 7.67 |
| Link-03 | CIRCULAR | 1.00 | 1.00 | 1 | 0.79 | 0.25 | 7.67 |
| Link-04 | CIRCULAR | 1.50 | 1.50 | 1 | 1.77 | 0.38 | 37.57 |
| Link-06 | CIRCULAR | 1.50 | 1.50 | 1 | 1.77 | 0.38 | 11.53 |
| Link-07 | CIRCULAR | 1.50 | 1.50 | 1 | 1.77 | 0.38 | 53.93 |
| Link-08 | CIRCULAR | 1.00 | 1.00 | 1 | 0.79 | 0.25 | 6.92 |
| Link-09 | CIRCULAR | 1.00 | 1.00 | 1 | 0.79 | 0.25 | 13.97 |
| Link-10 | CIRCULAR | 1.50 | 1.50 | 1 | 1.77 | 0.38 | 35.20 |
| Link-11 | CIRCULAR | 1.50 | 1.50 | 1 | 1.77 | 0.38 | 27.74 |
| Link-13 | CIRCULAR | 1.50 | 1.50 | 1 | 1.77 | 0.38 | 39.92 |
| Link-14 | CIRCULAR | 1.50 | 1.50 | 1 | 1.77 | 0.38 | 23.66 |
| Link-15 | CIRCULAR | 1.50 | 1.50 | 1 | 1.77 | 0.38 | 24.12 |
| Link-16 | CIRCULAR | 1.50 | 1.50 | 1 | 1.77 | 0.38 | 20.96 |
| Link-17 | CIRCULAR | 1.00 | 1.00 | 1 | 0.79 | 0.25 | 8.20 |
| Link-18 | CIRCULAR | 1.50 | 1.50 | 1 | 1.77 | 0.38 | 24.33 |
| Link-19 | CIRCULAR | 1.50 | 1.50 | 1 | 1.77 | 0.38 | 22.02 |
| Link-20 | CIRCULAR | 1.50 | 1.50 | 1 | 1.77 | 0.38 | 29.81 |
| Link-21 | CIRCULAR | 1.50 | 1.50 | 1 | 1.77 | 0.38 | 22.08 |
| Link-22 | CIRCULAR | 1.50 | 1.50 | 1 | 1.77 | 0.38 | 37.17 |
| Link-23 | CIRCULAR | 1.50 | 1.50 | 1 | 1.77 | 0.38 | 9.99 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Link-26 | CIRCULAR | 1.50 | 1.50 | 1 | 1.77 | 0.38 | 13.53 |
| Link-27 | CIRCULAR | 1.50 | 1.50 | 1 | 1.77 | 0.38 | 15.22 |
| Link-28 | CIRCULAR | 1.00 | 1.00 | 1 | 0.79 | 0.25 | 4.81 |
| Link-29 | CIRCULAR | 1.00 | 1.00 | 1 | 0.79 | 0.25 | 10.92 |
| Link-30 | CIRCULAR | 1.50 | 1.50 | 1 | 1.77 | 0.38 | 36.80 |
| Link-31 | CIRCULAR | 1.50 | 1.50 | 1 | 1.77 | 0.38 | 34.41 |
| Link-32 | CIRCULAR | 1.00 | 1.00 | 1 | 0.79 | 0.25 | 5.31 |
| Link-33 | CIRCULAR | 1.00 | 1.00 | 1 | 0.79 | 0.25 | 6.49 |
| Link-34 | CIRCULAR | 1.50 | 1.50 | 1 | 1.77 | 0.38 | 22.08 |
| Link-35 | CIRCULAR | 1.50 | 1.50 | 1 | 1.77 | 0.38 | 35.08 |
| Link-37 | CIRCULAR | 1.50 | 1.50 | 1 | 1.77 | 0.38 | 10.88 |
| Link-38 | CIRCULAR | 1.50 | 1.50 | 1 | 1.77 | 0.38 | 10.05 |
| Link-39 | CIRCULAR | 1.00 | 1.00 | 1 | 0.79 | 0.25 | 22.29 |
| Link-41 | CIRCULAR | 1.50 | 1.50 | 1 | 1.77 | 0.38 | 13.88 |
| Link-42 | CIRCULAR | 1.50 | 1.50 | 1 | 1.77 | 0.38 | 38.75 |
| Link-43 | CIRCULAR | 1.50 | 1.50 | 1 | 1.77 | 0.38 | 40.75 |
| Link-44 | CIRCULAR | 1.50 | 1.50 | 1 | 1.77 | 0.38 | 26.98 |
| Link-48 | CIRCULAR | 1.50 | 1.50 | 1 | 1.77 | 0.38 | 9.49 |
| Link-49 | CIRCULAR | 1.50 | 1.50 | 1 | 1.77 | 0.38 | 30.98 |
| Link-50 | CIRCULAR | 1.50 | 1.50 | 1 | 1.77 | 0.38 | 48.83 |
| Link-51 | CIRCULAR | 1.00 | 1.00 | 1 | 0.79 | 0.25 | 7.55 |
| Link-52 | CIRCULAR | 1.00 | 1.00 | 1 | 0.79 | 0.25 | 12.50 |
| Link-54 | CIRCULAR | 1.00 | 1.00 | 1 | 0.79 | 0.25 | 22.33 |
| Link-55 | CIRCULAR | 1.00 | 1.00 | 1 | 0.79 | 0.25 | 10.72 |
| Link-56 | CIRCULAR | 1.00 | 1.00 | 1 | 0.79 | 0.25 | 6.01 |
| Link-57 | CIRCULAR | 1.50 | 1.50 | 1 | 1.77 | 0.38 | 8.09 |
| Link-58 | CIRCULAR | 1.50 | 1.50 | 1 | 1.77 | 0.38 | 24.45 |
| Link-61 | CIRCULAR | 1.00 | 1.00 | 1 | 0.79 | 0.25 | 12.40 |
| Link-62 | CIRCULAR | 1.50 | 1.50 | 1 | 1.77 | 0.38 | 16.17 |
| Link-63 | CIRCULAR | 1.00 | 1.00 | 1 | 0.79 | 0.25 | 8.73 |
| Link-64 | CIRCULAR | 1.00 | 1.00 | 1 | 0.79 | 0.25 | 10.94 |
| Link-65 | CIRCULAR | 1.00 | 1.00 | 1 | 0.79 | 0.25 | 6.99 |
| Link-66 | CIRCULAR | 1.00 | 1.00 | 1 | 0.79 | 0.25 | 4.12 |
| Link-67 | CIRCULAR | 1.00 | 1.00 | 1 | 0.79 | 0.25 | 11.14 |
| Link-68 | CIRCULAR | 1.00 | 1.00 | 1 | 0.79 | 0.25 | 13.82 |
| Link-69 | CIRCULAR | 1.00 | 1.00 | 1 | 0.79 | 0.25 | 5.68 |
| Link-70 | CIRCULAR | 1.00 | 1.00 | 1 | 0.79 | 0.25 | 11.67 |
| Link-71 | CIRCULAR | 1.00 | 1.00 | 1 | 0.79 | 0.25 | 8.56 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Link-72 | CIRCULAR | 1.00 | 1.00 | 1 | 0.79 | 0.25 | 2.98 |
| Link-73 | CIRCULAR | 1.00 | 1.00 | 1 | 0.79 | 0.25 | 6.90 |
| Link-74 | CIRCULAR | 2.00 | 2.00 | 1 | 3.14 | 0.50 | 18.91 |
| Link-75 | CIRCULAR | 1.50 | 1.50 | 1 | 1.77 | 0.38 | 9.78 |
| Link-77 | CIRCULAR | 4.00 | 4.00 | 1 | 12.57 | 1.00 | 393.67 |
| Link-79 | CIRCULAR | 4.00 | 4.00 | 1 | 12.57 | 1.00 | 278.37 |

| ************************** Runoff Quantity Continuity ************************** | Volume acre-ft --------- | Depth inches ------- |
|---|---|---|
| Total Precipitation ..... | 2.608 | 0.930 |
| Continuity Error (%) ..... | 0.574 | |

| ************************** Flow Routing Continuity ************************** | Volume acre-ft --------- | Volume Mgallons --------- |
|---|---|---|
| External Inflow ..... | 0.000 | 0.000 |
| External Outflow ..... | 1.112 | 0.362 |
| Initial Stored Volume .... | 0.000 | 0.000 |
| Final Stored Volume ..... | 0.000 | 0.000 |
| Continuity Error (%) ..... | -0.000 | |

**Runoff Coefficient Computations Report**

Subbasin {Site 1}.P01

| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 0.35 | - | 0.35 |
| - | 0.35 | - | 0.30 |
| Composite Area & Weighted Runoff Coeff. | 0.71 | | 0.33 |

---
Subbasin {Site 1}.P02
---

| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 0.06 | - | 0.90 |
| - | 0.01 | - | 0.35 |
| Composite Area & Weighted Runoff Coeff. | 0.07 | | 0.85 |

---
Subbasin {Site 1}.P03
---

| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 0.31 | - | 0.57 |
| Composite Area & Weighted Runoff Coeff. | 0.31 | | 0.57 |

---
Subbasin {Site 1}.P04
---

| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 0.31 | - | 0.57 |
| Composite Area & Weighted Runoff Coeff. | 0.31 | | 0.57 |

---
Subbasin {Site 1}.P05
---

| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 0.68 | - | 0.35 |
| Composite Area & Weighted Runoff Coeff. | 0.68 | | 0.35 |

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Subbasin {Site 1}.P06

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| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 0.29 | - | 0.54 |
| Composite Area & Weighted Runoff Coeff. | 0.29 | | 0.54 |

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Subbasin {Site 1}.P07

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| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 0.35 | - | 0.57 |
| - | 0.28 | - | 0.90 |
| - | 0.07 | - | 0.35 |
| Composite Area & Weighted Runoff Coeff. | 0.71 | | 0.68 |

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Subbasin {Site 1}.P08

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| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 0.38 | - | 0.54 |
| Composite Area & Weighted Runoff Coeff. | 0.38 | | 0.54 |

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Subbasin {Site 1}.P09

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| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 1.13 | - | 0.30 |
| Composite Area & Weighted Runoff Coeff. | 1.13 | | 0.30 |

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Subbasin {Site 1}.P10

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| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 0.47 | - | 0.30 |
| Composite Area & Weighted Runoff Coeff. | 0.47 | | 0.30 |

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Subbasin {Site 1}.P11

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| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 0.73 | - | 0.57 |
| - | 0.09 | - | 0.90 |
| - | 0.09 | - | 0.35 |
| Composite Area & Weighted Runoff Coeff. | 0.91 | | 0.58 |

---

Subbasin {Site 1}.P12

---

| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 0.04 | - | 0.90 |
| - | 0.04 | - | 0.35 |
| Composite Area & Weighted Runoff Coeff. | 0.08 | | 0.63 |

---

Subbasin {Site 1}.P13

---

| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 0.43 | - | 0.35 |
| Composite Area & Weighted Runoff Coeff. | 0.43 | | 0.35 |

---

Subbasin {Site 1}.P14

---

| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 0.16 | - | 0.90 |
| - | 0.11 | - | 0.35 |
| Composite Area & Weighted Runoff Coeff. | 0.27 | | 0.68 |

---

Subbasin {Site 1}.P15

---

| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 0.14 | - | 0.90 |
| - | 0.14 | - | 0.35 |
| - | 0.67 | - | 0.57 |
| Composite Area & Weighted Runoff Coeff. | 0.95 | | 0.59 |

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Subbasin {Site 1}.P16

---

| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 0.03 | - | 0.35 |
| - | 0.03 | - | 0.90 |
| Composite Area & Weighted Runoff Coeff. | 0.05 | | 0.63 |

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Subbasin {Site 1}.P17

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| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|

| | | | |
|---|---|---|---|
| - | 0.25 | - | 0.57 |
| - | 0.08 | - | 0.35 |
| - | 0.06 | - | 0.90 |
| Composite Area & Weighted Runoff Coeff. | 0.38 | | 0.58 |

---
Subbasin {Site 1}.P18
---

| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 0.40 | - | 0.35 |
| - | 0.07 | - | 0.90 |
| Composite Area & Weighted Runoff Coeff. | 0.47 | | 0.43 |

---
Subbasin {Site 1}.P19
---

| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 0.62 | - | 0.57 |
| - | 0.21 | - | 0.35 |
| - | 0.21 | - | 0.90 |
| Composite Area & Weighted Runoff Coeff. | 1.04 | | 0.59 |

---
Subbasin {Site 1}.P20
---

| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 0.27 | - | 0.57 |
| - | 0.03 | - | 0.35 |
| Composite Area & Weighted Runoff Coeff. | 0.30 | | 0.55 |

---
Subbasin {Site 1}.P21

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| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 0.23 | - | 0.57 |
| - | 0.03 | - | 0.35 |
| Composite Area & Weighted Runoff Coeff. | 0.25 | | 0.55 |

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Subbasin {Site 1}.P22

---

| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 0.28 | - | 0.35 |
| Composite Area & Weighted Runoff Coeff. | 0.28 | | 0.35 |

---

Subbasin {Site 1}.P23

---

| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 0.08 | - | 0.90 |
| - | 0.05 | - | 0.35 |
| Composite Area & Weighted Runoff Coeff. | 0.13 | | 0.68 |

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Subbasin {Site 1}.P24

---

| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 0.07 | - | 0.90 |
| - | 0.12 | - | 0.35 |
| - | 0.28 | - | 0.57 |
| Composite Area & Weighted Runoff Coeff. | 0.46 | | 0.56 |

---

Subbasin {Site 1}.P25

---

| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 0.12 | - | 0.35 |
| - | 0.84 | - | 0.57 |
| - | 0.24 | - | 0.90 |
| Composite Area & Weighted Runoff Coeff. | 1.20 | | 0.61 |

---

Subbasin {Site 1}.P26

---

| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 0.18 | - | 0.35 |
| Composite Area & Weighted Runoff Coeff. | 0.18 | | 0.35 |

---

Subbasin {Site 1}.P27

---

| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 0.39 | - | 0.35 |
| Composite Area & Weighted Runoff Coeff. | 0.39 | | 0.35 |

---

Subbasin {Site 1}.P28

---

| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 0.24 | - | 0.57 |
| - | 0.04 | - | 0.35 |
| Composite Area & Weighted Runoff Coeff. | 0.28 | | 0.54 |

---
Subbasin E6
---

| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 10.30 | - | 0.37 |
| Composite Area & Weighted Runoff Coeff. | 10.30 | | 0.37 |

---
Subbasin P29
---

| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 2.76 | - | 0.35 |
| Composite Area & Weighted Runoff Coeff. | 2.76 | | 0.35 |

---
Subbasin P30
---

| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 5.75 | - | 0.35 |
| Composite Area & Weighted Runoff Coeff. | 5.75 | | 0.35 |

---
Subbasin P31
---

| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 0.06 | - | 0.35 |
| Composite Area & Weighted Runoff Coeff. | 0.06 | | 0.35 |

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Subbasin P32

| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 0.13 | - | 0.35 |
| Composite Area & Weighted Runoff Coeff. | 0.13 | | 0.35 |

Subbasin P33

| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 0.18 | - | 0.30 |
| - | 0.18 | - | 0.35 |
| Composite Area & Weighted Runoff Coeff. | 0.36 | | 0.33 |

Subbasin P34

| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 0.22 | - | 0.57 |
| - | 0.02 | - | 0.35 |
| Composite Area & Weighted Runoff Coeff. | 0.24 | | 0.55 |

Subbasin P35

| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 0.13 | - | 0.90 |
| - | 0.02 | - | 0.30 |
| Composite Area & Weighted Runoff Coeff. | 0.15 | | 0.81 |

---
Subbasin P36
---

| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 0.26 | - | 0.90 |
| - | 0.04 | - | 0.30 |
| Composite Area & Weighted Runoff Coeff. | 0.30 | | 0.81 |

---
Subbasin P37
---

| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 0.26 | - | 0.90 |
| - | 0.04 | - | 0.30 |
| Composite Area & Weighted Runoff Coeff. | 0.30 | | 0.81 |

---
Subbasin P38
---

| Soil/Surface Description | Area (acres) | Soil Group | Runoff Coeff. |
|---|---|---|---|
| - | 0.16 | - | 0.90 |
| - | 0.03 | - | 0.30 |
| Composite Area & Weighted Runoff Coeff. | 0.19 | | 0.81 |

**********
Subbasin Runoff Summary
**********

| Subbasin ID | Accumulated Precip in | Rainfall Intensity in/hr | Total Runoff in | Peak Runoff cfs | Weighted Runoff Coeff | Time of Concentration days | Time of Concentration hh:mm:ss |
|---|---|---|---|---|---|---|---|

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| {Site 1}.P01 | 0.96 | 6.14 | 0.32 | 1.44 | 0.330 | 0 | 00:09:24 |
| {Site 1}.P02 | 0.77 | 9.22 | 0.65 | 0.55 | 0.850 | 0 | 00:05:00 |
| {Site 1}.P03 | 0.98 | 6.06 | 0.56 | 1.07 | 0.570 | 0 | 00:09:36 |
| {Site 1}.P04 | 0.96 | 6.18 | 0.55 | 1.09 | 0.570 | 0 | 00:09:18 |
| {Site 1}.P05 | 0.84 | 7.94 | 0.29 | 1.89 | 0.350 | 0 | 00:06:18 |
| {Site 1}.P06 | 0.98 | 6.06 | 0.53 | 0.95 | 0.540 | 0 | 00:09:36 |
| {Site 1}.P07 | 0.98 | 6.06 | 0.66 | 2.92 | 0.680 | 0 | 00:09:36 |
| {Site 1}.P08 | 1.06 | 5.13 | 0.57 | 1.05 | 0.540 | 0 | 00:12:24 |
| {Site 1}.P09 | 0.77 | 9.22 | 0.23 | 3.13 | 0.300 | 0 | 00:05:00 |
| {Site 1}.P10 | 0.81 | 8.29 | 0.24 | 1.17 | 0.300 | 0 | 00:05:54 |
| {Site 1}.P11 | 1.00 | 5.72 | 0.58 | 3.02 | 0.580 | 0 | 00:10:30 |
| {Site 1}.P12 | 0.77 | 9.22 | 0.48 | 0.46 | 0.630 | 0 | 00:05:00 |
| {Site 1}.P13 | 0.77 | 9.22 | 0.27 | 1.39 | 0.350 | 0 | 00:05:00 |
| {Site 1}.P14 | 0.77 | 9.22 | 0.52 | 1.69 | 0.680 | 0 | 00:05:00 |
| {Site 1}.P15 | 0.96 | 6.14 | 0.56 | 3.44 | 0.590 | 0 | 00:09:24 |
| {Site 1}.P16 | 0.77 | 9.22 | 0.48 | 0.29 | 0.630 | 0 | 00:05:00 |
| {Site 1}.P17 | 0.96 | 6.18 | 0.56 | 1.36 | 0.580 | 0 | 00:09:18 |
| {Site 1}.P18 | 0.82 | 8.20 | 0.35 | 1.66 | 0.430 | 0 | 00:06:00 |
| {Site 1}.P19 | 0.98 | 5.98 | 0.58 | 3.67 | 0.590 | 0 | 00:09:48 |
| {Site 1}.P20 | 0.95 | 6.22 | 0.52 | 1.03 | 0.550 | 0 | 00:09:12 |
| {Site 1}.P21 | 0.94 | 6.36 | 0.51 | 0.87 | 0.550 | 0 | 00:08:54 |
| {Site 1}.P22 | 0.78 | 8.77 | 0.27 | 0.86 | 0.350 | 0 | 00:05:24 |
| {Site 1}.P23 | 0.77 | 9.22 | 0.52 | 0.82 | 0.680 | 0 | 00:05:00 |
| {Site 1}.P24 | 0.97 | 6.02 | 0.54 | 1.55 | 0.560 | 0 | 00:09:42 |
| {Site 1}.P25 | 0.96 | 6.14 | 0.58 | 4.49 | 0.610 | 0 | 00:09:24 |
| {Site 1}.P26 | 0.77 | 9.22 | 0.27 | 0.58 | 0.350 | 0 | 00:05:00 |
| {Site 1}.P27 | 1.11 | 4.70 | 0.39 | 0.64 | 0.350 | 0 | 00:14:12 |
| {Site 1}.P28 | 0.98 | 6.06 | 0.53 | 0.92 | 0.540 | 0 | 00:09:36 |
| E6 | 0.97 | 6.02 | 0.36 | 22.93 | 0.370 | 0 | 00:09:42 |
| P29 | 0.94 | 6.50 | 0.33 | 6.28 | 0.350 | 0 | 00:08:36 |
| P30 | 0.92 | 6.76 | 0.32 | 13.60 | 0.350 | 0 | 00:08:06 |
| P31 | 0.77 | 9.22 | 0.27 | 0.19 | 0.350 | 0 | 00:05:00 |
| P32 | 0.77 | 9.22 | 0.27 | 0.42 | 0.350 | 0 | 00:05:00 |
| P33 | 0.77 | 9.22 | 0.25 | 1.10 | 0.330 | 0 | 00:05:00 |
| P34 | 0.94 | 6.36 | 0.51 | 0.84 | 0.550 | 0 | 00:08:54 |
| P35 | 0.77 | 9.22 | 0.62 | 1.12 | 0.810 | 0 | 00:05:00 |
| P36 | 0.77 | 9.22 | 0.62 | 2.24 | 0.810 | 0 | 00:05:00 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| P37 | 0.90 | 6.92 | 0.73 | 1.68 | 0.810 | 0 | 00:07:48 |
| P38 | 0.77 | 9.22 | 0.62 | 1.42 | 0.810 | 0 | 00:05:00 |

