# Appendix IS-9

Sanitary Sewer Study

# PRELIMINARY SANITARY SEWER STUDY

**FOR**

**PROPOSED HOTEL DEVELOPMENT**

## THE BEACON HOTEL

100 E OCEAN BLVD
LONG BEACH, CALIFORNIA
90802

FOR

LONG BEACH WATER DEPARTMENT

1800 E. WARDLOW ROAD

LONG BEACH, CALIFORNIA

90807

By

KPFF Consulting Engineers
400 Oceangate, Suite 500
Long Beach, CA 90802

October 2, 2018

**Proposed Development:**

The proposed development is located in Downtown Long Beach and will occupy approximately 1 acre at the southeast corner of Ocean Blvd and Pine Ave in the City of Long Beach (Please see Figure 1 below).The proposed development will consist of a new high-rise hotel, 29-story, 2-level parking garage, 429-rooms, with restaurant, meeting room, parking, and roof top amenities.

**Figure 1 – Vicinity Map**

The proposed project is anticipated to contain 429 hotel rooms and 23,512 square feet of restaurant space, which translates to approximately 15,274 gallons per day (0.24 cfs), using the LA Sanitation District Number 3 loading rates. This is the maximum peak discharge flow rate possible for the proposed development.

**Flow Monitoring Analysis:**

Utility Systems Science and Software personnel performed a sewer flow monitoring study on the existing sewer manhole located at the intersection of Locust Ave and Seaside Way during the period spanning March 07, 2018 through March 14, 2018. The site report for the sewer manhole is included as Attachment A. The site report identifies the location of the manhole that was monitored as well as information relating to the condition of the sewer manhole and the connecting pipes. The manhole is identified as H08-SMH-004 per the Long Beach Water Department (LBWD) Sewer Atlas (Please see Attachment B). The contact information for the firm performing the sewer monitoring is shown below:

*Darlene Szczublewski, P E*
*Senior Civil Engineer*
*darlene.szczublewski@uscubed.com*
*1250 Pioneer Way, Suite F*
*El Cajon, CA 92020*
*619-546-4281 (work)*
*619-246-5304 (cell)*

The location of the sewer monitoring survey is subject to mild traffic during typical days; however the manhole is located in the path of the Long Beach Grand Prix, therefore the pavement shows signs of minor fatigue and wear.

Additional information relative to the sewer monitoring survey is included in Attachment C. This additional information includes:

- Instrumentation used for the sewer monitoring survey.
- Information showing the average and maximum velocity, level, and flow of the existing system for the duration of the survey:
    - Graphs of the results of the sewer monitoring survey
    - Statistics of the results of the sewer monitoring survey
    - Raw data of the sewer monitoring survey

**Proposed Flow Contribution:**

According to the sewer monitoring survey, the average flow for the system was 36.95 gpm (0.082cfs) and a maximum flow of 102.22 gpm (0.228cfs) for the duration of the survey.

The proposed hotel development will add an estimated peak of 154,274 gallons per day (0.24 cfs) to the existing system for a total of 0.322 cfs of average flow and a maximum flow of 0.468 cfs during a peak surge. These flows were estimated using LA County Sanitation's recommended flow rates and Long Beach Water Department's peaking factor. The total peak rate is summarized in the table below.

## The Beacon Hotel at 100 E Ocean Blvd

## Estimated Sewage Flow Rates

| Description | Unit | Rate[1] | Unit | Value | Unit | Flow Result | Unit |
|---|---|---|---|---|---|---|---|
| Hotel Room | per room | 125 | gpd | 429 | rooms | **53,625** | **gpd** |
| Restaurant | per 1,000 sf | 1,000 | gpd | 23,512 | sf | **23,512** | **gpd** |
| | | | | | Total | 77,137 | gpd |
| | | | | | Peak Factor | 2.0 | |
| | | | | | **Total Peak** | **154,274** | **gpd** |
| | | | | | **Total Peak** | **0.24** | **cfs** |

*Notes*

*1. Proposed flow rates are per "LA County Sanitation District No. 3 Service Charge Report for Fiscal year 2015-16."*

*2. Peak rate is per long Beach Water Department sewer design guidelines*

*3. One cubic foot per second = 646,358 gallons per day*

**Analysis:**

The proposed development was evaluated to determine the impact that the additional peak flow will have on the existing downstream system.

Performing a flow analysis calculation on the 10-inch sewer main downstream from the intersection of Locust Ave and Seaside Way, based on parameters from King's Hydraulic Hand Book, a Manning's friction factor of n=0.013, and an existing pipe slope of 0.004 ft/ft (Attachment D), resulted in the following:

- Average Flow 0.322 cfs: d/D = 0.33, V = 2.077 ft/s
- Peak Flow 0.468 cfs: d/D = 0.41, V = 2.318 ft/s

The hydraulic analysis of the existing 10-inch downstream pipe can be found in Attachment E.