**********
Node Depth Summary
**********

| Node ID | Average Depth Attained ft | Maximum Depth Attained ft | Maximum HGL Attained ft | Time of Max Occurrence days | Time of Max Occurrence hh:mm | Total Flooded Volume acre-in | Total Flooded Time minutes | Retention Time hh:mm:ss |
|---|---|---|---|---|---|---|---|---|
| J01 | 0.01 | 0.20 | 835.20 | 0 | 00:05 | 0 | 0 | 0:00:00 |
| J02 | 0.02 | 0.25 | 833.25 | 0 | 00:09 | 0 | 0 | 0:00:00 |
| J03 | 0.02 | 0.35 | 833.85 | 0 | 00:09 | 0 | 0 | 0:00:00 |
| J04 | 0.02 | 0.34 | 833.84 | 0 | 00:09 | 0 | 0 | 0:00:00 |
| J06 | 0.04 | 0.50 | 815.50 | 0 | 00:09 | 0 | 0 | 0:00:00 |
| J07 | 0.02 | 0.34 | 814.34 | 0 | 00:09 | 0 | 0 | 0:00:00 |
| J08 | 0.03 | 0.47 | 806.47 | 0 | 00:10 | 0 | 0 | 0:00:00 |
| J09 | 0.02 | 0.29 | 807.29 | 0 | 00:12 | 0 | 0 | 0:00:00 |
| J10 | 0.01 | 0.18 | 812.18 | 0 | 00:09 | 0 | 0 | 0:00:00 |
| J11 | 0.04 | 0.59 | 780.84 | 0 | 00:10 | 0 | 0 | 0:00:00 |
| J14 | 0.03 | 0.43 | 812.43 | 0 | 00:10 | 0 | 0 | 0:00:00 |
| J15 | 0.01 | 0.15 | 812.15 | 0 | 00:05 | 0 | 0 | 0:00:00 |
| J16 | 0.03 | 0.40 | 811.40 | 0 | 00:10 | 0 | 0 | 0:00:00 |
| J17 | 0.03 | 0.41 | 808.41 | 0 | 00:10 | 0 | 0 | 0:00:00 |
| J18 | 0.03 | 0.36 | 801.36 | 0 | 00:09 | 0 | 0 | 0:00:00 |
| J19 | 0.01 | 0.31 | 806.31 | 0 | 00:05 | 0 | 0 | 0:00:00 |
| J20 | 0.01 | 0.32 | 802.32 | 0 | 00:05 | 0 | 0 | 0:00:00 |
| J21 | 0.03 | 0.54 | 802.54 | 0 | 00:09 | 0 | 0 | 0:00:00 |
| J22 | 0.05 | 0.82 | 793.82 | 0 | 00:09 | 0 | 0 | 0:00:00 |
| J23 | 0.06 | 0.91 | 793.41 | 0 | 00:09 | 0 | 0 | 0:00:00 |
| J24 | 0.07 | 0.98 | 789.23 | 0 | 00:09 | 0 | 0 | 0:00:00 |
| J26 | 0.02 | 0.25 | 794.25 | 0 | 00:09 | 0 | 0 | 0:00:00 |
| J27 | 0.04 | 0.62 | 821.62 | 0 | 00:10 | 0 | 0 | 0:00:00 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| J28 | 0.04 | 0.58 | 820.58 | 0 | 00:10 | 0 | 0 | 0:00:00 |
| J29 | 0.03 | 0.39 | 818.39 | 0 | 00:10 | 0 | 0 | 0:00:00 |
| J30 | 0.02 | 0.37 | 818.87 | 0 | 00:09 | 0 | 0 | 0:00:00 |
| J31 | 0.01 | 0.23 | 819.23 | 0 | 00:09 | 0 | 0 | 0:00:00 |
| J32 | 0.01 | 0.32 | 792.82 | 0 | 00:05 | 0 | 0 | 0:00:00 |
| J33 | 0.01 | 0.27 | 792.27 | 0 | 00:05 | 0 | 0 | 0:00:00 |
| J34 | 0.03 | 0.45 | 790.45 | 0 | 00:09 | 0 | 0 | 0:00:00 |
| J35 | 0.04 | 0.67 | 791.67 | 0 | 00:10 | 0 | 0 | 0:00:00 |
| J36 | 0.02 | 0.31 | 791.31 | 0 | 00:09 | 0 | 0 | 0:00:00 |
| J37 | 0.08 | 1.31 | 762.31 | 0 | 00:10 | 0 | 0 | 0:00:00 |
| J38 | 0.03 | 0.34 | 767.34 | 0 | 00:05 | 0 | 0 | 0:00:00 |
| J39 | 0.01 | 0.12 | 784.12 | 0 | 00:14 | 0 | 0 | 0:00:00 |
| J40 | 0.05 | 0.70 | 763.20 | 0 | 00:09 | 0 | 0 | 0:00:00 |
| J41 | 0.05 | 0.83 | 763.83 | 0 | 00:09 | 0 | 0 | 0:00:00 |
| J43 | 0.05 | 0.67 | 759.67 | 0 | 00:10 | 0 | 0 | 0:00:00 |
| J44 | 0.04 | 0.58 | 744.58 | 0 | 00:10 | 0 | 0 | 0:00:00 |
| J45 | 0.06 | 0.87 | 724.87 | 0 | 00:10 | 0 | 0 | 0:00:00 |
| J46 | 0.05 | 0.78 | 712.28 | 0 | 00:10 | 0 | 0 | 0:00:00 |
| J48 | 0.05 | 0.81 | 777.81 | 0 | 00:06 | 0 | 0 | 0:00:00 |
| J49 | 0.02 | 0.38 | 814.38 | 0 | 00:06 | 0 | 0 | 0:00:00 |
| J50 | 0.01 | 0.27 | 808.27 | 0 | 00:06 | 0 | 0 | 0:00:00 |
| J51 | 0.00 | 0.07 | 830.07 | 0 | 00:05 | 0 | 0 | 0:00:00 |
| J52 | 0.01 | 0.16 | 814.16 | 0 | 00:05 | 0 | 0 | 0:00:00 |
| J53 | 0.01 | 0.21 | 790.21 | 0 | 00:05 | 0 | 0 | 0:00:00 |
| J54 | 0.04 | 0.69 | 785.09 | 0 | 00:06 | 0 | 0 | 0:00:00 |
| J55 | 0.00 | 0.00 | 0.00 | 0 | 00:00 | 0 | 0 | 0:00:00 |
| J56 | 0.03 | 0.35 | 800.35 | 0 | 00:11 | 0 | 0 | 0:00:00 |
| J57 | 0.04 | 0.51 | 786.01 | 0 | 00:11 | 0 | 0 | 0:00:00 |
| J59 | 0.01 | 0.31 | 805.31 | 0 | 00:05 | 0 | 0 | 0:00:00 |
| J60 | 0.01 | 0.27 | 802.27 | 0 | 00:05 | 0 | 0 | 0:00:00 |
| J61 | 0.01 | 0.19 | 789.89 | 0 | 00:05 | 0 | 0 | 0:00:00 |
| J62 | 0.02 | 0.25 | 768.25 | 0 | 00:05 | 0 | 0 | 0:00:00 |
| J63 | 0.02 | 0.19 | 766.19 | 0 | 00:05 | 0 | 0 | 0:00:00 |
| J64 | 0.01 | 0.16 | 744.16 | 0 | 00:05 | 0 | 0 | 0:00:00 |
| J65 | 0.02 | 0.26 | 724.26 | 0 | 00:06 | 0 | 0 | 0:00:00 |
| J66 | 0.01 | 0.21 | 765.21 | 0 | 00:09 | 0 | 0 | 0:00:00 |
| J67 | 0.01 | 0.21 | 760.21 | 0 | 00:09 | 0 | 0 | 0:00:00 |
| J68 | 0.02 | 0.64 | 777.39 | 0 | 00:05 | 0 | 0 | 0:00:00 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| J69 | 0.04 | 0.72 | 785.22 | 0 | 00:08 | 0 | 0 | 0:00:00 |
| J70 | 0.10 | 1.52 | 776.42 | 0 | 00:06 | 0 | 0 | 0:00:00 |
| J71 | 0.05 | 0.66 | 792.06 | 0 | 00:11 | 0 | 0 | 0:00:00 |
| J73 | 0.02 | 0.23 | 686.23 | 0 | 00:06 | 0 | 0 | 0:00:00 |
| J76 | 0.05 | 0.70 | 785.20 | 0 | 00:09 | 0 | 0 | 0:00:00 |
| POC01 | 0.00 | 0.00 | 684.00 | 0 | 00:00 | 0 | 0 | 0:00:00 |
| POC02 | 0.08 | 1.19 | 775.69 | 0 | 00:06 | 0 | 0 | 0:00:00 |
| POC03 | 0.04 | 0.46 | 784.46 | 0 | 00:11 | 0 | 0 | 0:00:00 |
| POC04 | 0.04 | 0.63 | 784.33 | 0 | 00:06 | 0 | 0 | 0:00:00 |
| POC05 | 0.01 | 0.18 | 685.18 | 0 | 00:06 | 0 | 0 | 0:00:00 |

**********
Node Flow Summary
**********

| Node ID | Element Type | Maximum Lateral Inflow cfs | Peak Inflow cfs | Time of Peak Occurrence days | Time of Peak Occurrence hh:mm | Maximum Flooding Overflow cfs | Time of Peak Flooding Occurrence days | Time of Peak Flooding Occurrence hh:mm |
|---|---|---|---|---|---|---|---|---|
| J01 | JUNCTION | 0.55 | 0.55 | 0 | 00:05 | 0.00 | | |
| J02 | JUNCTION | 0.00 | 2.22 | 0 | 00:09 | 0.00 | | |
| J03 | JUNCTION | 1.09 | 1.09 | 0 | 00:09 | 0.00 | | |
| J04 | JUNCTION | 1.07 | 1.07 | 0 | 00:09 | 0.00 | | |
| J06 | JUNCTION | 0.00 | 2.21 | 0 | 00:09 | 0.00 | | |
| J07 | JUNCTION | 2.92 | 5.13 | 0 | 00:09 | 0.00 | | |
| J08 | JUNCTION | 0.00 | 6.89 | 0 | 00:09 | 0.00 | | |
| J09 | JUNCTION | 1.05 | 1.05 | 0 | 00:12 | 0.00 | | |
| J10 | JUNCTION | 0.95 | 0.95 | 0 | 00:09 | 0.00 | | |
| J11 | JUNCTION | 0.00 | 6.86 | 0 | 00:10 | 0.00 | | |
| J14 | JUNCTION | 3.02 | 3.02 | 0 | 00:10 | 0.00 | | |
| J15 | JUNCTION | 0.46 | 0.46 | 0 | 00:05 | 0.00 | | |
| J16 | JUNCTION | 0.00 | 3.02 | 0 | 00:10 | 0.00 | | |
| J17 | JUNCTION | 0.00 | 3.02 | 0 | 00:10 | 0.00 | | |
| J18 | JUNCTION | 0.00 | 3.67 | 0 | 00:09 | 0.00 | | |
| J19 | JUNCTION | 1.39 | 1.39 | 0 | 00:05 | 0.00 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| J20 | JUNCTION | 1.69 | 1.69 | 0 | 00:05 | 0.00 |
| J21 | JUNCTION | 3.44 | 3.44 | 0 | 00:09 | 0.00 |
| J22 | JUNCTION | 0.00 | 5.03 | 0 | 00:09 | 0.00 |
| J23 | JUNCTION | 0.29 | 5.04 | 0 | 00:09 | 0.00 |
| J24 | JUNCTION | 0.00 | 5.04 | 0 | 00:09 | 0.00 |
| J26 | JUNCTION | 1.36 | 1.36 | 0 | 00:09 | 0.00 |
| J27 | JUNCTION | 3.67 | 3.67 | 0 | 00:10 | 0.00 |
| J28 | JUNCTION | 0.00 | 3.66 | 0 | 00:10 | 0.00 |
| J29 | JUNCTION | 0.00 | 5.34 | 0 | 00:10 | 0.00 |
| J30 | JUNCTION | 1.03 | 1.03 | 0 | 00:09 | 0.00 |
| J31 | JUNCTION | 0.87 | 0.87 | 0 | 00:09 | 0.00 |
| J32 | JUNCTION | 0.86 | 0.86 | 0 | 00:05 | 0.00 |
| J33 | JUNCTION | 0.00 | 0.85 | 0 | 00:05 | 0.00 |
| J34 | JUNCTION | 0.00 | 6.87 | 0 | 00:09 | 0.00 |
| J35 | JUNCTION | 0.82 | 5.33 | 0 | 00:10 | 0.00 |
| J36 | JUNCTION | 1.55 | 1.55 | 0 | 00:09 | 0.00 |
| J37 | JUNCTION | 0.00 | 11.25 | 0 | 00:09 | 0.00 |
| J38 | JUNCTION | 0.00 | 0.80 | 0 | 00:05 | 0.00 |
| J39 | JUNCTION | 0.64 | 0.64 | 0 | 00:14 | 0.00 |
| J40 | JUNCTION | 0.00 | 4.48 | 0 | 00:09 | 0.00 |
| J41 | JUNCTION | 4.49 | 4.49 | 0 | 00:09 | 0.00 |
| J43 | JUNCTION | 0.00 | 12.67 | 0 | 00:10 | 0.00 |
| J44 | JUNCTION | 0.00 | 12.67 | 0 | 00:10 | 0.00 |
| J45 | JUNCTION | 0.00 | 12.67 | 0 | 00:10 | 0.00 |
| J46 | JUNCTION | 0.00 | 12.66 | 0 | 00:10 | 0.00 |
| J48 | JUNCTION | 3.90 | 9.89 | 0 | 00:06 | 0.00 |
| J49 | JUNCTION | 1.89 | 1.89 | 0 | 00:06 | 0.00 |
| J50 | JUNCTION | 0.00 | 1.88 | 0 | 00:06 | 0.00 |
| J51 | JUNCTION | 0.19 | 0.19 | 0 | 00:05 | 0.00 |
| J52 | JUNCTION | 0.42 | 0.61 | 0 | 00:05 | 0.00 |
| J53 | JUNCTION | 0.00 | 0.59 | 0 | 00:05 | 0.00 |
| J54 | JUNCTION | 1.17 | 2.96 | 0 | 00:06 | 0.00 |
| J55 | JUNCTION | 0.00 | 0.00 | 0 | 00:00 | 0.00 |
| J56 | JUNCTION | 0.00 | 3.00 | 0 | 00:10 | 0.00 |
| J57 | JUNCTION | 0.00 | 2.95 | 0 | 00:11 | 0.00 |
| J59 | JUNCTION | 0.00 | 1.38 | 0 | 00:05 | 0.00 |
| J60 | JUNCTION | 0.00 | 1.38 | 0 | 00:05 | 0.00 |
| J61 | JUNCTION | 0.00 | 0.85 | 0 | 00:05 | 0.00 |

| | | | | | | |
|---|---|---|---|---|---|---|
| J62 | JUNCTION | 0.58 | 0.81 | 0 | 00:05 | 0.00 |
| J63 | JUNCTION | 0.00 | 0.79 | 0 | 00:05 | 0.00 |
| J64 | JUNCTION | 0.00 | 0.79 | 0 | 00:05 | 0.00 |
| J65 | JUNCTION | 0.00 | 0.78 | 0 | 00:05 | 0.00 |
| J66 | JUNCTION | 0.92 | 0.92 | 0 | 00:09 | 0.00 |
| J67 | JUNCTION | 0.84 | 0.84 | 0 | 00:09 | 0.00 |
| J68 | JUNCTION | 2.24 | 2.24 | 0 | 00:05 | 0.00 |
| J69 | JUNCTION | 1.68 | 1.68 | 0 | 00:08 | 0.00 |
| J70 | JUNCTION | 1.12 | 12.48 | 0 | 00:06 | 0.00 |
| J71 | JUNCTION | 0.00 | 2.98 | 0 | 00:11 | 0.00 |
| J73 | JUNCTION | 0.00 | 1.59 | 0 | 00:06 | 0.00 |
| J76 | JUNCTION | 0.00 | 7.95 | 0 | 00:09 | 0.00 |
| POC01 | OUTFALL | 34.03 | 46.22 | 0 | 00:09 | 0.00 |
| POC02 | OUTFALL | 0.00 | 12.47 | 0 | 00:06 | 0.00 |
| POC03 | OUTFALL | 3.89 | 11.36 | 0 | 00:06 | 0.00 |
| POC04 | OUTFALL | 0.00 | 2.95 | 0 | 00:06 | 0.00 |
| POC05 | OUTFALL | 6.28 | 7.32 | 0 | 00:08 | 0.00 |

**********
Outfall Loading Summary
**********

| Outfall Node ID | Flow Frequency (%) | Average Flow cfs | Peak Inflow cfs |
|---|---|---|---|
| POC01 | 15.78 | 15.26 | 46.22 |
| POC02 | 14.45 | 4.70 | 12.47 |
| POC03 | 14.19 | 4.30 | 11.36 |
| POC04 | 11.58 | 1.05 | 2.95 |
| POC05 | 15.26 | 2.39 | 7.32 |
| System | 14.25 | 27.70 | 74.59 |

**********

## Link Flow Summary

| Link ID | Element Type | Time of Peak Flow Occurrence days | Time of Peak Flow Occurrence hh:mm | Maximum Velocity Attained ft/sec | Length Factor | Peak Flow during Analysis cfs | Design Flow Capacity cfs | Ratio of Maximum /Design Flow | Ratio of Maximum Flow Depth | Total Time Surcharged minutes | Reported Condition |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Link-01 | CONDUIT | 0 | 00:05 | 3.67 | 1.00 | 0.54 | 14.86 | 0.04 | 0.14 | 0 | Calculated |
| Link-02 | CONDUIT | 0 | 00:09 | 5.59 | 1.00 | 1.09 | 7.67 | 0.14 | 0.30 | 0 | Calculated |
| Link-03 | CONDUIT | 0 | 00:09 | 5.55 | 1.00 | 1.07 | 7.67 | 0.14 | 0.29 | 0 | Calculated |
| Link-04 | CONDUIT | 0 | 00:09 | 6.83 | 1.00 | 2.21 | 37.57 | 0.06 | 0.25 | 0 | Calculated |
| Link-06 | CONDUIT | 0 | 00:09 | 5.40 | 1.00 | 2.21 | 11.53 | 0.19 | 0.28 | 0 | Calculated |
| Link-07 | CONDUIT | 0 | 00:09 | 13.17 | 1.00 | 5.12 | 53.93 | 0.10 | 0.27 | 0 | Calculated |
| Link-08 | CONDUIT | 0 | 00:12 | 5.02 | 1.00 | 1.05 | 6.92 | 0.15 | 0.36 | 0 | Calculated |
| Link-09 | CONDUIT | 0 | 00:09 | 4.29 | 1.00 | 0.95 | 13.97 | 0.07 | 0.32 | 0 | Calculated |
| Link-10 | CONDUIT | 0 | 00:10 | 14.86 | 1.00 | 6.86 | 35.20 | 0.19 | 0.31 | 0 | Calculated |
| Link-11 | CONDUIT | 0 | 00:10 | 9.51 | 1.00 | 6.86 | 27.74 | 0.25 | 0.45 | 0 | Calculated |
| Link-13 | CONDUIT | 0 | 00:10 | 7.61 | 1.00 | 3.01 | 39.92 | 0.08 | 0.28 | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | Calculated | | | | | | | | |
| Link-14 | | CONDUIT | 0 | 00:05 | 2.77 | 1.00 | 0.46 | 23.66 | 0.02 | 0.15 |
| | 0 | Calculated | | | | | | | | |
| Link-15 | | CONDUIT | 0 | 00:10 | 7.96 | 1.00 | 3.02 | 24.12 | 0.13 | 0.27 |
| | 0 | Calculated | | | | | | | | |
| Link-16 | | CONDUIT | 0 | 00:10 | 8.54 | 1.00 | 3.00 | 20.96 | 0.14 | 0.25 |
| | 0 | Calculated | | | | | | | | |
| Link-17 | | CONDUIT | 0 | 00:05 | 7.43 | 1.00 | 1.38 | 8.20 | 0.17 | 0.29 |
| | 0 | Calculated | | | | | | | | |
| Link-18 | | CONDUIT | 0 | 00:05 | 5.73 | 1.00 | 1.69 | 24.33 | 0.07 | 0.22 |
| | 0 | Calculated | | | | | | | | |
| Link-19 | | CONDUIT | 0 | 00:09 | 7.76 | 1.00 | 3.43 | 22.02 | 0.16 | 0.30 |
| | 0 | Calculated | | | | | | | | |
| Link-20 | | CONDUIT | 0 | 00:09 | 6.34 | 1.00 | 3.67 | 29.81 | 0.12 | 0.39 |
| | 0 | Calculated | | | | | | | | |
| Link-21 | | CONDUIT | 0 | 00:09 | 3.12 | 1.00 | 1.36 | 22.08 | 0.06 | 0.36 |
| | 0 | Calculated | | | | | | | | |
| Link-22 | | CONDUIT | 0 | 00:09 | 4.90 | 1.00 | 5.01 | 37.17 | 0.13 | 0.58 |
| | 0 | Calculated | | | | | | | | |
| Link-23 | | CONDUIT | 0 | 00:09 | 5.01 | 1.00 | 5.04 | 9.99 | 0.50 | 0.55 |
| | 0 | Calculated | | | | | | | | |
| Link-26 | | CONDUIT | 0 | 00:10 | 5.54 | 1.00 | 3.66 | 13.53 | 0.27 | 0.40 |
| | 0 | Calculated | | | | | | | | |
| Link-27 | | CONDUIT | 0 | 00:10 | 7.43 | 1.00 | 3.64 | 15.22 | 0.24 | 0.32 |
| | 0 | Calculated | | | | | | | | |
| Link-28 | | CONDUIT | 0 | 00:09 | 3.80 | 1.00 | 1.02 | 4.81 | 0.21 | 0.38 |
| | 0 | Calculated | | | | | | | | |
| Link-29 | | CONDUIT | 0 | 00:09 | 4.63 | 1.00 | 0.87 | 10.92 | 0.08 | 0.30 |
| | 0 | Calculated | | | | | | | | |
| Link-30 | | CONDUIT | 0 | 00:10 | 9.64 | 1.00 | 5.33 | 36.80 | 0.14 | 0.35 |
| | 0 | Calculated | | | | | | | | |
| Link-31 | | CONDUIT | 0 | 00:10 | 8.90 | 1.00 | 5.32 | 34.41 | 0.15 | 0.37 |
| | 0 | Calculated | | | | | | | | |
| Link-32 | | CONDUIT | 0 | 00:05 | 4.36 | 1.00 | 0.85 | 5.31 | 0.16 | 0.30 |
| | 0 | Calculated | | | | | | | | |
| Link-33 | | CONDUIT | 0 | 00:05 | 6.19 | 1.00 | 0.85 | 6.49 | 0.13 | 0.23 |
| | 0 | Calculated | | | | | | | | |
| Link-34 | | CONDUIT | 0 | 00:09 | 4.41 | 1.00 | 1.55 | 22.08 | 0.07 | 0.25 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | Calculated | | | | | | | | |
| Link-35 | | CONDUIT | 0 | 00:09 | 7.24 | 1.00 | 6.86 | 35.08 | 0.20 | 0.59 |
| | 0 | Calculated | | | | | | | | |
| Link-37 | | CONDUIT | 0 | 00:09 | 4.99 | 1.00 | 4.48 | 10.88 | 0.41 | 0.51 |
| | 0 | Calculated | | | | | | | | |
| Link-38 | | CONDUIT | 0 | 00:09 | 3.60 | 1.00 | 4.43 | 10.05 | 0.44 | 0.67 |
| | 0 | Calculated | | | | | | | | |
| Link-39 | | CONDUIT | 0 | 00:14 | 7.39 | 1.00 | 0.64 | 22.29 | 0.03 | 0.17 |
| | 0 | Calculated | | | | | | | | |
| Link-41 | | CONDUIT | 0 | 00:10 | 8.99 | 1.00 | 11.07 | 13.88 | 0.80 | 0.66 |
| | 0 | Calculated | | | | | | | | |
| Link-42 | | CONDUIT | 0 | 00:10 | 18.20 | 1.00 | 12.67 | 38.75 | 0.33 | 0.42 |
| | 0 | Calculated | | | | | | | | |
| Link-43 | | CONDUIT | 0 | 00:10 | 15.07 | 1.00 | 12.67 | 40.75 | 0.31 | 0.48 |
| | 0 | Calculated | | | | | | | | |
| Link-44 | | CONDUIT | 0 | 00:10 | 13.30 | 1.00 | 12.66 | 26.98 | 0.47 | 0.53 |
| | 0 | Calculated | | | | | | | | |
| Link-48 | | CONDUIT | 0 | 00:09 | 4.67 | 1.00 | 5.03 | 9.49 | 0.53 | 0.59 |
| | 0 | Calculated | | | | | | | | |
| Link-49 | | CONDUIT | 0 | 00:10 | 14.96 | 1.00 | 12.66 | 30.98 | 0.41 | 0.48 |
| | 0 | Calculated | | | | | | | | |
| Link-50 | | CONDUIT | 0 | 00:06 | 7.58 | 1.00 | 9.90 | 48.83 | 0.20 | 0.77 |
| | 0 | Calculated | | | | | | | | |
| Link-51 | | CONDUIT | 0 | 00:06 | 8.63 | 1.00 | 1.88 | 7.55 | 0.25 | 0.32 |
| | 0 | Calculated | | | | | | | | |
| Link-52 | | CONDUIT | 0 | 00:06 | 11.16 | 1.00 | 1.85 | 12.50 | 0.15 | 0.26 |
| | 0 | Calculated | | | | | | | | |
| Link-54 | | CONDUIT | 0 | 00:05 | 3.96 | 1.00 | 0.19 | 22.33 | 0.01 | 0.11 |
| | 0 | Calculated | | | | | | | | |
| Link-55 | | CONDUIT | 0 | 00:05 | 6.15 | 1.00 | 0.59 | 10.72 | 0.06 | 0.18 |
| | 0 | Calculated | | | | | | | | |
| Link-56 | | CONDUIT | 0 | 00:05 | 1.76 | 1.00 | 0.56 | 6.01 | 0.09 | 0.45 |
| | 0 | Calculated | | | | | | | | |
| Link-57 | | CONDUIT | 0 | 00:06 | 3.96 | 1.00 | 2.95 | 8.09 | 0.36 | 0.44 |
| | 0 | Calculated | | | | | | | | |
| Link-58 | | CONDUIT | 0 | 00:11 | 5.69 | 1.00 | 2.98 | 24.45 | 0.12 | 0.34 |
| | 0 | Calculated | | | | | | | | |
| Link-61 | | CONDUIT | 0 | 00:05 | 6.77 | 1.00 | 1.38 | 12.40 | 0.11 | 0.31 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | Calculated | | | | | | | | |
| Link-62 | | CONDUIT | 0 | 00:11 | 4.69 | 1.00 | 2.95 | 16.17 | 0.18 | 0.40 |
| | 0 | Calculated | | | | | | | | |
| Link-63 | | CONDUIT | 0 | 00:05 | 7.91 | 1.00 | 1.33 | 8.73 | 0.15 | 0.27 |
| | 0 | Calculated | | | | | | | | |
| Link-64 | | CONDUIT | 0 | 00:05 | 8.10 | 1.00 | 0.83 | 10.94 | 0.08 | 0.19 |
| | 0 | Calculated | | | | | | | | |
| Link-65 | | CONDUIT | 0 | 00:05 | 4.16 | 1.00 | 0.80 | 6.99 | 0.11 | 0.29 |
| | 0 | Calculated | | | | | | | | |
| Link-66 | | CONDUIT | 0 | 00:05 | 4.82 | 1.00 | 0.79 | 4.12 | 0.19 | 0.26 |
| | 0 | Calculated | | | | | | | | |
| Link-67 | | CONDUIT | 0 | 00:05 | 8.63 | 1.00 | 0.79 | 11.14 | 0.07 | 0.17 |
| | 0 | Calculated | | | | | | | | |
| Link-68 | | CONDUIT | 0 | 00:05 | 7.08 | 1.00 | 0.78 | 13.82 | 0.06 | 0.21 |
| | 0 | Calculated | | | | | | | | |
| Link-69 | | CONDUIT | 0 | 00:06 | 4.85 | 1.00 | 0.77 | 5.68 | 0.14 | 0.26 |
| | 0 | Calculated | | | | | | | | |
| Link-70 | | CONDUIT | 0 | 00:09 | 8.15 | 1.00 | 0.91 | 11.67 | 0.08 | 0.20 |
| | 0 | Calculated | | | | | | | | |
| Link-71 | | CONDUIT | 0 | 00:09 | 3.68 | 1.00 | 0.84 | 8.56 | 0.10 | 0.43 |
| | 0 | Calculated | | | | | | | | |
| Link-72 | | CONDUIT | 0 | 00:05 | 3.02 | 1.00 | 2.08 | 2.98 | 0.70 | 0.82 |
| | 0 | Calculated | | | | | | | | |
| Link-73 | | CONDUIT | 0 | 00:08 | 2.91 | 1.00 | 1.68 | 6.90 | 0.24 | 0.70 |
| | 0 | Calculated | | | | | | | | |
| Link-74 | | CONDUIT | 0 | 00:06 | 5.52 | 1.00 | 12.47 | 18.91 | 0.66 | 0.68 |
| | 0 | Calculated | | | | | | | | |
| Link-75 | | CONDUIT | 0 | 00:11 | 4.34 | 1.00 | 2.95 | 9.78 | 0.30 | 0.41 |
| | 0 | Calculated | | | | | | | | |
| Link-77 | | CONDUIT | 0 | 00:06 | 6.43 | 1.00 | 1.59 | 393.67 | 0.00 | 0.05 |
| | 0 | Calculated | | | | | | | | |
| Link-79 | | CONDUIT | 0 | 00:09 | 6.99 | 1.00 | 7.95 | 278.37 | 0.03 | 0.15 |
| | 0 | Calculated | | | | | | | | |

**********
Highest Flow Instability Indexes
**********

All links are stable.

Analysis began on:  Mon Apr 13 11:08:21 2020
Analysis ended on:  Mon Apr 13 11:08:23 2020
Total elapsed time: 00:00:02

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| P1 | Proposed | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | |
|---|---|---|
| Flow Length, D | ft | 100 |
| Change in Elevation, ΔE | ft | 7 |
| Land Slope, S | ft/ft | 0.070 |
| Runoff Coefficient, C | | 0.33 |
| Travel Time, Ti | min | 7.2 |
| A for Ti, to calculate Tt | Ac | 0.710 |
| I calculated from Ti | in/hr | 7.3 |
| Q for Ti, to calculate Tt | CFS | 1.70 |

Ti (min) = 7.2

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | |
|---|---|---|
| Flow Length, D | ft | 370 |
| Change in Elevation, ΔE | ft | 36 |
| Travel Time, Ti | hr | 0.030 |

Tt (min) = 1.8

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | |
|---|---|---|
| Flow Length, D | ft | 200 |
| Change in Elevation, ΔE | ft | 21 |
| Land Slope, S | ft/ft | 0.105 |
| Manning's n | | 0.013 |
| Q from Ti | CFS | 1.70 |
| R | ft | 0.141 |
| Velocity | ft/sec | 10.045 |
| Travel Time, Ti | min | 0.3 |

Tt (min) = 0.3

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Street Grade | % | |
| Q from Ti | CFS | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

Combined Travel Time, $T_t$ (min) = 2.150

**Time of Concetration, $T_c$ (min) = *9.4***

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| P2 | Proposed | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | |
|---|---|---|
| Flow Length, D | ft | 20 |
| Change in Elevation, ΔE | ft | 0.4 |
| Land Slope, S | ft/ft | 0.020 |
| Runoff Coefficient, C | | 0.85 |
| Travel Time, Ti | min | 1.6 |
| A for Ti, to calculate Tt | Ac | |
| I calculated from Ti | in/hr | |
| Q for Ti, to calculate Tt | CFS | |

Ti (min) = 1.6

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Travel Time, Ti | hr | |

Tt (min) =

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Land Slope, S | ft/ft | |
| Manning's n | | |
| Q from Ti | CFS | |
| R | ft | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Street Grade | % | |
| Q from Ti | CFS | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

Combined Travel Time, $T_t$ (min) =

**Time of Concetration, $T_c$ (min) =** ***1.6*** *

***Use minimum Tc of 5 minutes***

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| P3 | Proposed | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | | | |
|---|---|---|---|---|
| Flow Length, D | ft | 70 | | |
| Change in Elevation, ΔE | ft | 0.7 | | |
| Land Slope, S | ft/ft | 0.010 | | |
| Runoff Coefficient, C | | 0.57 | | |
| Travel Time, Ti | min | 8.0 | Ti (min) = | 8.0 |
| A for Ti, to calculate Tt | Ac | | | |
| I calculated from Ti | in/hr | | | |
| Q for Ti, to calculate Tt | CFS | | | |

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | | | |
|---|---|---|---|---|
| Flow Length, D | ft | 100 | | |
| Change in Elevation, ΔE | ft | 1 | | |
| Travel Time, Ti | hr | 0.027 | Tt (min) = | 1.6 |

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | | | |
|---|---|---|---|---|
| Flow Length, D | ft | | | |
| Change in Elevation, ΔE | ft | | | |
| Land Slope, S | ft/ft | | | |
| Manning's n | | | | |
| Q from Ti | CFS | | | |
| R | ft | | | |
| Velocity | ft/sec | | | |
| Travel Time, Ti | min | | Tt (min) = | |

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | | | |
|---|---|---|---|---|
| Flow Length, D | ft | | | |
| Change in Elevation, ΔE | ft | | | |
| Street Grade | % | | | |
| Q from Ti | CFS | | | |
| Velocity | ft/sec | | | |
| Travel Time, Ti | min | | Tt (min) = | |

Combined Travel Time, $T_t$ (min) = 1.6

**Time of Concetration, $T_c$ (min) = *9.6***

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| P4 | Proposed | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | |
|---|---|---|
| Flow Length, D | ft | 70 |
| Change in Elevation, ΔE | ft | 0.7 |
| Land Slope, S | ft/ft | 0.010 |
| Runoff Coefficient, C | | 0.57 |
| Travel Time, Ti | min | 8.0 |
| A for Ti, to calculate Tt | Ac | |
| I calculated from Ti | in/hr | |
| Q for Ti, to calculate Tt | CFS | |

Ti (min) = 8.0

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | |
|---|---|---|
| Flow Length, D | ft | 80 |
| Change in Elevation, ΔE | ft | 0.8 |
| Travel Time, Ti | hr | 0.022 |

Tt (min) = 1.3

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Land Slope, S | ft/ft | |
| Manning's n | | |
| Q from Ti | CFS | |
| R | ft | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Street Grade | % | |
| Q from Ti | CFS | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

Combined Travel Time, $T_t$ (min) = 1.3

**Time of Concetration, $T_c$ (min) = *9.3***

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| P5 | Proposed | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | |
|---|---|---|
| Flow Length, D | ft | 100 |
| Change in Elevation, ΔE | ft | 16 |
| Land Slope, S | ft/ft | 0.160 |
| Runoff Coefficient, C | | 0.35 |
| Travel Time, Ti | min | 5.4 |
| A for Ti, to calculate Tt | Ac | 0.680 |
| I calculated from Ti | in/hr | 8.8 |
| Q for Ti, to calculate Tt | CFS | 2.10 |

Ti (min) = 5.4

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | |
|---|---|---|
| Flow Length, D | ft | 30 |
| Change in Elevation, ΔE | ft | 4 |
| Travel Time, Ti | hr | 0.004 |

Tt (min) = 0.2

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | |
|---|---|---|
| Flow Length, D | ft | 150 |
| Change in Elevation, ΔE | ft | 0.75 |
| Land Slope, S | ft/ft | 0.005 |
| Manning's n | | 0.013 |
| Q from Ti | CFS | 2.10 |
| R | ft | 0.271 |
| Velocity | ft/sec | 3.393 |
| Travel Time, Ti | min | 0.7 |

Tt (min) = 0.7

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Street Grade | % | |
| Q from Ti | CFS | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

Combined Travel Time, $T_t$ (min) = 0.969

**Time of Concetration, $T_c$ (min) = *6.3***

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| P6 | Proposed | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | | | |
|---|---|---|---|---|
| Flow Length, D | ft | 70 | | |
| Change in Elevation, ΔE | ft | 0.7 | | |
| Land Slope, S | ft/ft | 0.010 | | |
| Runoff Coefficient, C | | 0.54 | | |
| Travel Time, Ti | min | 8.4 | Ti (min) = | 8.4 |
| A for Ti, to calculate Tt | Ac | | | |
| I calculated from Ti | in/hr | | | |
| Q for Ti, to calculate Tt | CFS | | | |

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | | | |
|---|---|---|---|---|
| Flow Length, D | ft | 70 | | |
| Change in Elevation, ΔE | ft | 0.7 | | |
| Travel Time, Ti | hr | 0.020 | Tt (min) = | 1.2 |

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | | | |
|---|---|---|---|---|
| Flow Length, D | ft | | | |
| Change in Elevation, ΔE | ft | | | |
| Land Slope, S | ft/ft | | | |
| Manning's n | | | | |
| Q from Ti | CFS | | | |
| R | ft | | | |
| Velocity | ft/sec | | | |
| Travel Time, Ti | min | | Tt (min) = | |

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | | | |
|---|---|---|---|---|
| Flow Length, D | ft | | | |
| Change in Elevation, ΔE | ft | | | |
| Street Grade | % | | | |
| Q from Ti | CFS | | | |
| Velocity | ft/sec | | | |
| Travel Time, Ti | min | | Tt (min) = | |

Combined Travel Time, $T_t$ (min) = 1.2

**Time of Concetration, $T_c$ (min) = *9.6***

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| P7 | Proposed | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | |
|---|---|---|
| Flow Length, D | ft | 70 |
| Change in Elevation, ΔE | ft | 0.7 |
| Land Slope, S | ft/ft | 0.010 |
| Runoff Coefficient, C | | 0.68 |
| Travel Time, Ti | min | 6.3 |
| A for Ti, to calculate Tt | Ac | 0.710 |
| I calculated from Ti | in/hr | 7.9 |
| Q for Ti, to calculate Tt | CFS | 3.83 |

Ti (min) = 6.3

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | |
|---|---|---|
| Flow Length, D | ft | 130 |
| Change in Elevation, ΔE | ft | 1.3 |
| Travel Time, Ti | hr | 0.033 |

Tt (min) = 2.0

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Land Slope, S | ft/ft | |
| Manning's n | | |
| Q from Ti | CFS | |
| R | ft | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | |
|---|---|---|
| Flow Length, D | ft | 200 |
| Change in Elevation, ΔE | ft | 2 |
| Street Grade | % | 0.010 |
| Q from Ti | CFS | 3.83 |
| Velocity | ft/sec | 2.500 |
| Travel Time, Ti | min | 1.3 |

Tt (min) = 1.3

Combined Travel Time, $T_t$ (min) = 3.3

**Time of Concetration, $T_c$ (min) = *9.6***

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| P8 | Proposed | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | | | |
|---|---|---|---|---|
| Flow Length, D | ft | 70 | | |
| Change in Elevation, ΔE | ft | 0.7 | | |
| Land Slope, S | ft/ft | 0.010 | | |
| Runoff Coefficient, C | | 0.57 | | |
| Travel Time, Ti | min | 8.0 | Ti (min) = | 8.0 |
| A for Ti, to calculate Tt | Ac | | | |
| I calculated from Ti | in/hr | | | |
| Q for Ti, to calculate Tt | CFS | | | |

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | | | |
|---|---|---|---|---|
| Flow Length, D | ft | 120 | | |
| Change in Elevation, ΔE | ft | 0.12 | | |
| Travel Time, Ti | hr | 0.074 | Tt (min) = | 4.5 |

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | | | |
|---|---|---|---|---|
| Flow Length, D | ft | | | |
| Change in Elevation, ΔE | ft | | | |
| Land Slope, S | ft/ft | | | |
| Manning's n | | | | |
| Q from Ti | CFS | | | |
| R | ft | | | |
| Velocity | ft/sec | | | |
| Travel Time, Ti | min | | Tt (min) = | |

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | | | |
|---|---|---|---|---|
| Flow Length, D | ft | | | |
| Change in Elevation, ΔE | ft | | | |
| Street Grade | % | | | |
| Q from Ti | CFS | | | |
| Velocity | ft/sec | | | |
| Travel Time, Ti | min | | Tt (min) = | |

Combined Travel Time, $T_t$ (min) = 4.5

**Time of Concetration, $T_c$ (min) =** ***12.4***

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| P9 | Proposed | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | |
|---|---|---|
| Flow Length, D | ft | 50 |
| Change in Elevation, ΔE | ft | 18 |
| Land Slope, S | ft/ft | 0.360 |
| Runoff Coefficient, C | | 0.30 |
| Travel Time, Ti | min | 3.1 |
| A for Ti, to calculate Tt | Ac | 1.130 |
| I calculated from Ti | in/hr | 9.2 |
| Q for Ti, to calculate Tt | CFS | 3.12 |

Ti (min) = 3.1

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Travel Time, Ti | hr | |

Tt (min) =

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | |
|---|---|---|
| Flow Length, D | ft | 540 |
| Change in Elevation, ΔE | ft | 14 |
| Land Slope, S | ft/ft | 0.026 |
| Manning's n | | 0.013 |
| Q from Ti | CFS | 3.12 |
| R | ft | 0.229 |
| Velocity | ft/sec | 6.914 |
| Travel Time, Ti | min | 1.3 |

Tt (min) = 1.3

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Street Grade | % | |
| Q from Ti | CFS | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

Combined Travel Time, $T_t$ (min) = 1.302

**Time of Concetration, $T_c$ (min)** = ***4.4*** *

***Use minimum Tc of 5 minutes***

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| P10 | Proposed | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | |
|---|---|---|
| Flow Length, D | ft | 70 |
| Change in Elevation, ΔE | ft | 20 |
| Land Slope, S | ft/ft | 0.286 |
| Runoff Coefficient, C | | 0.30 |
| Travel Time, Ti | min | 3.9 |
| A for Ti, to calculate Tt | Ac | 0.470 |
| I calculated from Ti | in/hr | 9.2 |
| Q for Ti, to calculate Tt | CFS | 1.30 |

Ti (min) = 3.9

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | |
|---|---|---|
| Flow Length, D | ft | 90 |
| Change in Elevation, ΔE | ft | 0.9 |
| Travel Time, Ti | hr | 0.025 |

Tt (min) = 1.5

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | |
|---|---|---|
| Flow Length, D | ft | 90 |
| Change in Elevation, ΔE | ft | 0.5 |
| Land Slope, S | ft/ft | 0.006 |
| Manning's n | | 0.013 |
| Q from Ti | CFS | 1.30 |
| R | ft | 0.220 |
| Velocity | ft/sec | 3.117 |
| Travel Time, Ti | min | 0.5 |

Tt (min) = 0.5

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Street Grade | % | |
| Q from Ti | CFS | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

Combined Travel Time, $T_t$ (min) = 1.951

**Time of Concetration, $T_c$ (min) = *5.9***

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| P11 | Proposed | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | | | |
|---|---|---|---|---|
| Flow Length, D | ft | 70 | | |
| Change in Elevation, ΔE | ft | 0.7 | | |
| Land Slope, S | ft/ft | 0.010 | | |
| Runoff Coefficient, C | | 0.58 | | |
| Travel Time, Ti | min | 7.8 | Ti (min) = | 7.8 |
| A for Ti, to calculate Tt | Ac | 0.910 | | |
| I calculated from Ti | in/hr | 6.9 | | |
| Q for Ti, to calculate Tt | CFS | 3.64 | | |

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | | | |
|---|---|---|---|---|
| Flow Length, D | ft | 130 | | |
| Change in Elevation, ΔE | ft | 1.3 | | |
| Travel Time, Ti | hr | 0.033 | Tt (min) = | 2.0 |

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | | | |
|---|---|---|---|---|
| Flow Length, D | ft | | | |
| Change in Elevation, ΔE | ft | | | |
| Land Slope, S | ft/ft | | | |
| Manning's n | | | | |
| Q from Ti | CFS | | | |
| R | ft | | | |
| Velocity | ft/sec | | | |
| Travel Time, Ti | min | | Tt (min) = | |

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | | | |
|---|---|---|---|---|
| Flow Length, D | ft | 270 | | |
| Change in Elevation, ΔE | ft | 24 | | |
| Street Grade | % | 8.9 | | |
| Q from Ti | CFS | 3.64 | | |
| Velocity | ft/sec | 6.0 | | |
| Travel Time, Ti | min | 0.8 | Tt (min) = | 0.8 |

Combined Travel Time, $T_t$ (min) = 2.7

**Time of Concetration, $T_c$ (min) = *10.5***

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| P12 | Proposed | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | |
|---|---|---|
| Flow Length, D | ft | 20 |
| Change in Elevation, ΔE | ft | 2.5 |
| Land Slope, S | ft/ft | 0.125 |
| Runoff Coefficient, C | | 0.63 |
| Travel Time, Ti | min | 1.6 |
| A for Ti, to calculate Tt | Ac | 0.080 |
| I calculated from Ti | in/hr | 9.2 |
| Q for Ti, to calculate Tt | CFS | 0.46 |

Ti (min) = 1.6

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Travel Time, Ti | hr | |

Tt (min) =

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Land Slope, S | ft/ft | |
| Manning's n | | |
| Q from Ti | CFS | |
| R | ft | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | |
|---|---|---|
| Flow Length, D | ft | 110 |
| Change in Elevation, ΔE | ft | 14 |
| Street Grade | % | 12.7 |
| Q from Ti | CFS | 0.46 |
| Velocity | ft/sec | 6.0 |
| Travel Time, Ti | min | 0.3 |

Tt (min) = 0.3

Combined Travel Time, $T_t$ (min) = 0.3

**Time of Concetration, $T_c$ (min) =** ***1.9*** *

***Use minimum Tc of 5 minutes**

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| P13 | Proposed | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | |
|---|---|---|
| Flow Length, D | ft | 100 |
| Change in Elevation, ΔE | ft | 21 |
| Land Slope, S | ft/ft | 0.210 |
| Runoff Coefficient, C | | 0.35 |
| Travel Time, Ti | min | 4.9 |
| A for Ti, to calculate Tt | Ac | 0.430 |
| I calculated from Ti | in/hr | 9.2 |
| Q for Ti, to calculate Tt | CFS | 1.38 |

Ti (min) = 4.9

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | |
|---|---|---|
| Flow Length, D | ft | 10 |
| Change in Elevation, ΔE | ft | 2 |
| Travel Time, Ti | hr | 0.001 |

Tt (min) = 0.1

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | |
|---|---|---|
| Flow Length, D | ft | 15 |
| Change in Elevation, ΔE | ft | 2.5 |
| Land Slope, S | ft/ft | 0.167 |
| Manning's n | | 0.013 |
| Q from Ti | CFS | 1.38 |
| R | ft | 0.120 |
| Velocity | ft/sec | 11.384 |
| Travel Time, Ti | min | 0.02 |

Tt (min) = 0.02

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Street Grade | % | |
| Q from Ti | CFS | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

Combined Travel Time, $T_t$ (min) = 0.107

**Time of Concetration, $T_c$ (min)** = ***5.0***

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| P14 | Proposed | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | |
|---|---|---|
| Flow Length, D | ft | 15 |
| Change in Elevation, ΔE | ft | 0.3 |
| Land Slope, S | ft/ft | 0.020 |
| Runoff Coefficient, C | | 0.68 |
| Travel Time, Ti | min | 2.3 |
| A for Ti, to calculate Tt | Ac | 0.270 |
| I calculated from Ti | in/hr | 9.2 |
| Q for Ti, to calculate Tt | CFS | 1.69 |

Ti (min) = 2.3

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Travel Time, Ti | hr | |

Tt (min) =

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Land Slope, S | ft/ft | |
| Manning's n | | |
| Q from Ti | CFS | |
| R | ft | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | |
|---|---|---|
| Flow Length, D | ft | 370 |
| Change in Elevation, ΔE | ft | 13 |
| Street Grade | % | 3.5 |
| Q from Ti | CFS | 1.69 |
| Velocity | ft/sec | 3.9 |
| Travel Time, Ti | min | 1.6 |

Tt (min) = 1.6

Combined Travel Time, $T_t$ (min) = 1.6

**Time of Concetration, $T_c$ (min) =** ***3.9*** *

***Use minimum Tc of 5 minutes**

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| P15 | Proposed | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | |
|---|---|---|
| Flow Length, D | ft | 70 |
| Change in Elevation, ΔE | ft | 0.7 |
| Land Slope, S | ft/ft | 0.010 |
| Runoff Coefficient, C | | 0.59 |
| Travel Time, Ti | min | 7.7 |
| A for Ti, to calculate Tt | Ac | 0.950 |
| I calculated from Ti | in/hr | 7.0 |
| Q for Ti, to calculate Tt | CFS | 3.92 |

Ti (min) = 7.7

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | |
|---|---|---|
| Flow Length, D | ft | 30 |
| Change in Elevation, ΔE | ft | 0.3 |
| Travel Time, Ti | hr | 0.011 |

Tt (min) = 0.6

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Land Slope, S | ft/ft | |
| Manning's n | | |
| Q from Ti | CFS | |
| R | ft | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | |
|---|---|---|
| Flow Length, D | ft | 270 |
| Change in Elevation, ΔE | ft | 10 |
| Street Grade | % | 3.7 |
| Q from Ti | CFS | 3.92 |
| Velocity | ft/sec | 4.2 |
| Travel Time, Ti | min | 1.1 |

Tt (min) = 1.1

Combined Travel Time, $T_t$ (min) = 1.7

**Time of Concetration, $T_c$ (min) = *9.4***

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| P16 | Proposed | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | |
|---|---|---|
| Flow Length, D | ft | 35 |
| Change in Elevation, ΔE | ft | 3 |
| Land Slope, S | ft/ft | 0.086 |
| Runoff Coefficient, C | | 0.68 |
| Travel Time, Ti | min | 2.2 |
| A for Ti, to calculate Tt | Ac | 0.050 |
| I calculated from Ti | in/hr | 9.2 |
| Q for Ti, to calculate Tt | CFS | 0.31 |

Ti (min) = 2.2

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Travel Time, Ti | hr | |

Tt (min) =

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Land Slope, S | ft/ft | |
| Manning's n | | |
| Q from Ti | CFS | |
| R | ft | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | |
|---|---|---|
| Flow Length, D | ft | 45 |
| Change in Elevation, ΔE | ft | 6 |
| Street Grade | % | 13.3 |
| Q from Ti | CFS | 0.31 |
| Velocity | ft/sec | 7.0 |
| Travel Time, Ti | min | 0.1 |

Tt (min) = 0.1

Combined Travel Time, $T_t$ (min) = 0.1

**Time of Concetration, $T_c$ (min) =** ***2.3*** *

***Use minimum Tc of 5 minutes**

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| P17 | Proposed | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | |
|---|---|---|
| Flow Length, D | ft | 70 |
| Change in Elevation, ΔE | ft | 0.7 |
| Land Slope, S | ft/ft | 0.010 |
| Runoff Coefficient, C | | 0.58 |
| Travel Time, Ti | min | 7.8 |
| A for Ti, to calculate Tt | Ac | 0.380 |
| I calculated from Ti | in/hr | 6.9 |
| Q for Ti, to calculate Tt | CFS | 1.52 |

Ti (min) = 7.8

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | |
|---|---|---|
| Flow Length, D | ft | 70 |
| Change in Elevation, ΔE | ft | 0.7 |
| Travel Time, Ti | hr | 0.020 |

Tt (min) = 1.2

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Land Slope, S | ft/ft | |
| Manning's n | | |
| Q from Ti | CFS | |
| R | ft | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | |
|---|---|---|
| Flow Length, D | ft | 100 |
| Change in Elevation, ΔE | ft | 10 |
| Street Grade | % | 10.0 |
| Q from Ti | CFS | 1.52 |
| Velocity | ft/sec | 6.0 |
| Travel Time, Ti | min | 0.3 |

Tt (min) = 0.3

Combined Travel Time, $T_t$ (min) = 1.5

**Time of Concetration, $T_c$ (min) = *9.3***

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| P18 | Proposed | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | |
|---|---|---|
| Flow Length, D | ft | 100 |
| Change in Elevation, ΔE | ft | 11 |
| Land Slope, S | ft/ft | 0.110 |
| Runoff Coefficient, C | | 0.43 |
| Travel Time, Ti | min | 5.4 |
| A for Ti, to calculate Tt | Ac | 0.470 |
| I calculated from Ti | in/hr | 8.8 |
| Q for Ti, to calculate Tt | CFS | 1.77 |

Ti (min) = 5.4

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | |
|---|---|---|
| Flow Length, D | ft | 80 |
| Change in Elevation, ΔE | ft | 8 |
| Travel Time, Ti | hr | 0.009 |

Tt (min) = 0.6

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Land Slope, S | ft/ft | |
| Manning's n | | |
| Q from Ti | CFS | |
| R | ft | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Street Grade | % | |
| Q from Ti | CFS | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

Combined Travel Time, $T_t$ (min) = 0.6

**Time of Concetration, $T_c$ (min) = *6.0***

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| P19 | Proposed | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | |
|---|---|---|
| Flow Length, D | ft | 70 |
| Change in Elevation, ΔE | ft | 0.7 |
| Land Slope, S | ft/ft | 0.010 |
| Runoff Coefficient, C | | 0.59 |
| Travel Time, Ti | min | 7.7 |
| A for Ti, to calculate Tt | Ac | 1.040 |
| I calculated from Ti | in/hr | 7.0 |
| Q for Ti, to calculate Tt | CFS | 4.29 |

Ti (min) = 7.7

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | |
|---|---|---|
| Flow Length, D | ft | 70 |
| Change in Elevation, ΔE | ft | 0.7 |
| Travel Time, Ti | hr | 0.020 |

Tt (min) = 1.2

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Land Slope, S | ft/ft | |
| Manning's n | | |
| Q from Ti | CFS | |
| R | ft | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | |
|---|---|---|
| Flow Length, D | ft | 270 |
| Change in Elevation, ΔE | ft | 14 |
| Street Grade | % | 5.2 |
| Q from Ti | CFS | 4.29 |
| Velocity | ft/sec | 5.0 |
| Travel Time, Ti | min | 0.9 |

Tt (min) = 0.9

Combined Travel Time, $T_t$ (min) = 2.1

**Time of Concetration, $T_c$ (min) = *9.8***

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| P20 | Proposed | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | |
|---|---|---|
| Flow Length, D | ft | 70 |
| Change in Elevation, ΔE | ft | 0.7 |
| Land Slope, S | ft/ft | 0.010 |
| Runoff Coefficient, C | | 0.55 |
| Travel Time, Ti | min | 8.3 |
| A for Ti, to calculate Tt | Ac | |
| I calculated from Ti | in/hr | |
| Q for Ti, to calculate Tt | CFS | |

Ti (min) = 8.3

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | |
|---|---|---|
| Flow Length, D | ft | 50 |
| Change in Elevation, ΔE | ft | 0.5 |
| Travel Time, Ti | hr | 0.016 |

Tt (min) = 0.9

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Land Slope, S | ft/ft | |
| Manning's n | | |
| Q from Ti | CFS | |
| R | ft | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Street Grade | % | |
| Q from Ti | CFS | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

Combined Travel Time, $T_t$ (min) = 0.9

**Time of Concetration, $T_c$ (min)** = ***9.2***

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| P21 | Proposed | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | | | | |
|---|---|---|---|---|---|
| Flow Length, D | ft | 70 | | | |
| Change in Elevation, ΔE | ft | 0.7 | | | |
| Land Slope, S | ft/ft | 0.010 | | | |
| Runoff Coefficient, C | | 0.55 | | | |
| Travel Time, Ti | min | 8.3 | Ti (min) | = | 8.3 |
| A for Ti, to calculate Tt | Ac | | | | |
| I calculated from Ti | in/hr | | | | |
| Q for Ti, to calculate Tt | CFS | | | | |

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | | | | |
|---|---|---|---|---|---|
| Flow Length, D | ft | 30 | | | |
| Change in Elevation, ΔE | ft | 0.3 | | | |
| Travel Time, Ti | hr | 0.011 | Tt (min) | = | 0.6 |

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | | | | |
|---|---|---|---|---|---|
| Flow Length, D | ft | | | | |
| Change in Elevation, ΔE | ft | | | | |
| Land Slope, S | ft/ft | | | | |
| Manning's n | | | | | |
| Q from Ti | CFS | | | | |
| R | ft | | | | |
| Velocity | ft/sec | | | | |
| Travel Time, Ti | min | | Tt (min) | = | |

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | | | | |
|---|---|---|---|---|---|
| Flow Length, D | ft | | | | |
| Change in Elevation, ΔE | ft | | | | |
| Street Grade | % | | | | |
| Q from Ti | CFS | | | | |
| Velocity | ft/sec | | | | |
| Travel Time, Ti | min | | Tt (min) | = | |

Combined Travel Time, $T_t$ (min) = 0.6

**Time of Concetration, $T_c$ (min) = *8.9***

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| P22 | Proposed | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | |
|---|---|---|
| Flow Length, D | ft | 100 |
| Change in Elevation, ΔE | ft | 17 |
| Land Slope, S | ft/ft | 0.170 |
| Runoff Coefficient, C | | 0.35 |
| Travel Time, Ti | min | 5.3 |
| A for Ti, to calculate Tt | Ac | 0.280 |
| I calculated from Ti | in/hr | 8.9 |
| Q for Ti, to calculate Tt | CFS | 0.88 |

Ti (min) = 5.3

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | |
|---|---|---|
| Flow Length, D | ft | 10 |
| Change in Elevation, ΔE | ft | 2 |
| Travel Time, Ti | hr | 0.001 |

Tt (min) = 0.1

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | |
|---|---|---|
| Flow Length, D | ft | 20 |
| Change in Elevation, ΔE | ft | 0.2 |
| Land Slope, S | ft/ft | 0.010 |
| Manning's n | | 0.013 |
| Q from Ti | CFS | 0.88 |
| R | ft | 0.170 |
| Velocity | ft/sec | 3.521 |
| Travel Time, Ti | min | 0.09 |

Tt (min) = 0.09

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Street Grade | % | |
| Q from Ti | CFS | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

Combined Travel Time, $T_t$ (min) = 0.180

**Time of Concetration, $T_c$ (min) = *5.4***

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| P23 | Proposed | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | |
|---|---|---|
| Flow Length, D | ft | 20 |
| Change in Elevation, ΔE | ft | 2 |
| Land Slope, S | ft/ft | 0.100 |
| Runoff Coefficient, C | | 0.68 |
| Travel Time, Ti | min | 1.6 |
| A for Ti, to calculate Tt | Ac | 0.130 |
| I calculated from Ti | in/hr | 9.2 |
| Q for Ti, to calculate Tt | CFS | 0.81 |

Ti (min) = 1.6

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Travel Time, Ti | hr | |

Tt (min) =

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Land Slope, S | ft/ft | |
| Manning's n | | |
| Q from Ti | CFS | |
| R | ft | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | |
|---|---|---|
| Flow Length, D | ft | 230 |
| Change in Elevation, ΔE | ft | 20 |
| Street Grade | % | 8.7 |
| Q from Ti | CFS | 0.81 |
| Velocity | ft/sec | 6.0 |
| Travel Time, Ti | min | 0.6 |

Tt (min) = 0.6

Combined Travel Time, $T_t$ (min) = 0.6

**Time of Concetration, $T_c$ (min) =** ***2.2*** *

***Use minimum Tc of 5 minutes**

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| P24 | Proposed | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | |
|---|---|---|
| Flow Length, D | ft | 70 |
| Change in Elevation, ΔE | ft | 0.7 |
| Land Slope, S | ft/ft | 0.010 |
| Runoff Coefficient, C | | 0.56 |
| Travel Time, Ti | min | 8.1 |
| A for Ti, to calculate Tt | Ac | 0.460 |
| I calculated from Ti | in/hr | 6.7 |
| Q for Ti, to calculate Tt | CFS | 1.74 |

Ti (min) = 8.1

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | |
|---|---|---|
| Flow Length, D | ft | 80 |
| Change in Elevation, ΔE | ft | 0.8 |
| Travel Time, Ti | hr | 0.022 |

Tt (min) = 1.3

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Land Slope, S | ft/ft | |
| Manning's n | | |
| Q from Ti | CFS | |
| R | ft | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | |
|---|---|---|
| Flow Length, D | ft | 60 |
| Change in Elevation, ΔE | ft | 3 |
| Street Grade | % | 0.050 |
| Q from Ti | CFS | 1.74 |
| Velocity | ft/sec | 4.200 |
| Travel Time, Ti | min | 0.2 |

Tt (min) = 0.2

Combined Travel Time, $T_t$ (min) = 1.6

**Time of Concetration, $T_c$ (min) = *9.7***

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| P25 | Proposed | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | |
|---|---|---|
| Flow Length, D | ft | 70 |
| Change in Elevation, ΔE | ft | 0.7 |
| Land Slope, S | ft/ft | 0.010 |
| Runoff Coefficient, C | | 0.61 |
| Travel Time, Ti | min | 7.4 |
| A for Ti, to calculate Tt | Ac | 1.200 |
| I calculated from Ti | in/hr | 7.2 |
| Q for Ti, to calculate Tt | CFS | 5.25 |

Ti (min) = 7.4

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | |
|---|---|---|
| Flow Length, D | ft | 80 |
| Change in Elevation, ΔE | ft | 0.8 |
| Travel Time, Ti | hr | 0.022 |

Tt (min) = 1.3

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Land Slope, S | ft/ft | |
| Manning's n | | |
| Q from Ti | CFS | |
| R | ft | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | |
|---|---|---|
| Flow Length, D | ft | 250 |
| Change in Elevation, ΔE | ft | 25 |
| Street Grade | % | 0.100 |
| Q from Ti | CFS | 5.25 |
| Velocity | ft/sec | 6.200 |
| Travel Time, Ti | min | 0.7 |

Tt (min) = 0.7

Combined Travel Time, $T_t$ (min) = 2.0

**Time of Concetration, $T_c$ (min) = *9.4***

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| P26 | Proposed | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | |
|---|---|---|
| Flow Length, D | ft | 25 |
| Change in Elevation, ΔE | ft | 12 |
| Land Slope, S | ft/ft | 0.480 |
| Runoff Coefficient, C | | 0.35 |
| Travel Time, Ti | min | 1.9 |
| A for Ti, to calculate Tt | Ac | 0.180 |
| I calculated from Ti | in/hr | 9.2 |
| Q for Ti, to calculate Tt | CFS | 0.58 |

Ti (min) = 1.9

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Travel Time, Ti | hr | |

Tt (min) =

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | |
|---|---|---|
| Flow Length, D | ft | 230 |
| Change in Elevation, ΔE | ft | 25 |
| Land Slope, S | ft/ft | 0.109 |
| Manning's n | | 0.013 |
| Q from Ti | CFS | 0.58 |
| R | ft | 0.095 |
| Velocity | ft/sec | 7.877 |
| Travel Time, Ti | min | 0.49 |

Tt (min) = 0.49

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Street Grade | % | |
| Q from Ti | CFS | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

Combined Travel Time, $T_t$ (min) = 0.487

**Time of Concetration, $T_c$ (min)** = ***2.3*** *

***Use minimum Tc of 5 minutes***

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| P27 | Proposed | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | |
|---|---|---|
| Flow Length, D | ft | 70 |
| Change in Elevation, ΔE | ft | 0.39 |
| Land Slope, S | ft/ft | 0.006 |
| Runoff Coefficient, C | | 0.35 |
| Travel Time, Ti | min | 13.7 |
| A for Ti, to calculate Tt | Ac | 0.180 |
| I calculated from Ti | in/hr | 4.8 |
| Q for Ti, to calculate Tt | CFS | 0.30 |

Ti (min) = 13.7

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Travel Time, Ti | hr | |

Tt (min) =

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | |
|---|---|---|
| Flow Length, D | ft | 230 |
| Change in Elevation, ΔE | ft | 25 |
| Land Slope, S | ft/ft | 0.109 |
| Manning's n | | 0.013 |
| Q from Ti | CFS | 0.30 |
| R | ft | 0.095 |
| Velocity | ft/sec | 7.877 |
| Travel Time, Ti | min | 0.49 |

Tt (min) = 0.49

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Street Grade | % | |
| Q from Ti | CFS | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

Combined Travel Time, $T_t$ (min) = 0.487

**Time of Concetration, $T_c$ (min) = *14.2***

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| P28 | Proposed | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | | | |
|---|---|---|---|---|
| Flow Length, D | ft | 70 | | |
| Change in Elevation, ΔE | ft | 0.7 | | |
| Land Slope, S | ft/ft | 0.010 | | |
| Runoff Coefficient, C | | 0.54 | | |
| Travel Time, Ti | min | 8.4 | Ti (min) = | 8.4 |
| A for Ti, to calculate Tt | Ac | | | |
| I calculated from Ti | in/hr | | | |
| Q for Ti, to calculate Tt | CFS | | | |

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | | | |
|---|---|---|---|---|
| Flow Length, D | ft | 70 | | |
| Change in Elevation, ΔE | ft | 0.7 | | |
| Travel Time, Ti | hr | 0.020 | Tt (min) = | 1.2 |

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | | | |
|---|---|---|---|---|
| Flow Length, D | ft | | | |
| Change in Elevation, ΔE | ft | | | |
| Land Slope, S | ft/ft | | | |
| Manning's n | | | | |
| Q from Ti | CFS | | | |
| R | ft | | | |
| Velocity | ft/sec | | | |
| Travel Time, Ti | min | | Tt (min) = | |

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | | | |
|---|---|---|---|---|
| Flow Length, D | ft | | | |
| Change in Elevation, ΔE | ft | | | |
| Street Grade | % | | | |
| Q from Ti | CFS | | | |
| Velocity | ft/sec | | | |
| Travel Time, Ti | min | | Tt (min) = | |

Combined Travel Time, $T_t$ (min) = 1.2

**Time of Concetration, $T_c$ (min) = *9.6***

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| P29 | Proposed | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | |
|---|---|---|
| Flow Length, D | ft | 100 |
| Change in Elevation, ΔE | ft | 13 |
| Land Slope, S | ft/ft | 0.130 |
| Runoff Coefficient, C | | 0.35 |
| Travel Time, Ti | min | 5.7 |
| A for Ti, to calculate Tt | Ac | |
| I calculated from Ti | in/hr | |
| Q for Ti, to calculate Tt | CFS | |

Ti (min) = 5.7

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | |
|---|---|---|
| Flow Length, D | ft | 800 |
| Change in Elevation, ΔE | ft | 110 |
| Travel Time, Ti | hr | 0.048 |

Tt (min) = 2.9

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Land Slope, S | ft/ft | |
| Manning's n | | |
| Q from Ti | CFS | |
| R | ft | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Street Grade | % | |
| Q from Ti | CFS | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

Combined Travel Time, $T_t$ (min) = 2.9

**Time of Concetration, $T_c$ (min) = *8.6***

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| P30 | Proposed | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | |
|---|---|---|
| Flow Length, D | ft | 100 |
| Change in Elevation, ΔE | ft | 17 |
| Land Slope, S | ft/ft | 0.170 |
| Runoff Coefficient, C | | 0.35 |
| Travel Time, Ti | min | 5.3 |
| A for Ti, to calculate Tt | Ac | |
| I calculated from Ti | in/hr | |
| Q for Ti, to calculate Tt | CFS | |

Ti (min) = 5.3

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | |
|---|---|---|
| Flow Length, D | ft | 800 |
| Change in Elevation, ΔE | ft | 110 |
| Travel Time, Ti | hr | 0.048 |

Tt (min) = 2.9

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Land Slope, S | ft/ft | |
| Manning's n | | |
| Q from Ti | CFS | |
| R | ft | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Street Grade | % | |
| Q from Ti | CFS | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

Combined Travel Time, $T_t$ (min) = 2.9

**Time of Concetration, $T_c$ (min) = *8.1***

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| P31 | Proposed | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | |
|---|---|---|
| Flow Length, D | ft | 15 |
| Change in Elevation, ΔE | ft | 1.5 |
| Land Slope, S | ft/ft | 0.100 |
| Runoff Coefficient, C | | 0.35 |
| Travel Time, Ti | min | 2.4 |
| A for Ti, to calculate Tt | Ac | 0.060 |
| I calculated from Ti | in/hr | 9.2 |
| Q for Ti, to calculate Tt | CFS | 0.19 |

Ti (min) = 2.4

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Travel Time, Ti | hr | |

Tt (min) =

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | |
|---|---|---|
| Flow Length, D | ft | 160 |
| Change in Elevation, ΔE | ft | 5 |
| Land Slope, S | ft/ft | 0.031 |
| Manning's n | | 0.013 |
| Q from Ti | CFS | 0.19 |
| R | ft | 0.078 |
| Velocity | ft/sec | 3.707 |
| Travel Time, Ti | min | 0.72 |

Tt (min) = 0.72

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Street Grade | % | |
| Q from Ti | CFS | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

Combined Travel Time, $T_t$ (min) = 0.719

**Time of Concetration, $T_c$ (min)** = ***3.1*** *

***Use minimum Tc of 5 minutes***

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| P32 | Proposed | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | |
|---|---|---|
| Flow Length, D | ft | 25 |
| Change in Elevation, ΔE | ft | 17 |
| Land Slope, S | ft/ft | 0.680 |
| Runoff Coefficient, C | | 0.35 |
| Travel Time, Ti | min | 1.7 |
| A for Ti, to calculate Tt | Ac | 0.130 |
| I calculated from Ti | in/hr | 9.2 |
| Q for Ti, to calculate Tt | CFS | 0.42 |

Ti (min) = 1.7

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Travel Time, Ti | hr | |

Tt (min) =

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | |
|---|---|---|
| Flow Length, D | ft | 190 |
| Change in Elevation, ΔE | ft | 5 |
| Land Slope, S | ft/ft | 0.026 |
| Manning's n | | 0.013 |
| Q from Ti | CFS | 0.42 |
| R | ft | 0.107 |
| Velocity | ft/sec | 4.202 |
| Travel Time, Ti | min | 0.75 |

Tt (min) = 0.75

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Street Grade | % | |
| Q from Ti | CFS | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

Combined Travel Time, $T_t$ (min) = 0.754

**Time of Concetration, $T_c$ (min)** = ***2.4*** *

***Use minimum Tc of 5 minutes***

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| P33 | Proposed | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | |
|---|---|---|
| Flow Length, D | ft | 60 |
| Change in Elevation, ΔE | ft | 9 |
| Land Slope, S | ft/ft | 0.150 |
| Runoff Coefficient, C | | 0.35 |
| Travel Time, Ti | min | 4.2 |
| A for Ti, to calculate Tt | Ac | 0.360 |
| I calculated from Ti | in/hr | 9.2 |
| Q for Ti, to calculate Tt | CFS | 1.16 |

Ti (min) = 4.2

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Travel Time, Ti | hr | |

Tt (min) =

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | |
|---|---|---|
| Flow Length, D | ft | 200 |
| Change in Elevation, ΔE | ft | 3 |
| Land Slope, S | ft/ft | 0.015 |
| Manning's n | | 0.013 |
| Q from Ti | CFS | 1.16 |
| R | ft | 0.179 |
| Velocity | ft/sec | 4.454 |
| Travel Time, Ti | min | 0.75 |

Tt (min) = 0.75

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Street Grade | % | |
| Q from Ti | CFS | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

Combined Travel Time, $T_t$ (min) = 0.748

**Time of Concetration, $T_c$ (min)** = ***5.0*** *

***Use minimum Tc of 5 minutes***

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| P34 | Proposed | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | |
|---|---|---|
| Flow Length, D | ft | 70 |
| Change in Elevation, ΔE | ft | 0.7 |
| Land Slope, S | ft/ft | 0.010 |
| Runoff Coefficient, C | | 0.55 |
| Travel Time, Ti | min | 8.3 |
| A for Ti, to calculate Tt | Ac | |
| I calculated from Ti | in/hr | |
| Q for Ti, to calculate Tt | CFS | |

Ti (min) = 8.3

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | |
|---|---|---|
| Flow Length, D | ft | 30 |
| Change in Elevation, ΔE | ft | 0.3 |
| Travel Time, Ti | hr | 0.011 |

Tt (min) = 0.6

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Land Slope, S | ft/ft | |
| Manning's n | | |
| Q from Ti | CFS | |
| R | ft | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Street Grade | % | |
| Q from Ti | CFS | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

Combined Travel Time, $T_t$ (min) = 0.6

**Time of Concetration, $T_c$ (min) = *8.9***

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| P35 | Proposed | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | |
|---|---|---|
| Flow Length, D | ft | 30 |
| Change in Elevation, ΔE | ft | 1.2 |
| Land Slope, S | ft/ft | 0.040 |
| Runoff Coefficient, C | | 0.81 |
| Travel Time, Ti | min | 1.8 |
| A for Ti, to calculate Tt | Ac | 0.150 |
| I calculated from Ti | in/hr | 9.2 |
| Q for Ti, to calculate Tt | CFS | 1.12 |

Ti (min) = 1.8

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Travel Time, Ti | hr | |

Tt (min) =

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Land Slope, S | ft/ft | |
| Manning's n | | |
| Q from Ti | CFS | |
| R | ft | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | |
|---|---|---|
| Flow Length, D | ft | 180 |
| Change in Elevation, ΔE | ft | 2 |
| Street Grade | % | 0.011 |
| Q from Ti | CFS | 1.12 |
| Velocity | ft/sec | 2.200 |
| Travel Time, Ti | min | 1.4 |

Tt (min) = 1.4

Combined Travel Time, $T_t$ (min) = 1.4

**Time of Concetration, $T_c$ (min) =** ***3.2*** *

***Use minimum Tc of 5 minutes***

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| P36 | Proposed | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | |
|---|---|---|
| Flow Length, D | ft | 30 |
| Change in Elevation, ΔE | ft | 1.2 |
| Land Slope, S | ft/ft | 0.040 |
| Runoff Coefficient, C | | 0.81 |
| Travel Time, Ti | min | 1.8 |
| A for Ti, to calculate Tt | Ac | |
| I calculated from Ti | in/hr | |
| Q for Ti, to calculate Tt | CFS | |

Ti (min) = 1.8

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | |
|---|---|---|
| Flow Length, D | ft | 340 |
| Change in Elevation, ΔE | ft | 6.8 |
| Travel Time, Ti | hr | 0.052 |

Tt (min) = 3.1

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Land Slope, S | ft/ft | |
| Manning's n | | |
| Q from Ti | CFS | |
| R | ft | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Street Grade | % | |
| Q from Ti | CFS | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

Combined Travel Time, $T_t$ (min) = 3.1

**Time of Concetration, $T_c$ (min)** = ***4.9*** *

***Use minimum Tc of 5 minutes***

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| P37 | Proposed | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | |
|---|---|---|
| Flow Length, D | ft | 50 |
| Change in Elevation, ΔE | ft | 1 |
| Land Slope, S | ft/ft | 0.020 |
| Runoff Coefficient, C | | 0.81 |
| Travel Time, Ti | min | 2.9 |
| A for Ti, to calculate Tt | Ac | |
| I calculated from Ti | in/hr | |
| Q for Ti, to calculate Tt | CFS | |

Ti (min) = 2.9

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | |
|---|---|---|
| Flow Length, D | ft | 300 |
| Change in Elevation, ΔE | ft | 1.5 |
| Travel Time, Ti | hr | 0.081 |

Tt (min) = 4.9

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Land Slope, S | ft/ft | |
| Manning's n | | |
| Q from Ti | CFS | |
| R | ft | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Street Grade | % | |
| Q from Ti | CFS | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

Combined Travel Time, $T_t$ (min) = 4.9

**Time of Concetration, $T_c$ (min) = *7.8***

# TIME OF CONCENTRATION

## Project Information

| Project | County | Date | Project No. |
|---|---|---|---|
| Summit Estates | San Diego | 4/10/2020 | 1599.10 |
| **Location** | **Condtion** | **By** | **Checked** |
| P38 | Proposed | LZ | GP |

## Initial Time ($T_i$)

**FAA (Figure 3-3)**

| | | |
|---|---|---|
| Flow Length, D | ft | 25 |
| Change in Elevation, ΔE | ft | 0.25 |
| Land Slope, S | ft/ft | 0.010 |
| Runoff Coefficient, C | | 0.81 |
| Travel Time, Ti | min | 2.6 |
| A for Ti, to calculate Tt | Ac | 0.190 |
| I calculated from Ti | in/hr | 9.2 |
| Q for Ti, to calculate Tt | CFS | 1.42 |

Ti (min) = 2.6

## Travel Time

**Natural Watersheds** — **KIRPICH (Figure 3-4)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Travel Time, Ti | hr | |

Tt (min) =

**Brow Ditch** — **MANNING'S (Figure 3-7)**

| | | |
|---|---|---|
| Flow Length, D | ft | |
| Change in Elevation, ΔE | ft | |
| Land Slope, S | ft/ft | |
| Manning's n | | |
| Q from Ti | CFS | |
| R | ft | |
| Velocity | ft/sec | |
| Travel Time, Ti | min | |

Tt (min) =

**Gutter Flow** — **GUTTER FLOW (Figure 3-6)**

| | | |
|---|---|---|
| Flow Length, D | ft | 270 |
| Change in Elevation, ΔE | ft | 5 |
| Street Grade | % | 0.019 |
| Q from Ti | CFS | 1.42 |
| Velocity | ft/sec | 2.800 |
| Travel Time, Ti | min | 1.6 |

Tt (min) = 1.6

Combined Travel Time, $T_t$ (min) = 1.6

**Time of Concetration, $T_c$ (min) =** ***4.2*** *

***Use minimum Tc of 5 minutes***

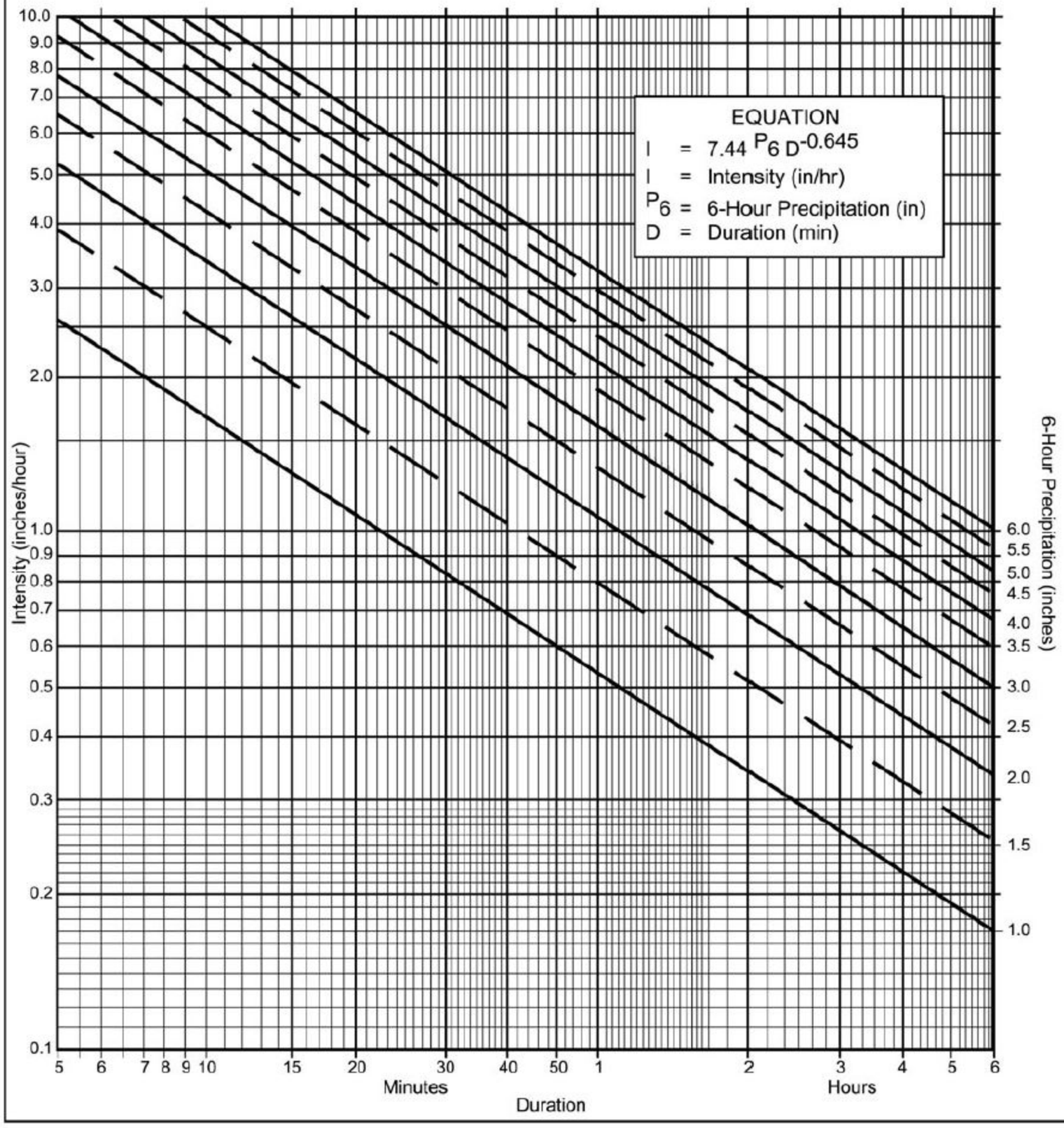
## Appendix C

San Diego County Manual References

## Table 3-1
## RUNOFF COEFFICIENTS FOR URBAN AREAS

| Land Use | | Runoff Coefficient "C" | | | | |
|---|---|---|---|---|---|---|
| | | | Soil Type | | | |
| NRCS Elements | County Elements | % IMPER. | A | B | C | D |
| Undisturbed Natural Terrain (Natural) | Permanent Open Space | 0* | 0.20 | 0.25 | 0.30 | 0.35 |
| Low Density Residential (LDR) | Residential, 1.0 DU/A or less | 10 | 0.27 | 0.32 | 0.36 | 0.41 |
| Low Density Residential (LDR) | Residential, 2.0 DU/A or less | 20 | 0.34 | 0.38 | 0.42 | 0.46 |
| Low Density Residential (LDR) | Residential, 2.9 DU/A or less | 25 | 0.38 | 0.41 | 0.45 | 0.49 |
| Medium Density Residential (MDR) | Residential, 4.3 DU/A or less | 30 | 0.41 | 0.45 | 0.48 | 0.52 |
| Medium Density Residential (MDR) | Residential, 7.3 DU/A or less | 40 | 0.48 | 0.51 | 0.54 | 0.57 |
| Medium Density Residential (MDR) | Residential, 10.9 DU/A or less | 45 | 0.52 | 0.54 | 0.57 | 0.60 |
| Medium Density Residential (MDR) | Residential, 14.5 DU/A or less | 50 | 0.55 | 0.58 | 0.60 | 0.63 |
| High Density Residential (HDR) | Residential, 24.0 DU/A or less | 65 | 0.66 | 0.67 | 0.69 | 0.71 |
| High Density Residential (HDR) | Residential, 43.0 DU/A or less | 80 | 0.76 | 0.77 | 0.78 | 0.79 |
| Commercial/Industrial (N. Com) | Neighborhood Commercial | 80 | 0.76 | 0.77 | 0.78 | 0.79 |
| Commercial/Industrial (G. Com) | General Commercial | 85 | 0.80 | 0.80 | 0.81 | 0.82 |
| Commercial/Industrial (O.P. Com) | Office Professional/Commercial | 90 | 0.83 | 0.84 | 0.84 | 0.85 |
| Commercial/Industrial (Limited I.) | Limited Industrial | 90 | 0.83 | 0.84 | 0.84 | 0.85 |
| Commercial/Industrial (General I.) | General Industrial | 95 | 0.87 | 0.87 | 0.87 | 0.87 |

*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the pervious runoff coefficient, Cp, for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the area will remain natural forever (e.g., the area is located in Cleveland National Forest).
DU/A = dwelling units per acre
NRCS = National Resources Conservation Service




**Directions for Application:**

(1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).

(2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicaple to Desert).

(3) Plot 6 hr precipitation on the right side of the chart.

(4) Draw a line through the point parallel to the plotted lines.

(5) This line is the intensity-duration curve for the location being analyzed.

**Application Form:**

(a) Selected frequency _____ year

(b) $P_6$ = _____ in., $P_{24}$ = _____, $\frac{P_6}{P_{24}}$ = _____ %(2)

(c) Adjusted $P_6$(2) = _____ in.

(d) $t_x$ = _____ min.

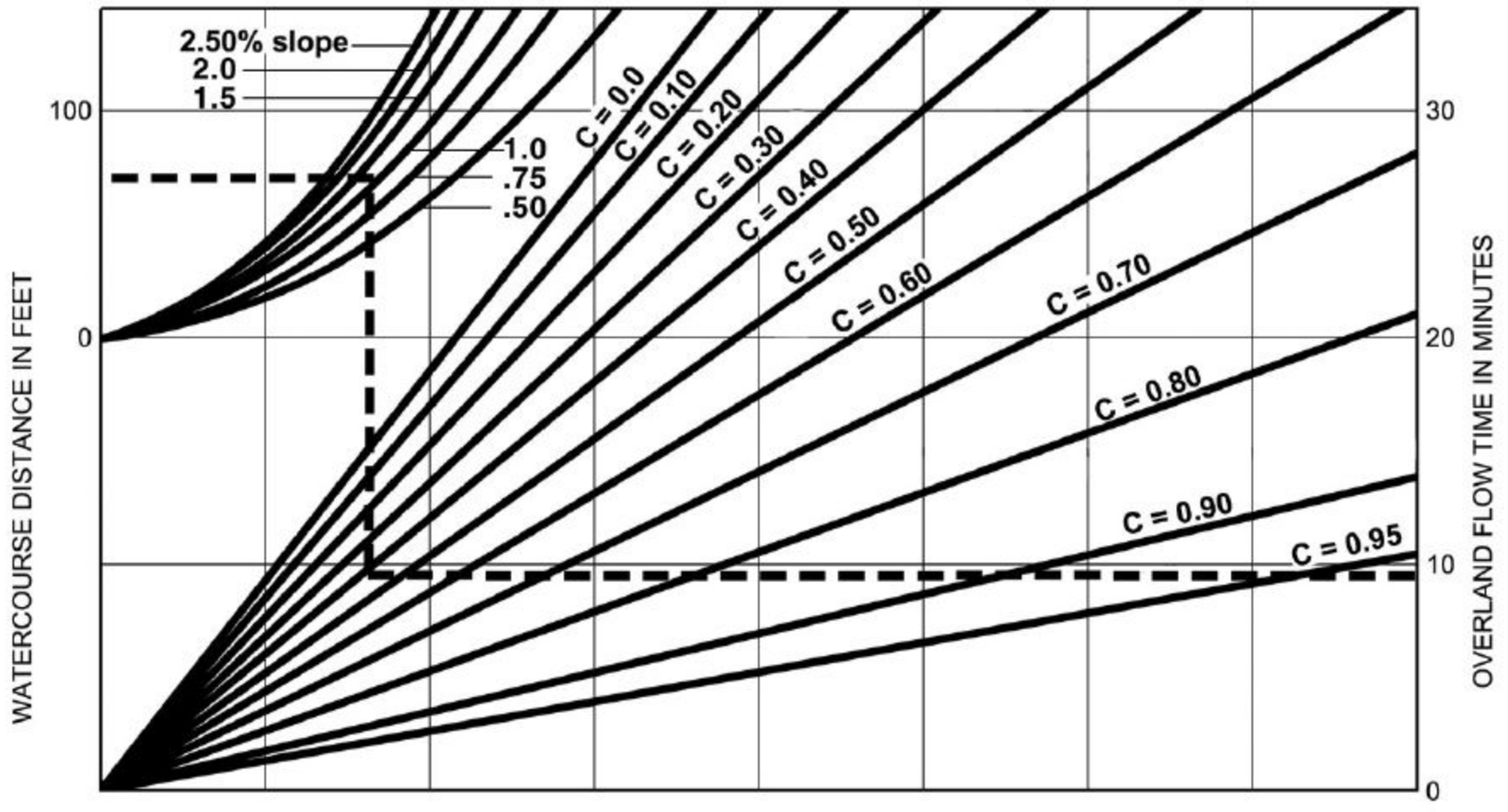
(e) I = _____ in./hr.

Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

| P6 | 1 | 1.5 | 2 | 2.5 | 3 | 3.5 | 4 | 4.5 | 5 | 5.5 | 6 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Duration | I | I | I | I | I | I | I | I | I | I | I |
| **5** | 2.63 | 3.95 | 5.27 | 6.59 | 7.90 | 9.22 | 10.54 | 11.86 | 13.17 | 14.49 | 15.81 |
| **7** | 2.12 | 3.18 | 4.24 | 5.30 | 6.36 | 7.42 | 8.48 | 9.54 | 10.60 | 11.66 | 12.72 |
| **10** | 1.68 | 2.53 | 3.37 | 4.21 | 5.05 | 5.90 | 6.74 | 7.58 | 8.42 | 9.27 | 10.11 |
| **15** | 1.30 | 1.95 | 2.59 | 3.24 | 3.89 | 4.54 | 5.19 | 5.84 | 6.49 | 7.13 | 7.78 |
| **20** | 1.08 | 1.62 | 2.15 | 2.69 | 3.23 | 3.77 | 4.31 | 4.85 | 5.39 | 5.93 | 6.46 |
| **25** | 0.93 | 1.40 | 1.87 | 2.33 | 2.80 | 3.27 | 3.73 | 4.20 | 4.67 | 5.13 | 5.60 |
| **30** | 0.83 | 1.24 | 1.66 | 2.07 | 2.49 | 2.90 | 3.32 | 3.73 | 4.15 | 4.56 | 4.98 |
| **40** | 0.69 | 1.03 | 1.38 | 1.72 | 2.07 | 2.41 | 2.76 | 3.10 | 3.45 | 3.79 | 4.13 |
| **50** | 0.60 | 0.90 | 1.19 | 1.49 | 1.79 | 2.09 | 2.39 | 2.69 | 2.98 | 3.28 | 3.58 |
| **60** | 0.53 | 0.80 | 1.06 | 1.33 | 1.59 | 1.86 | 2.12 | 2.39 | 2.65 | 2.92 | 3.18 |
| **90** | 0.41 | 0.61 | 0.82 | 1.02 | 1.23 | 1.43 | 1.63 | 1.84 | 2.04 | 2.25 | 2.45 |
| **120** | 0.34 | 0.51 | 0.68 | 0.85 | 1.02 | 1.19 | 1.36 | 1.53 | 1.70 | 1.87 | 2.04 |
| **150** | 0.29 | 0.44 | 0.59 | 0.73 | 0.88 | 1.03 | 1.18 | 1.32 | 1.47 | 1.62 | 1.76 |
| **180** | 0.26 | 0.39 | 0.52 | 0.65 | 0.78 | 0.91 | 1.04 | 1.18 | 1.31 | 1.44 | 1.57 |
| **240** | 0.22 | 0.33 | 0.43 | 0.54 | 0.65 | 0.76 | 0.87 | 0.98 | 1.08 | 1.19 | 1.30 |
| **300** | 0.19 | 0.28 | 0.38 | 0.47 | 0.56 | 0.66 | 0.75 | 0.85 | 0.94 | 1.03 | 1.13 |
| **360** | 0.17 | 0.25 | 0.33 | 0.42 | 0.50 | 0.58 | 0.67 | 0.75 | 0.84 | 0.92 | 1.00 |

**Intensity-Duration Design Chart - Template**

**FIGURE 3-1**




EXAMPLE:

Given: Watercourse Distance (D) = 70 Feet
Slope (s) = 1.3%
Runoff Coefficient (C) = 0.41
Overland Flow Time (T) = 9.5 Minutes

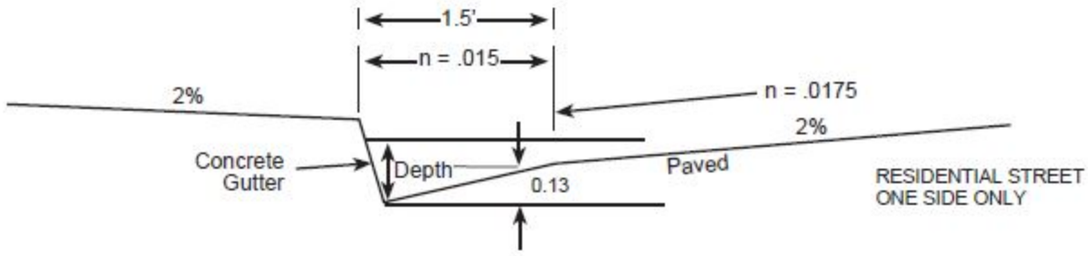
$$T = \frac{1.8\,(1.1-C)\sqrt{D}}{\sqrt[3]{s}}$$

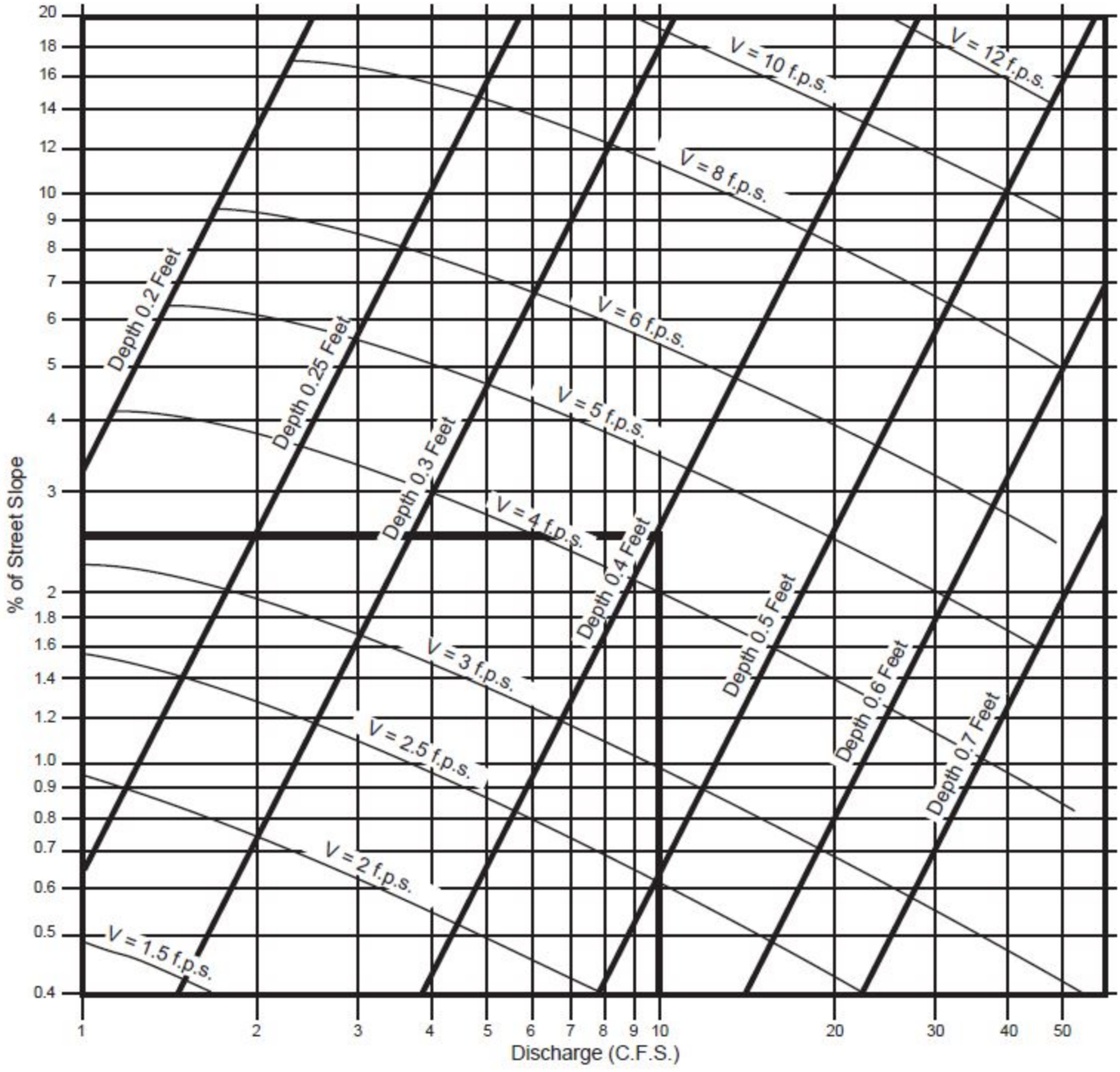
SOURCE: Airport Drainage, Federal Aviation Administration, 1965

FIGURE

**Rational Formula - Overland Time of Flow Nomograph**

**3-3**




**EXAMPLE:**
**Given: Q = 10 S = 2.5%**
**Chart gives: Depth = 0.4, Velocity = 4.4 f.p.s.**

SOURCE: San Diego County Department of Special District Services Design Manual

FIGURE

**Gutter and Roadway Discharge - Velocity Chart**

**3-6**

# County of San Diego Hydrology Manual

*Rainfall Isopluvials*

**100 Year Rainfall Event - 6 Hours**

Isopluvial (inches)

Orange County

Riverside County

Imperial County

Pacific Ocean

Mexico

SITE
P6=3.5"

OCEANSIDE
VISTA
CARLSBAD
ESCONDIDO
ENCINITAS
SOLANA BEACH
DEL MAR
POWAY
S.D. COUNTY
SANTEE
SAN DIEGO
EL CAJON
LA MESA
LEMON GROVE
CORONADO
SD
CHULA VISTA
IMPERIAL BEACH

117°30' 117°15' 117°00' 116°45' 116°30' 116°15'
33°30' 33°15' 33°00' 32°45' 32°30'

DPW GIS
Department of Public Works Geographic Information Services

SanGIS
We Have San Diego Covered!

N W E S

3 0 3 Miles

# County of San Diego Hydrology Manual

*Rainfall Isopluvials*

**100 Year Rainfall Event - 24 Hours**

Isopluvial (inches)

Orange County

Riverside County

Imperial County

Pacific Ocean

Mexico

SITE
P24=6"

OCEANSIDE
VISTA
CARLSBAD
ESCONDIDO
ENCINITAS
SOLANA BEACH
DEL MAR
POWAY
S.D. COUNTY
SANTEE
SAN DIEGO
EL CAJON
LA MESA
LEMON GROVE
CORONADO
SD
CHULA VISTA
IMPERIAL BEACH

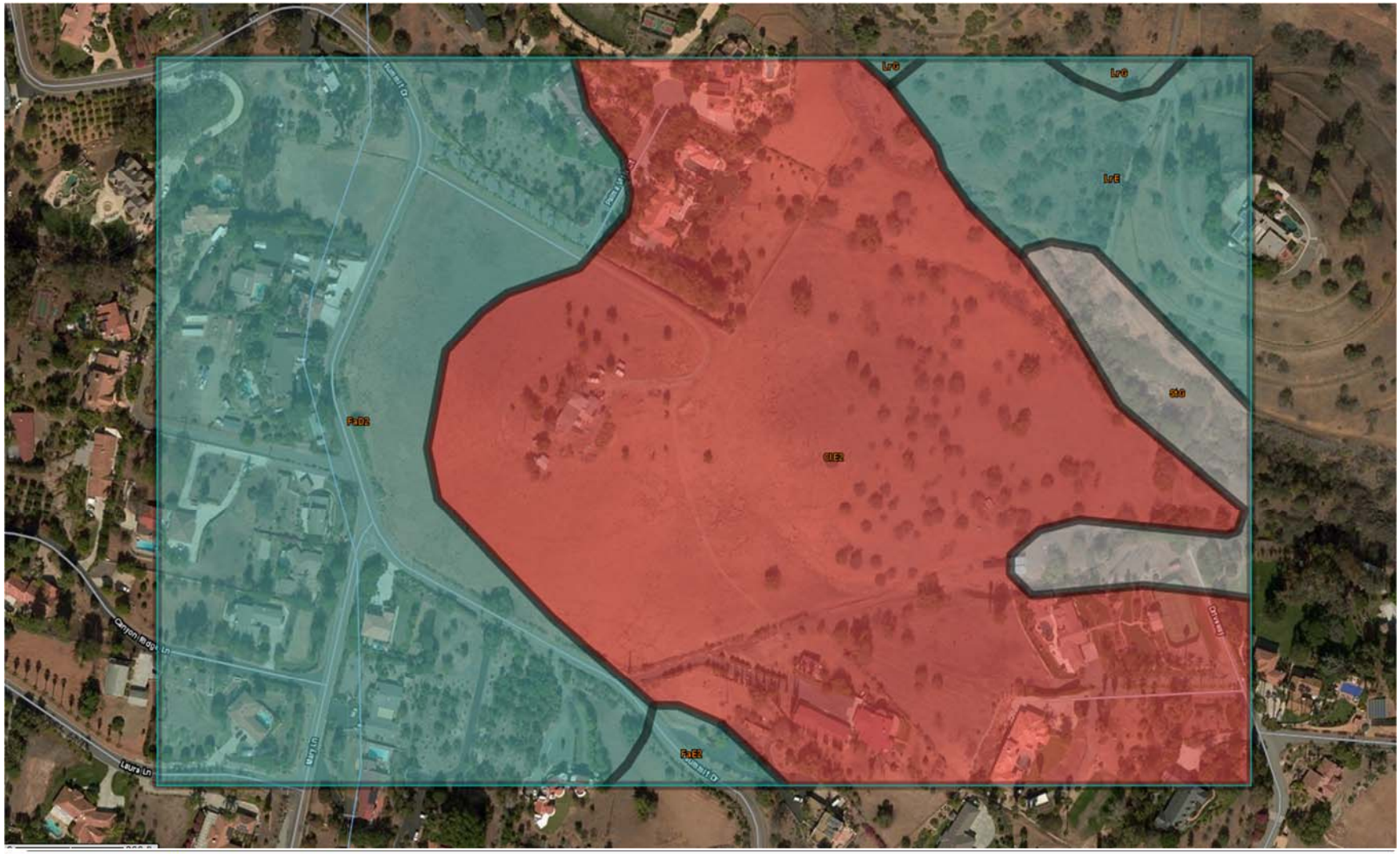
117°30' 117°15' 117°00' 116°45' 116°30' 116°15'
33°30' 33°15' 33°00' 32°45' 32°30'

DPW GIS
Department of Public Works Geospatial Information Services

SanGIS
We Have San Diego Covered!

N W E S

3 0 3 Miles

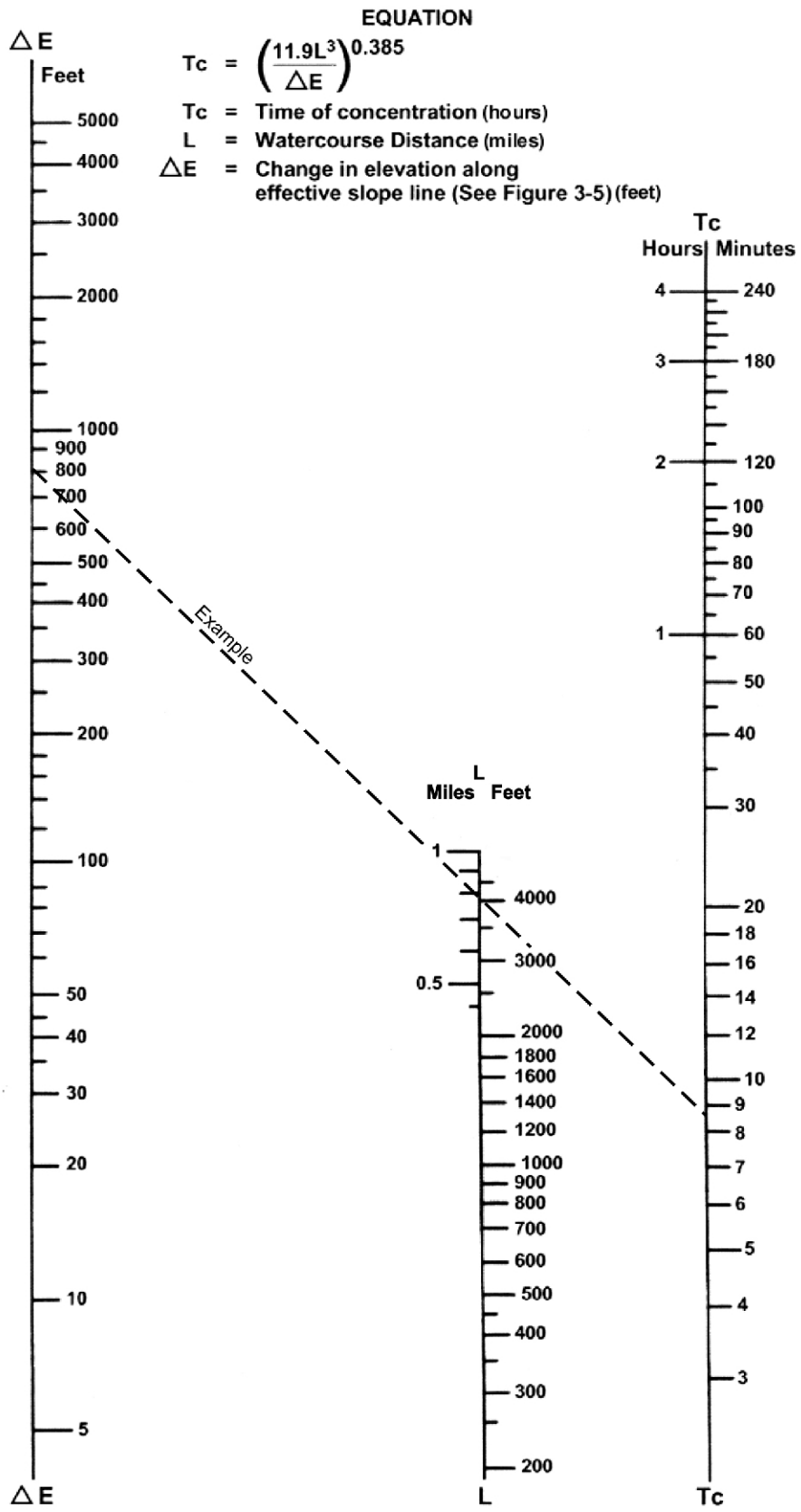



**Tables — Hydrologic Soil Group — Summary By Map Unit**

**Summary by Map Unit — San Diego County Area, California (CA638)**

Summary by Map Unit — San Diego County Area, California (CA638)

| Map unit symbol | Map unit name | Rating | Acres in AOI | Percent of AOI |
|---|---|---|---|---|
| ClE2 | Cieneba coarse sandy loam, 15 to 30 percent slopes, eroded | D | 31.1 | 49.8% |
| FaD2 | Fallbrook sandy loam, 9 to 15 percent slopes, eroded | C | 22.0 | 35.2% |
| FaE2 | Fallbrook sandy loam, 15 to 30 percent slopes, eroded | C | 0.7 | 1.0% |
| LrE | Las Posas stony fine sandy loam, 9 to 30 percent slopes | C | 5.4 | 8.6% |
| LrG | Las Posas stony fine sandy loam, 30 to 65 percent slopes | C | 0.3 | 0.5% |
| StG | Steep gullied land | | 3.0 | 4.8% |
| **Totals for Area of Interest** | | | **62.4** | **100.0%** |

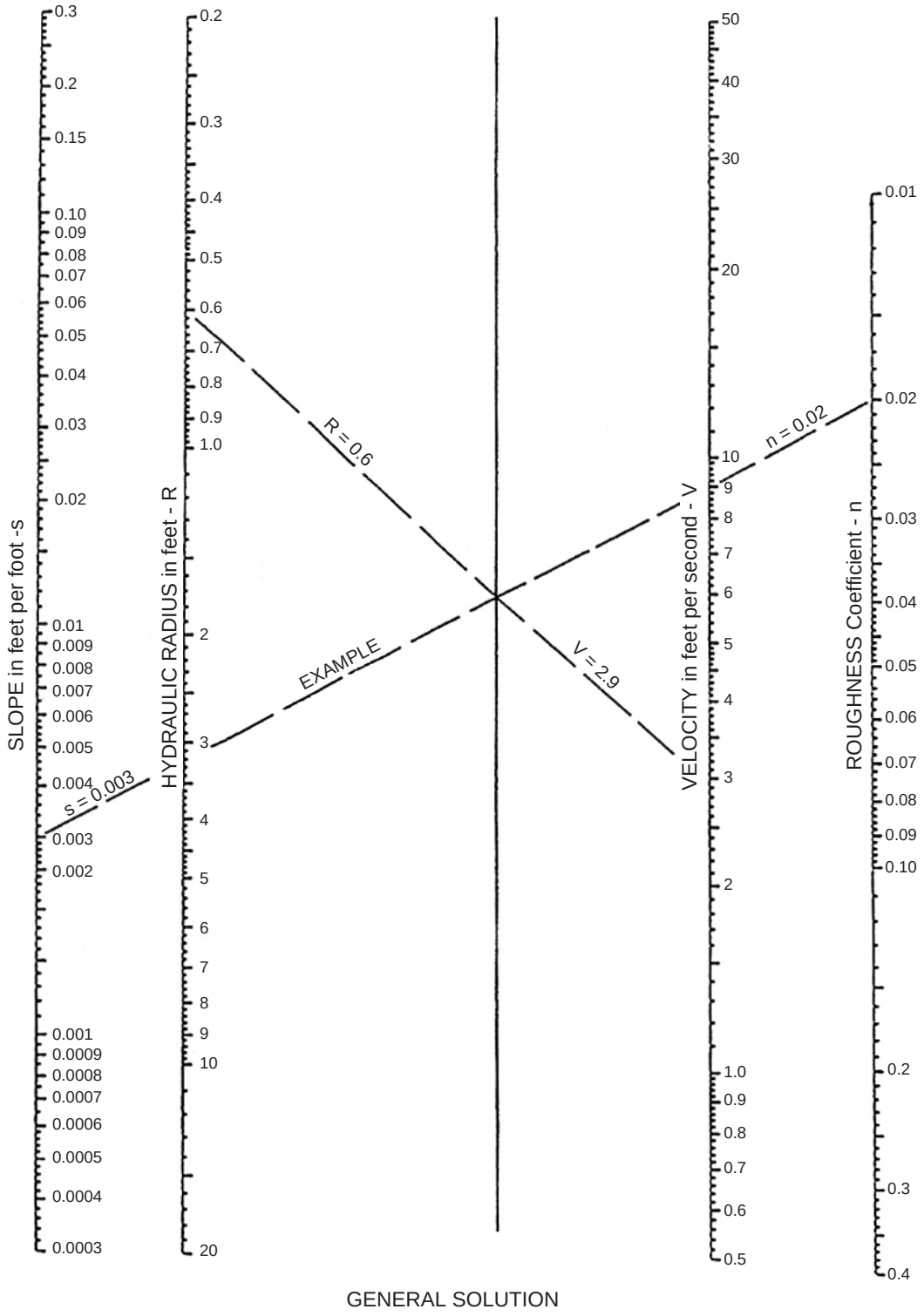



SOURCE: California Division of Highways (1941) and Kirpich (1940)

FIGURE 3-4

Nomograph for Determination of
Time of Concentration (Tc) or Travel Time (Tt) for Natural Watersheds

EQUATION: $V = \frac{1.49}{n} R^{2/3} s^{1/2}$




SOURCE: USDOT, FHWA, HDS-3 (1961)

**FIGURE**

**Manning's Equation Nomograph**

**3-7**

Note that the Initial Time of Concentration should be reflective of the general land-use at the upstream end of a drainage basin. A single lot with an area of two or less acres does not have a significant effect where the drainage basin area is 20 to 600 acres.

Table 3-2 provides limits of the length (Maximum Length ($L_M$)) of sheet flow to be used in hydrology studies. Initial $T_i$ values based on average C values for the Land Use Element are also included. These values can be used in planning and design applications as described below. Exceptions may be approved by the "Regulating Agency" when submitted with a detailed study.

**Table 3-2**

**MAXIMUM OVERLAND FLOW LENGTH ($L_M$)**
**& INITIAL TIME OF CONCENTRATION ($T_i$)**

| Element* | DU/ Acre | .5% | | 1% | | 2% | | 3% | | 5% | | 10% | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $L_M$ | $T_i$ | $L_M$ | $T_i$ | $L_M$ | $T_i$ | $L_M$ | $T_i$ | $L_M$ | $T_i$ | $L_M$ | $T_i$ |
| Natural | | 50 | 13.2 | 70 | 12.5 | 85 | 10.9 | 100 | 10.3 | 100 | 8.7 | 100 | 6.9 |
| LDR | 1 | 50 | 12.2 | 70 | 11.5 | 85 | 10.0 | 100 | 9.5 | 100 | 8.0 | 100 | 6.4 |
| LDR | 2 | 50 | 11.3 | 70 | 10.5 | 85 | 9.2 | 100 | 8.8 | 100 | 7.4 | 100 | 5.8 |
| LDR | 2.9 | 50 | 10.7 | 70 | 10.0 | 85 | 8.8 | 95 | 8.1 | 100 | 7.0 | 100 | 5.6 |
| MDR | 4.3 | 50 | 10.2 | 70 | 9.6 | 80 | 8.1 | 95 | 7.8 | 100 | 6.7 | 100 | 5.3 |
| MDR | 7.3 | 50 | 9.2 | 65 | 8.4 | 80 | 7.4 | 95 | 7.0 | 100 | 6.0 | 100 | 4.8 |
| MDR | 10.9 | 50 | 8.7 | 65 | 7.9 | 80 | 6.9 | 90 | 6.4 | 100 | 5.7 | 100 | 4.5 |
| MDR | 14.5 | 50 | 8.2 | 65 | 7.4 | 80 | 6.5 | 90 | 6.0 | 100 | 5.4 | 100 | 4.3 |
| HDR | 24 | 50 | 6.7 | 65 | 6.1 | 75 | 5.1 | 90 | 4.9 | 95 | 4.3 | 100 | 3.5 |
| HDR | 43 | 50 | 5.3 | 65 | 4.7 | 75 | 4.0 | 85 | 3.8 | 95 | 3.4 | 100 | 2.7 |
| N. Com | | 50 | 5.3 | 60 | 4.5 | 75 | 4.0 | 85 | 3.8 | 95 | 3.4 | 100 | 2.7 |
| G. Com | | 50 | 4.7 | 60 | 4.1 | 75 | 3.6 | 85 | 3.4 | 90 | 2.9 | 100 | 2.4 |
| O.P./Com | | 50 | 4.2 | 60 | 3.7 | 70 | 3.1 | 80 | 2.9 | 90 | 2.6 | 100 | 2.2 |
| Limited I. | | 50 | 4.2 | 60 | 3.7 | 70 | 3.1 | 80 | 2.9 | 90 | 2.6 | 100 | 2.2 |
| General I. | | 50 | 3.7 | 60 | 3.2 | 70 | 2.7 | 80 | 2.6 | 90 | 2.3 | 100 | 1.9 |

*See Table 3-1 for more detailed description

**Appendix D**

Storage Calculations

6-Hour Hydrograph per San Diego County Hydrology Manual Section 6

POC 1

| | | |
|---|---|---|
| C | 0.4 | |
| A | 20.51 | AC |
| Tc | 10.734 | min |
| P6 | 3.5 | in |
| | | |
| N | 33 | |
| Tc used | 10.909 | min |

Follow steps to build 6-hour incremental hydrograph per San Diego County Hydrology Manual Section 6.

| N | PT(N) (in) | PN (in) | QN (cfs) | TCs from Center | Time block from 1 | Time (min) | QN (cfs) | PN (in) |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.008 | 1.008 | 46.220 | 0 | 22 | 245.455 | 46.220 | 1.008 |
| 2 | 1.289 | 0.281 | 12.895 | -1 | 21 | 234.545 | 12.895 | 0.281 |
| 3 | 1.489 | 0.200 | 9.152 | -2 | 20 | 223.636 | 9.152 | 0.200 |
| 4 | 1.649 | 0.160 | 7.340 | 1 | 23 | 256.364 | 7.340 | 0.160 |
| 5 | 1.785 | 0.136 | 6.233 | -3 | 19 | 212.727 | 6.233 | 0.136 |
| 6 | 1.904 | 0.119 | 5.472 | -4 | 18 | 201.818 | 5.472 | 0.119 |
| 7 | 2.011 | 0.107 | 4.911 | 2 | 24 | 267.273 | 4.911 | 0.107 |
| 8 | 2.109 | 0.098 | 4.477 | -5 | 17 | 190.909 | 4.477 | 0.098 |
| 9 | 2.199 | 0.090 | 4.129 | -6 | 16 | 180.000 | 4.129 | 0.090 |
| 10 | 2.282 | 0.084 | 3.843 | 3 | 25 | 278.182 | 3.843 | 0.084 |
| 11 | 2.361 | 0.079 | 3.602 | -7 | 15 | 169.091 | 3.602 | 0.079 |
| 12 | 2.435 | 0.074 | 3.397 | -8 | 14 | 158.182 | 3.397 | 0.074 |
| 13 | 2.505 | 0.070 | 3.219 | 4 | 26 | 289.091 | 3.219 | 0.070 |
| 14 | 2.572 | 0.067 | 3.063 | -9 | 13 | 147.273 | 3.063 | 0.067 |
| 15 | 2.636 | 0.064 | 2.925 | -10 | 12 | 136.364 | 2.925 | 0.064 |
| 16 | 2.697 | 0.061 | 2.801 | 5 | 27 | 300.000 | 2.801 | 0.061 |
| 17 | 2.756 | 0.059 | 2.691 | -11 | 11 | 125.455 | 2.691 | 0.059 |
| 18 | 2.812 | 0.056 | 2.590 | -12 | 10 | 114.545 | 2.590 | 0.056 |
| 19 | 2.867 | 0.054 | 2.499 | 6 | 28 | 310.909 | 2.499 | 0.054 |
| 20 | 2.919 | 0.053 | 2.416 | -13 | 9 | 103.636 | 2.416 | 0.053 |
| 21 | 2.970 | 0.051 | 2.339 | -14 | 8 | 92.727 | 2.339 | 0.051 |
| 22 | 3.020 | 0.049 | 2.268 | 7 | 29 | 321.818 | 2.268 | 0.049 |
| 23 | 3.068 | 0.048 | 2.203 | -15 | 7 | 81.818 | 2.203 | 0.048 |
| 24 | 3.114 | 0.047 | 2.142 | -16 | 6 | 70.909 | 2.142 | 0.047 |
| 25 | 3.160 | 0.045 | 2.085 | 8 | 30 | 332.727 | 2.085 | 0.045 |
| 26 | 3.204 | 0.044 | 2.032 | -17 | 5 | 60.000 | 2.032 | 0.044 |
| 27 | 3.247 | 0.043 | 1.982 | -18 | 4 | 49.091 | 1.982 | 0.043 |
| 28 | 3.290 | 0.042 | 1.935 | 9 | 31 | 343.636 | 1.935 | 0.042 |
| 29 | 3.331 | 0.041 | 1.891 | -19 | 3 | 38.182 | 1.891 | 0.041 |
| 30 | 3.371 | 0.040 | 1.849 | -20 | 2 | 27.273 | 1.849 | 0.040 |
| 31 | 3.411 | 0.039 | 1.810 | 10 | 32 | 354.545 | 1.810 | 0.039 |
| 32 | 3.449 | 0.039 | 1.773 | -21 | 1 | 16.364 | 1.773 | 0.039 |

6-Hour Hydrograph per San Diego County Hydrology Manual Section 6
POC 1

Sort by Time Block.

| Time Block | PN (in) | Time (min) | Time (HH:MM) | QN (cfs) | VOL IN | CUM VOL IN |
|---|---|---|---|---|---|---|
| 0 | 0.038 | 0.000 | 0:00 | 0.000 | 0.00 | 0.00 |
| 1 | 0.039 | 16.364 | 0:16 | 1.773 | 870.30 | 870.30 |
| 2 | 0.040 | 27.273 | 0:27 | 1.849 | 1185.47 | 2055.77 |
| 3 | 0.041 | 38.182 | 0:38 | 1.891 | 1224.17 | 3279.94 |
| 4 | 0.043 | 49.091 | 0:49 | 1.982 | 1267.53 | 4547.47 |
| 5 | 0.044 | 60.000 | 1:00 | 2.032 | 1313.57 | 5861.03 |
| 6 | 0.047 | 70.909 | 1:10 | 2.142 | 1365.84 | 7226.88 |
| 7 | 0.048 | 81.818 | 1:21 | 2.203 | 1421.76 | 8648.64 |
| 8 | 0.051 | 92.727 | 1:32 | 2.339 | 1486.33 | 10134.97 |
| 9 | 0.053 | 103.636 | 1:43 | 2.416 | 1556.05 | 11691.02 |
| 10 | 0.056 | 114.545 | 1:54 | 2.590 | 1638.33 | 13329.36 |
| 11 | 0.059 | 125.455 | 2:05 | 2.691 | 1728.32 | 15057.67 |
| 12 | 0.064 | 136.364 | 2:16 | 2.925 | 1837.70 | 16895.37 |
| 13 | 0.067 | 147.273 | 2:27 | 3.063 | 1959.46 | 18854.84 |
| 14 | 0.074 | 158.182 | 2:38 | 3.397 | 2113.95 | 20968.79 |
| 15 | 0.079 | 169.091 | 2:49 | 3.602 | 2290.53 | 23259.32 |
| 16 | 0.090 | 180.000 | 3:00 | 4.129 | 2530.21 | 25789.53 |
| 17 | 0.098 | 190.909 | 3:10 | 4.477 | 2816.51 | 28606.03 |
| 18 | 0.119 | 201.818 | 3:21 | 5.472 | 3256.08 | 31862.12 |
| 19 | 0.136 | 212.727 | 3:32 | 6.233 | 3830.74 | 35692.86 |
| 20 | 0.200 | 223.636 | 3:43 | 9.152 | 5034.98 | 40727.84 |
| 21 | 0.281 | 234.545 | 3:54 | 12.895 | 7215.21 | 47943.05 |
| 22 | 1.008 | 245.455 | 4:05 | 46.220 | 19346.57 | 67289.62 |
| 23 | 0.160 | 256.364 | 4:16 | 7.340 | 17528.77 | 84818.39 |
| 24 | 0.107 | 267.273 | 4:27 | 4.911 | 4009.56 | 88827.95 |
| 25 | 0.084 | 278.182 | 4:38 | 3.843 | 2864.90 | 91692.85 |
| 26 | 0.070 | 289.091 | 4:49 | 3.219 | 2310.99 | 94003.84 |
| 27 | 0.061 | 300.000 | 5:00 | 2.801 | 1970.19 | 95974.04 |
| 28 | 0.054 | 310.909 | 5:10 | 2.499 | 1734.71 | 97708.75 |
| 29 | 0.049 | 321.818 | 5:21 | 2.268 | 1560.20 | 99268.95 |
| 30 | 0.045 | 332.727 | 5:32 | 2.085 | 1424.63 | 100693.58 |
| 31 | 0.042 | 343.636 | 5:43 | 1.935 | 1315.64 | 102009.22 |
| 32 | 0.039 | 354.545 | 5:54 | 1.810 | 1225.72 | 103234.93 |

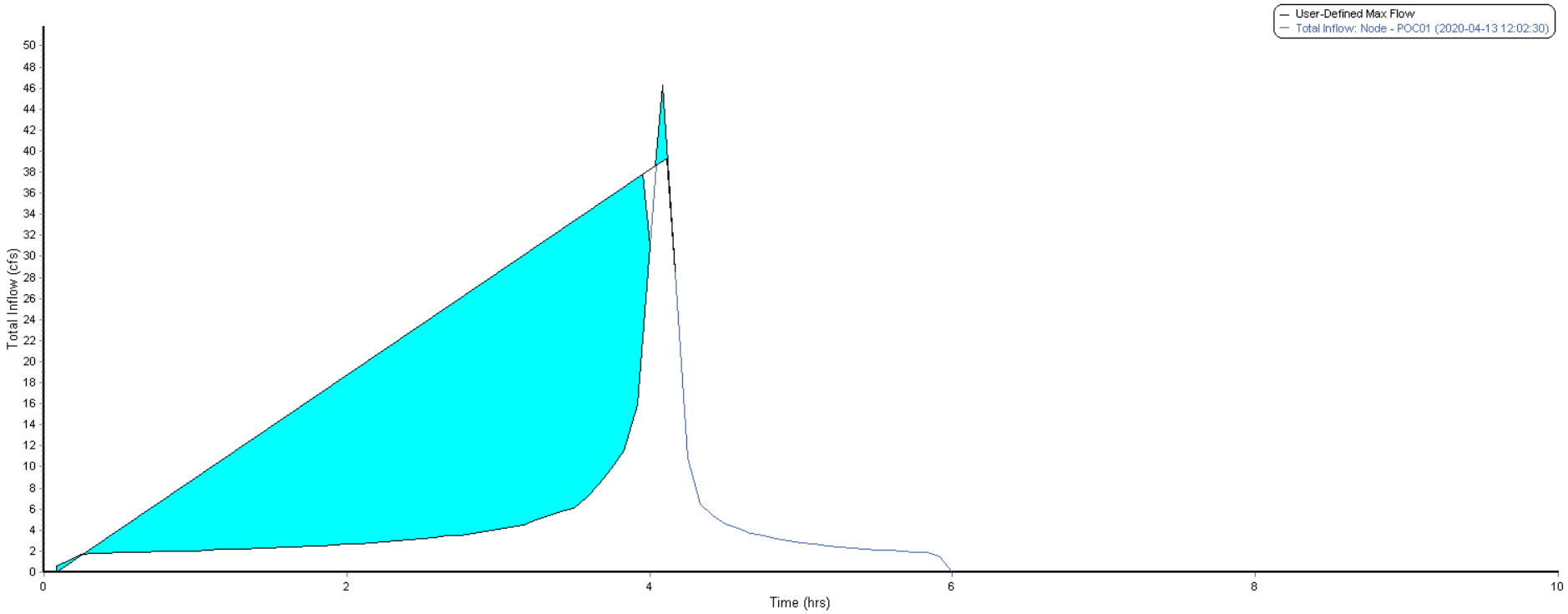
6-Hour Hydrograph per San Diego County Hydrology Manual Section 6

POC 1

| Time (HH:MM) | QN (cfs) |
|---|---|
| 0:00 | 0.000 |
| 0:16 | 1.773 |
| 0:27 | 1.849 |
| 0:38 | 1.891 |
| 0:49 | 1.982 |
| 1:00 | 2.032 |
| 1:10 | 2.142 |
| 1:21 | 2.203 |
| 1:32 | 2.339 |
| 1:43 | 2.416 |
| 1:54 | 2.590 |
| 2:05 | 2.691 |
| 2:16 | 2.925 |
| 2:27 | 3.063 |
| 2:38 | 3.397 |
| 2:49 | 3.602 |
| 3:00 | 4.129 |
| 3:10 | 4.477 |
| 3:21 | 5.472 |
| 3:32 | 6.233 |
| 3:43 | 9.152 |
| 3:54 | 12.895 |
| 4:05 | 46.220 |
| 4:16 | 7.340 |
| 4:27 | 4.911 |
| 4:38 | 3.843 |
| 4:49 | 3.219 |
| 5:00 | 2.801 |
| 5:10 | 2.499 |
| 5:21 | 2.268 |
| 5:32 | 2.085 |
| 5:43 | 1.935 |
| 5:54 | 1.810 |
| 6:00 | 0.000 |

Result is a time series for the 6-hour hydrograph.

**POC 1**




Time period

| | |
|---|---|
| From: | 04/13/2020, 12:00:00 AM |
| To: | 04/13/2020, 10:00:00 AM |

Thresholds

| | |
|---|---|
| Exceedance: | 0 |
| Deficit: | 0 |

Detention storage

| | |
|---|---|
| Max flow: | 39.35 |

| | |
|---|---|
| Element ID | POC01 |
| Maximum Total Inflow (cfs) | 46.22 |
| Minimum Total Inflow (cfs) | 0.00 |
| Event Mean Total Inflow (cfs) | 2.93 |
| Duration of Exceedances (hrs) | N/A |
| Duration of Deficits (hrs) | N/A |
| Number of Exceedances | N/A |
| Number of Deficits | N/A |
| Volume of Exceedance (ft³) | N/A |
| Volume of Deficit (ft³) | N/A |
| Total Inflow Volume (ft³) | 104526.94 |
| Detention Storage (ft³) | 564.82 |

Plot time series developed from the procedure in Section 6 of the San Diego County Hydrology Manual using SSA.

Input the existing condition peak flow for the POC to be plotted on the proposed hydrograph.

Draw straight line to the existing condition peak flow on the descending arm of the proposed 6-hour hydrograph.

Calculate area between the hydrograph and straight line as the detention volume needed to reduce the proposed peak flow.

6-Hour Hydrograph per San Diego County Hydrology Manual Section 6
POC 2

| | | |
|---|---|---|
| C | 0.49 | |
| A | 5.04 | AC |
| Tc | 12.72 | min |
| P6 | 3.5 | in |
| | | |
| N | 28 | |
| Tc used | 12.857 | min |

Follow steps to build 6-hour incremental hydrograph per San Diego County Hydrology Manual Section 6.

| N | PT(N) (in) | PN (in) | QN (cfs) | TCs from Center | Time block from 1 | Time (min) | QN (cfs) | PN (in) |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.070 | 1.070 | 12.470 | 0 | 19 | 246.429 | 12.470 | 1.070 |
| 2 | 1.369 | 0.299 | 3.479 | -1 | 18 | 233.571 | 3.479 | 0.299 |
| 3 | 1.581 | 0.212 | 2.469 | -2 | 17 | 220.714 | 2.469 | 0.212 |
| 4 | 1.751 | 0.170 | 1.980 | 1 | 20 | 259.286 | 1.980 | 0.170 |
| 5 | 1.895 | 0.144 | 1.682 | -3 | 16 | 207.857 | 1.682 | 0.144 |
| 6 | 2.022 | 0.127 | 1.476 | -4 | 15 | 195.000 | 1.476 | 0.127 |
| 7 | 2.136 | 0.114 | 1.325 | 2 | 21 | 272.143 | 1.325 | 0.114 |
| 8 | 2.240 | 0.104 | 1.208 | -5 | 14 | 182.143 | 1.208 | 0.104 |
| 9 | 2.335 | 0.096 | 1.114 | -6 | 13 | 169.286 | 1.114 | 0.096 |
| 10 | 2.424 | 0.089 | 1.037 | 3 | 22 | 285.000 | 1.037 | 0.089 |
| 11 | 2.508 | 0.083 | 0.972 | -7 | 12 | 156.429 | 0.972 | 0.083 |
| 12 | 2.586 | 0.079 | 0.916 | -8 | 11 | 143.571 | 0.916 | 0.079 |
| 13 | 2.661 | 0.075 | 0.868 | 4 | 23 | 297.857 | 0.868 | 0.075 |
| 14 | 2.732 | 0.071 | 0.826 | -9 | 10 | 130.714 | 0.826 | 0.071 |
| 15 | 2.800 | 0.068 | 0.789 | -10 | 9 | 117.857 | 0.789 | 0.068 |
| 16 | 2.864 | 0.065 | 0.756 | 5 | 24 | 310.714 | 0.756 | 0.065 |
| 17 | 2.927 | 0.062 | 0.726 | -11 | 8 | 105.000 | 0.726 | 0.062 |
| 18 | 2.987 | 0.060 | 0.699 | -12 | 7 | 92.143 | 0.699 | 0.060 |
| 19 | 3.045 | 0.058 | 0.674 | 6 | 25 | 323.571 | 0.674 | 0.058 |
| 20 | 3.101 | 0.056 | 0.652 | -13 | 6 | 79.286 | 0.652 | 0.056 |
| 21 | 3.155 | 0.054 | 0.631 | -14 | 5 | 66.429 | 0.631 | 0.054 |
| 22 | 3.207 | 0.053 | 0.612 | 7 | 26 | 336.429 | 0.612 | 0.053 |
| 23 | 3.258 | 0.051 | 0.594 | -15 | 4 | 53.571 | 0.594 | 0.051 |
| 24 | 3.308 | 0.050 | 0.578 | -16 | 3 | 40.714 | 0.578 | 0.050 |
| 25 | 3.356 | 0.048 | 0.562 | 8 | 27 | 349.286 | 0.562 | 0.048 |
| 26 | 3.403 | 0.047 | 0.548 | -17 | 2 | 27.857 | 0.548 | 0.047 |
| 27 | 3.449 | 0.046 | 0.535 | -18 | 1 | 15.000 | 0.535 | 0.046 |

6-Hour Hydrograph per San Diego County Hydrology Manual Section 6

POC 2

Sort by Time Block.

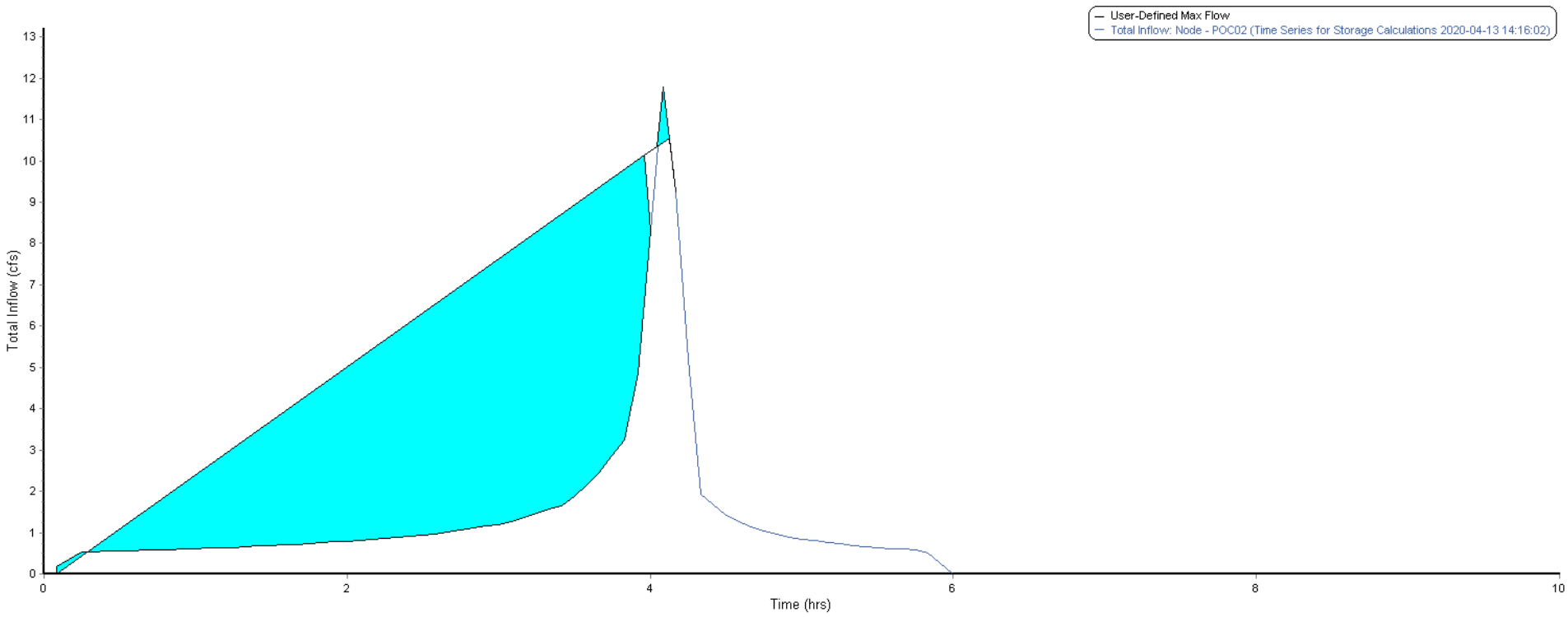
| Time Block | PN (in) | Time (min) | Time (HH:MM) | QN (cfs) | VOL IN | CUM VOL IN |
|---|---|---|---|---|---|---|
| 0 | 0.000 | 0.000 | 0:00 | 0.000 | 0.00 | 0.00 |
| 1 | 0.046 | 15.000 | 0:15 | 0.535 | 240.63 | 240.63 |
| 2 | 0.047 | 27.857 | 0:27 | 0.548 | 417.68 | 658.31 |
| 3 | 0.050 | 40.714 | 0:40 | 0.578 | 434.31 | 1092.61 |
| 4 | 0.051 | 53.571 | 0:53 | 0.594 | 452.09 | 1544.70 |
| 5 | 0.054 | 66.429 | 1:06 | 0.631 | 472.62 | 2017.32 |
| 6 | 0.056 | 79.286 | 1:19 | 0.652 | 494.79 | 2512.11 |
| 7 | 0.060 | 92.143 | 1:32 | 0.699 | 520.95 | 3033.06 |
| 8 | 0.062 | 105.000 | 1:45 | 0.726 | 549.56 | 3582.62 |
| 9 | 0.068 | 117.857 | 1:57 | 0.789 | 584.35 | 4166.97 |
| 10 | 0.071 | 130.714 | 2:10 | 0.826 | 623.06 | 4790.03 |
| 11 | 0.079 | 143.571 | 2:23 | 0.916 | 672.19 | 5462.22 |
| 12 | 0.083 | 156.429 | 2:36 | 0.972 | 728.33 | 6190.55 |
| 13 | 0.096 | 169.286 | 2:49 | 1.114 | 804.55 | 6995.09 |
| 14 | 0.104 | 182.143 | 3:02 | 1.208 | 895.58 | 7890.68 |
| 15 | 0.127 | 195.000 | 3:15 | 1.476 | 1035.36 | 8926.03 |
| 16 | 0.144 | 207.857 | 3:27 | 1.682 | 1218.08 | 10144.12 |
| 17 | 0.212 | 220.714 | 3:40 | 2.469 | 1601.01 | 11745.12 |
| 18 | 0.299 | 233.571 | 3:53 | 3.479 | 2294.27 | 14039.39 |
| 19 | 1.070 | 246.429 | 4:06 | 12.470 | 6151.75 | 20191.14 |
| 20 | 0.170 | 259.286 | 4:19 | 1.980 | 5573.73 | 25764.87 |
| 21 | 0.114 | 272.143 | 4:32 | 1.325 | 1274.95 | 27039.81 |
| 22 | 0.089 | 285.000 | 4:45 | 1.037 | 910.97 | 27950.78 |
| 23 | 0.075 | 297.857 | 4:57 | 0.868 | 734.84 | 28685.62 |
| 24 | 0.065 | 310.714 | 5:10 | 0.756 | 626.47 | 29312.10 |
| 25 | 0.058 | 323.571 | 5:23 | 0.674 | 551.60 | 29863.69 |
| 26 | 0.053 | 336.429 | 5:36 | 0.612 | 496.11 | 30359.80 |
| 27 | 0.048 | 349.286 | 5:49 | 0.562 | 453.00 | 30812.80 |

6-Hour Hydrograph per San Diego County Hydrology Manual Section 6
POC 2

| Time (HH:MM) | QN (cfs) |
|---|---|
| 0:00 | 0.000 |
| 0:15 | 0.535 |
| 0:27 | 0.548 |
| 0:40 | 0.578 |
| 0:53 | 0.594 |
| 1:06 | 0.631 |
| 1:19 | 0.652 |
| 1:32 | 0.699 |
| 1:45 | 0.726 |
| 1:57 | 0.789 |
| 2:10 | 0.826 |
| 2:23 | 0.916 |
| 2:36 | 0.972 |
| 2:49 | 1.114 |
| 3:02 | 1.208 |
| 3:15 | 1.476 |
| 3:27 | 1.682 |
| 3:40 | 2.469 |
| 3:53 | 3.479 |
| 4:06 | 12.470 |
| 4:19 | 1.980 |
| 4:32 | 1.325 |
| 4:45 | 1.037 |
| 4:57 | 0.868 |
| 5:10 | 0.756 |
| 5:23 | 0.674 |
| 5:36 | 0.612 |
| 5:49 | 0.562 |
| 6:00 | 0.000 |

Result is a time series for the 6-hour hydrograph.

**POC 2**




Time period

| | |
|---|---|
| From: | 04/13/2020, 12:00:00 AM |
| To: | 04/13/2020, 10:00:00 AM |

Thresholds

| | |
|---|---|
| Exceedance: | 0 |
| Deficit: | 0 |

Detention storage

| | |
|---|---|
| Max flow: | 10.55 |

| | |
|---|---|
| Element ID | POC02 |
| Maximum Total Inflow (cfs) | 11.78 |
| Minimum Total Inflow (cfs) | 0.00 |
| Event Mean Total Inflow (cfs) | 0.87 |
| Duration of Exceedances (hrs) | N/A |
| Duration of Deficits (hrs) | N/A |
| Number of Exceedances | N/A |
| Number of Deficits | N/A |
| Volume of Exceedance (ft³) | N/A |
| Volume of Deficit (ft³) | N/A |
| Total Inflow Volume (ft³) | 31112.88 |
| Detention Storage (ft³) | 151.28 |

Plot time series developed from the procedure in Section 6 of the San Diego County Hydrology Manual using SSA.

Input the existing condition peak flow for the POC to be plotted on the proposed hydrograph.

Draw straight line to the existing condition peak flow on the descending arm of the proposed 6-hour hydrograph.

Calculate area between the hydrograph and straight line as the detention volume needed to reduce the proposed peak flow.

6-Hour Hydrograph per San Diego County Hydrology Manual Section 6

POC 3

| | | |
|---|---|---|
| C | 0.54 | |
| A | 4.1 | AC |
| Tc | 12.408 | min |
| P6 | 3.5 | in |
| | | |
| N | 30 | |
| Tc used | 12 | min |

Follow steps to build 6-hour incremental hydrograph per San Diego County Hydrology Manual Section 6.

| N | PT(N) (in) | PN (in) | QN (cfs) | TCs from Center | Time block from 1 | Time (min) | QN (cfs) | PN (in) |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.061 | 1.061 | 11.360 | 0 | 20 | 246.000 | 11.360 | 1.061 |
| 2 | 1.357 | 0.296 | 3.169 | -1 | 19 | 234.000 | 3.169 | 0.296 |
| 3 | 1.567 | 0.210 | 2.249 | -2 | 18 | 222.000 | 2.249 | 0.210 |
| 4 | 1.736 | 0.169 | 1.804 | 1 | 21 | 258.000 | 1.804 | 0.169 |
| 5 | 1.879 | 0.143 | 1.532 | -3 | 17 | 210.000 | 1.532 | 0.143 |
| 6 | 2.004 | 0.126 | 1.345 | -4 | 16 | 198.000 | 1.345 | 0.126 |
| 7 | 2.117 | 0.113 | 1.207 | 2 | 22 | 270.000 | 1.207 | 0.113 |
| 8 | 2.220 | 0.103 | 1.100 | -5 | 15 | 186.000 | 1.100 | 0.103 |
| 9 | 2.315 | 0.095 | 1.015 | -6 | 14 | 174.000 | 1.015 | 0.095 |
| 10 | 2.403 | 0.088 | 0.944 | 3 | 23 | 282.000 | 0.944 | 0.088 |
| 11 | 2.486 | 0.083 | 0.885 | -7 | 13 | 162.000 | 0.885 | 0.083 |
| 12 | 2.564 | 0.078 | 0.835 | -8 | 12 | 150.000 | 0.835 | 0.078 |
| 13 | 2.638 | 0.074 | 0.791 | 4 | 24 | 294.000 | 0.791 | 0.074 |
| 14 | 2.708 | 0.070 | 0.753 | -9 | 11 | 138.000 | 0.753 | 0.070 |
| 15 | 2.775 | 0.067 | 0.719 | -10 | 10 | 126.000 | 0.719 | 0.067 |
| 16 | 2.839 | 0.064 | 0.689 | 5 | 25 | 306.000 | 0.689 | 0.064 |
| 17 | 2.901 | 0.062 | 0.661 | -11 | 9 | 114.000 | 0.661 | 0.062 |
| 18 | 2.961 | 0.059 | 0.637 | -12 | 8 | 102.000 | 0.637 | 0.059 |
| 19 | 3.018 | 0.057 | 0.614 | 6 | 26 | 318.000 | 0.614 | 0.057 |
| 20 | 3.073 | 0.055 | 0.594 | -13 | 7 | 90.000 | 0.594 | 0.055 |
| 21 | 3.127 | 0.054 | 0.575 | -14 | 6 | 78.000 | 0.575 | 0.054 |
| 22 | 3.179 | 0.052 | 0.557 | 7 | 27 | 330.000 | 0.557 | 0.052 |
| 23 | 3.230 | 0.051 | 0.541 | -15 | 5 | 66.000 | 0.541 | 0.051 |
| 24 | 3.279 | 0.049 | 0.526 | -16 | 4 | 54.000 | 0.526 | 0.049 |
| 25 | 3.327 | 0.048 | 0.512 | 8 | 28 | 342.000 | 0.512 | 0.048 |
| 26 | 3.373 | 0.047 | 0.499 | -17 | 3 | 42.000 | 0.499 | 0.047 |
| 27 | 3.419 | 0.046 | 0.487 | -18 | 2 | 30.000 | 0.487 | 0.046 |
| 28 | 3.463 | 0.044 | 0.476 | 9 | 29 | 354.000 | 0.476 | 0.044 |
| 29 | 3.507 | 0.043 | 0.465 | -19 | 1 | 18.000 | 0.465 | 0.043 |

6-Hour Hydrograph per San Diego County Hydrology Manual Section 6
POC 3

Sort by Time Block.

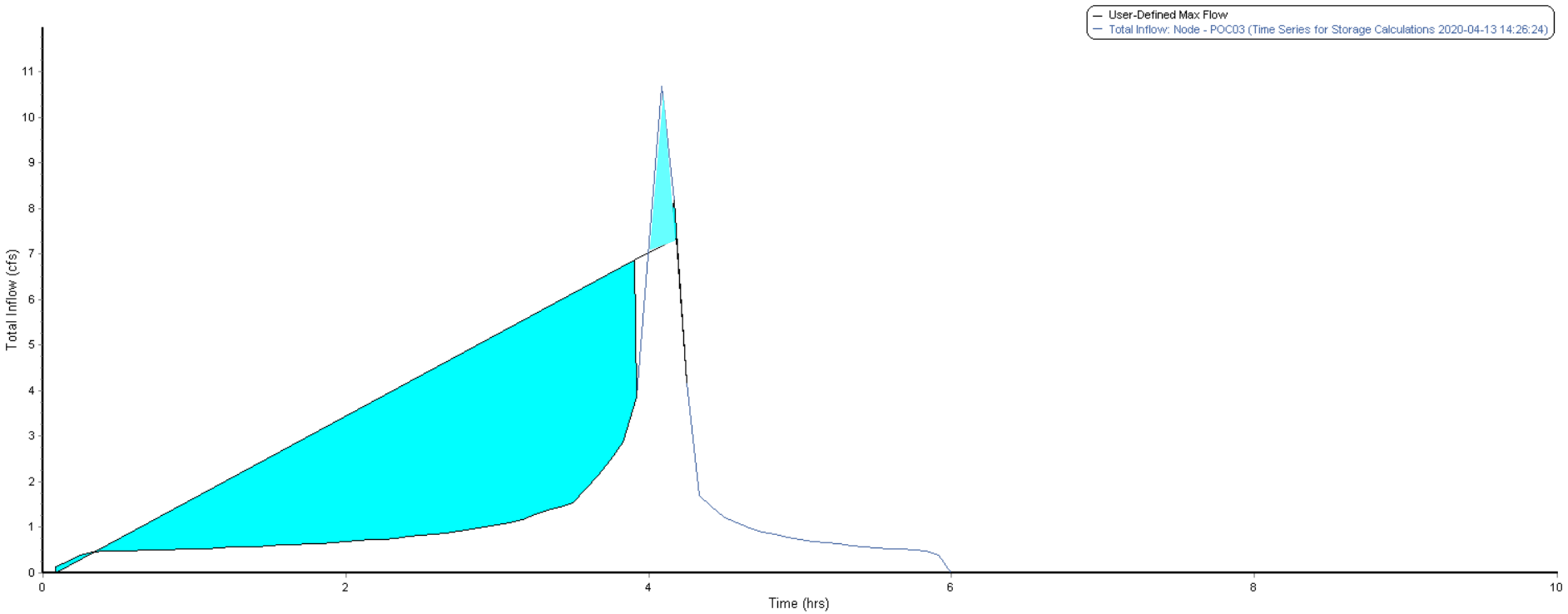
| Time Block | PN (in) | Time (min) | Time (HH:MM) | QN (cfs) | VOL IN | CUM VOL IN |
|---|---|---|---|---|---|---|
| 0 | 0.042 | 0.000 | 0:00 | 0.000 | 0.00 | 0.00 |
| 1 | 0.043 | 18.000 | 0:18 | 0.465 | 250.99 | 250.99 |
| 2 | 0.046 | 30.000 | 0:30 | 0.487 | 342.69 | 593.67 |
| 3 | 0.047 | 42.000 | 0:42 | 0.499 | 355.14 | 948.81 |
| 4 | 0.049 | 54.000 | 0:54 | 0.526 | 369.27 | 1318.08 |
| 5 | 0.051 | 66.000 | 1:06 | 0.541 | 384.39 | 1702.46 |
| 6 | 0.054 | 78.000 | 1:18 | 0.575 | 401.84 | 2104.31 |
| 7 | 0.055 | 90.000 | 1:30 | 0.594 | 420.69 | 2525.00 |
| 8 | 0.059 | 102.000 | 1:42 | 0.637 | 442.94 | 2967.94 |
| 9 | 0.062 | 114.000 | 1:54 | 0.661 | 467.27 | 3435.21 |
| 10 | 0.067 | 126.000 | 2:06 | 0.719 | 496.84 | 3932.05 |
| 11 | 0.070 | 138.000 | 2:18 | 0.753 | 529.76 | 4461.81 |
| 12 | 0.078 | 150.000 | 2:30 | 0.835 | 571.53 | 5033.33 |
| 13 | 0.083 | 162.000 | 2:42 | 0.885 | 619.27 | 5652.60 |
| 14 | 0.095 | 174.000 | 2:54 | 1.015 | 684.07 | 6336.66 |
| 15 | 0.103 | 186.000 | 3:06 | 1.100 | 761.47 | 7098.13 |
| 16 | 0.126 | 198.000 | 3:18 | 1.345 | 880.31 | 7978.45 |
| 17 | 0.143 | 210.000 | 3:30 | 1.532 | 1035.68 | 9014.12 |
| 18 | 0.210 | 222.000 | 3:42 | 2.249 | 1361.26 | 10375.38 |
| 19 | 0.296 | 234.000 | 3:54 | 3.169 | 1950.70 | 12326.08 |
| 20 | 1.061 | 246.000 | 4:06 | 11.360 | 5230.53 | 17556.60 |
| 21 | 0.169 | 258.000 | 4:18 | 1.804 | 4739.07 | 22295.67 |
| 22 | 0.113 | 270.000 | 4:30 | 1.207 | 1084.02 | 23379.69 |
| 23 | 0.088 | 282.000 | 4:42 | 0.944 | 774.55 | 24154.25 |
| 24 | 0.074 | 294.000 | 4:54 | 0.791 | 624.80 | 24779.05 |
| 25 | 0.064 | 306.000 | 5:06 | 0.689 | 532.66 | 25311.71 |
| 26 | 0.057 | 318.000 | 5:18 | 0.614 | 469.00 | 25780.70 |
| 27 | 0.052 | 330.000 | 5:30 | 0.557 | 421.82 | 26202.52 |
| 28 | 0.048 | 342.000 | 5:42 | 0.512 | 385.16 | 26587.68 |
| 29 | 0.044 | 354.000 | 5:54 | 0.476 | 355.69 | 26943.37 |

6-Hour Hydrograph per San Diego County Hydrology Manual Section 6
POC 3

| Time (HH:MM) | QN (cfs) |
|---|---|
| 0:00 | 0.000 |
| 0:18 | 0.465 |
| 0:30 | 0.487 |
| 0:42 | 0.499 |
| 0:54 | 0.526 |
| 1:06 | 0.541 |
| 1:18 | 0.575 |
| 1:30 | 0.594 |
| 1:42 | 0.637 |
| 1:54 | 0.661 |
| 2:06 | 0.719 |
| 2:18 | 0.753 |
| 2:30 | 0.835 |
| 2:42 | 0.885 |
| 2:54 | 1.015 |
| 3:06 | 1.100 |
| 3:18 | 1.345 |
| 3:30 | 1.532 |
| 3:42 | 2.249 |
| 3:54 | 3.169 |
| 4:06 | 11.360 |
| 4:18 | 1.804 |
| 4:30 | 1.207 |
| 4:42 | 0.944 |
| 4:54 | 0.791 |
| 5:06 | 0.689 |
| 5:18 | 0.614 |
| 5:30 | 0.557 |
| 5:42 | 0.512 |
| 5:54 | 0.476 |
| 6:00 | 0.000 |

Result is a time series for the 6-hour hydrograph.

**POC 3**




Time period

| | |
|---|---|
| From: | 04/13/2020, 12:00:00 AM |
| To: | 04/13/2020, 10:00:00 AM |

Thresholds

| | |
|---|---|
| Exceedance: | 0 |
| Deficit: | 0 |

Detention storage

| | |
|---|---|
| Max flow: | 7.36 |

| | |
|---|---|
| Element ID | POC03 |
| Maximum Total Inflow (cfs) | 10.68 |
| Minimum Total Inflow (cfs) | 0.00 |
| Event Mean Total Inflow (cfs) | 0.76 |
| Duration of Exceedances (hrs) | N/A |
| Duration of Deficits (hrs) | N/A |
| Number of Exceedances | N/A |
| Number of Deficits | N/A |
| Volume of Exceedance (ft³) | N/A |
| Volume of Deficit (ft³) | N/A |
| Total Inflow Volume (ft³) | 27032.27 |
| Detention Storage (ft³) | 1238.97 |

Plot time series developed from the procedure in Section 6 of the San Diego County Hydrology Manual using SSA.

Input the existing condition peak flow for the POC to be plotted on the proposed hydrograph.

Draw straight line to the existing condition peak flow on the descending arm of the proposed 6-hour hydrograph.

Calculate area between the hydrograph and straight line as the detention volume needed to reduce the proposed peak flow.

Summit Estates
Provided Storage Calculations

| BMP | POC | Area (SF) | DCV from SWQMP (CF) | Soil Depth (ft) | Gravel Depth (ft) | Subsurface storage available for DCV (CF) | Can DCV be detained in subsurface storage? | Height of Overflow Riser (ft) | Storage Volume provided from Basin Surface to Riser (CF) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 8540 | 3895 | 1.5 | 3.25 | 13664 | Yes | 1.5 | 12810 |
| 2 | 2 | 2560 | 2005 | 1.5 | 1.5 | 2304 | Yes | 1 | 2560 |
| 3A | 3 | 2000 | 1848 | 1.5 | 2 | 2200 | Yes | 1 | 2000 |
| 3B | 3 | 1000 | 1038 | 1.5 | 2 | 1100 | Yes | 1 | 1000 |

Notes:
1. See SWQMP for reference.
2. Subsurface storage available for DCV considers a void ratio of 0.2 for soil layer and 0.4 for gravel layer. An effective depth is calculated using the void ratios, and the volume is calculated as effective depth multiplied by basin area.
3. If DCV can be fully detained in the subsurface storage, flood control volume can begin at the basin surface.

| Total Storage Tributary to Each POC | |
|---|---|
| **POC** | **Volume (CF)** |
| 1 | 12810 |
| 2 | 2560 |
| 3 | 3000 |
| 4 | N/A |
| 5 | N/A |

## Appendix E

Summit Drive Pipe Sizing Calculations

# Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Apr 14 2020

## <Summit Estates Pipe at POC 2>

**Circular**

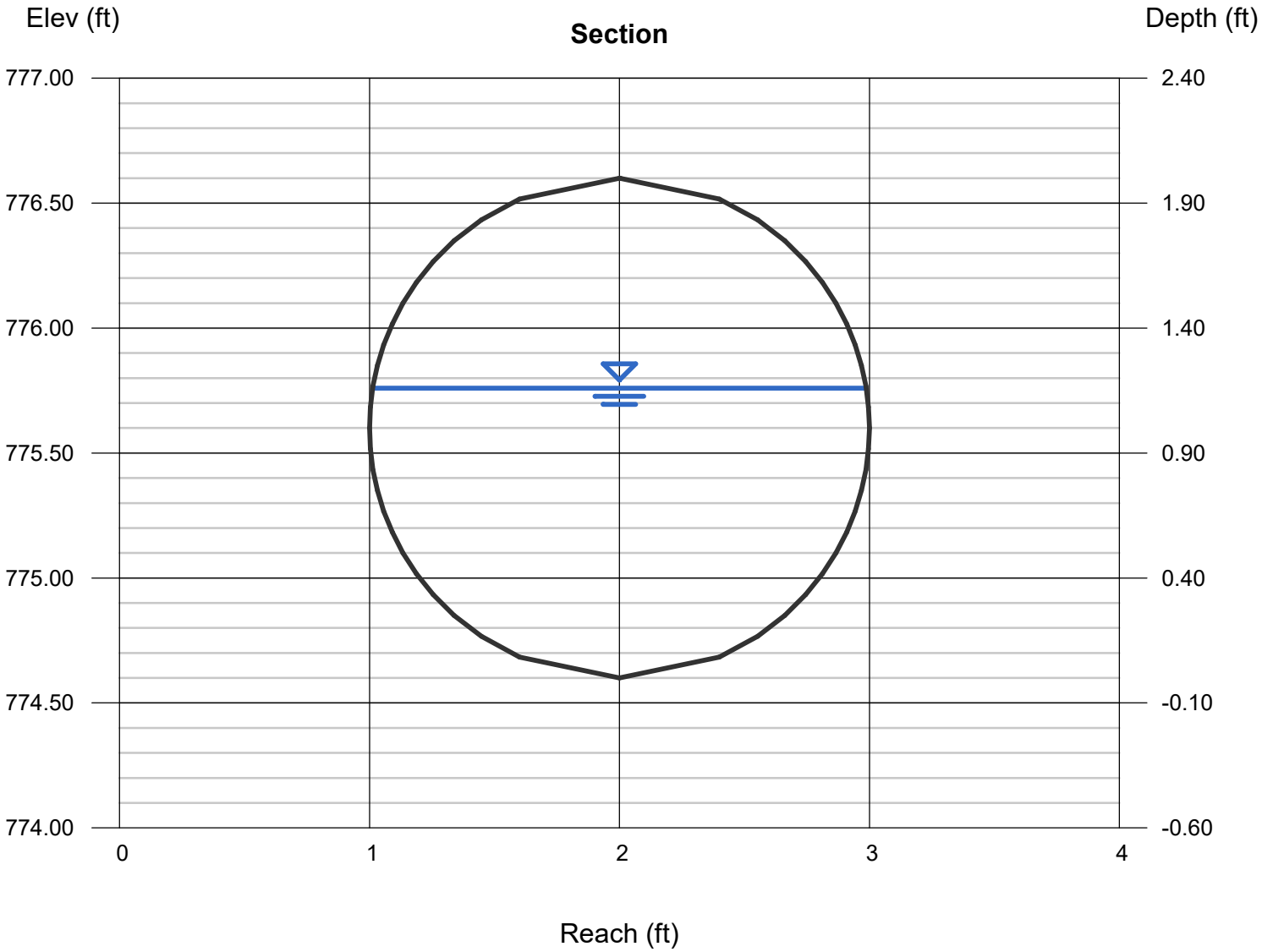
| | |
|---|---|
| Diameter (ft) | = 2.00 |
| Invert Elev (ft) | = 774.60 |
| Slope (%) | = 1.00 |
| N-Value | = 0.015 |

**Calculations**

| | |
|---|---|
| Compute by: | Known Q |
| Known Q (cfs) | = 12.47 |

**Highlighted**

| | |
|---|---|
| Depth (ft) | = 1.16 |
| Q (cfs) | = 12.47 |
| Area (sqft) | = 1.90 |
| Velocity (ft/s) | = 6.58 |
| Wetted Perim (ft) | = 3.47 |
| Crit Depth, Yc (ft) | = 1.27 |
| Top Width (ft) | = 1.97 |
| EGL (ft) | = 1.83 |



# Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Apr 14 2020

## <Summit Estates Pipe at POC 4>

**Circular**

| | |
|---|---|
| Diameter (ft) | = 1.50 |
| Invert Elev (ft) | = 783.70 |
| Slope (%) | = 1.00 |
| N-Value | = 0.015 |

**Calculations**

| | |
|---|---|
| Compute by: | Known Q |
| Known Q (cfs) | = 2.95 |

**Highlighted**

| | |
|---|---|
| Depth (ft) | = 0.59 |
| Q (cfs) | = 2.950 |
| Area (sqft) | = 0.65 |
| Velocity (ft/s) | = 4.54 |
| Wetted Perim (ft) | = 2.04 |
| Crit Depth, Yc (ft) | = 0.66 |
| Top Width (ft) | = 1.47 |
| EGL (ft) | = 0.91 |