**Findings and Conclusions:**

The effluent flow from the proposed project will add approximately 154,274 gallons per day (0.24 cfs) to the existing system. To assess the impact the additional flow will have on the system we used both the average flow and the maximum (peak) flow results from the sewer monitoring study and added the projected flow from the proposed development. The resulting d/D for the average flow was 0.33 and for maximum peak flow the d/D was 0.41. Therefore it is our opinion that the downstream sewer line can convey the increased flow from this development.

| **Summary Table** | | | | | |
|---|---|---|---|---|---|
| | *Existing (cfs)* | *Prop. (cfs)* | *Total (cfs)* | *d/D* | *V (ft/s)* |
| *Average* | 0.082 | 0.135 | 0.322 | 0.33 | 2.077 |
| *Peak* | 0.228 | 0.24 | 0.468 | 0.41 | 2.318 |

***Note:*** *It should be noted that the downstream system will also require improvement for the system to operate within acceptable d/D limits. The improvement consists of upsizing an 8" pipe to a 10" pipe to obtain system continuity of a 10" line. The existing system immediately downstream of the proposed development is a 10" line; however this line spills into a manhole, which is connected to an 8" downstream line. This 8" line is connected to a downstream manhole, which is connected to a 10" downstream line. The 8" line in-between the two 10" lines will require upsizing to a 10" line.*

This provides the results of the sewer monitoring analysis requested. Please call if you have any questions or need additional information.

José Hernández, PE

Attachments:
A) Sewer Monitoring Survey Site Report
B) Long Beach Water Department Sewer Atlas
C) Sewer Flow Monitoring Data
D) Existing 10-inch Sewer Pipe Record Dwg
E) Sewer Flow Calculation Results

# Attachment A

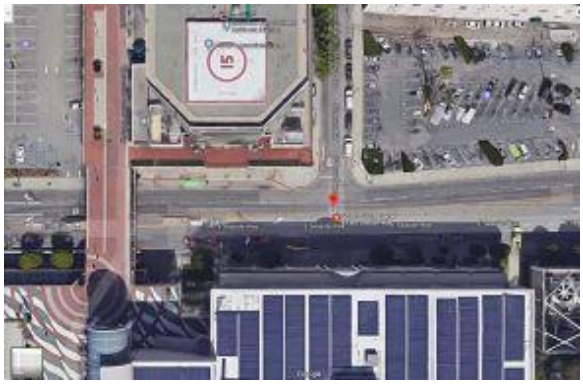
Site Report 03-15-2018

**Confidential Proprietary Information**

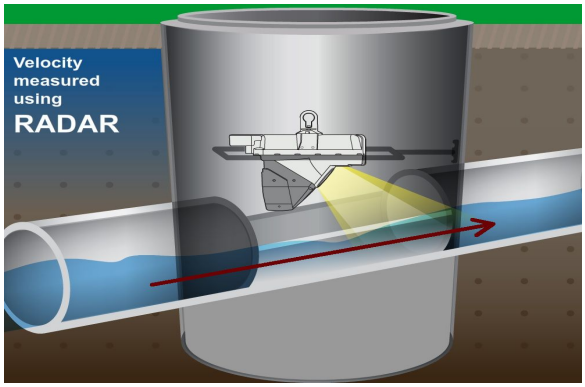
| | |
|---|---|
| KPFF | ~40 S. Locust Av |
| 2018.03 Locust Av FM MH H08-SMH-004 | Sewer Flow Monitoring for the Beacon Hotel Project |

| Access: | System Type: | Install Date: 3/07/2018 |
|---|---|---|
| MH in center westbound lane of Seaside Way at Locust Av | Sanitary [X] Storm [ ] | |

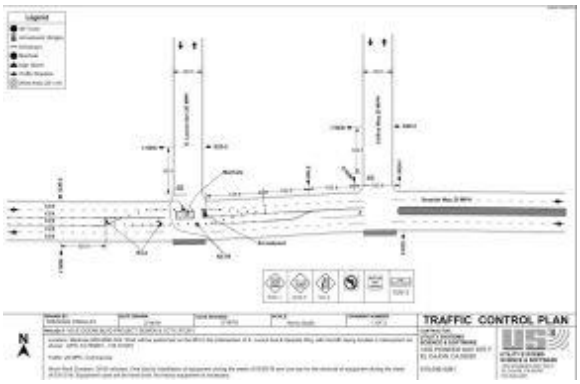
Map



Technology




Traffic Plan




| Flow Meter | | | |
|---|---|---|---|
| Meter Depth: 86" | | | |
| Map Coordinates: 33.765860, -118.191000 | | | |
| Slightly turbulent open channel hydraulics due to minor drop in western trough. | | | |
| Avg Velocity | Avg Measured Level | | Multiplier |
| 2.0 fps | 1.5" | | 1 |
| **Gas** | | | |
| O2 | H2S | CO | LEL |
| 20.9 | 0 | 0 | 0 |
| **Notes** | | | |
| Undocumented lateral entering MH from north; monitored downstream line to get total flow. | | | |
| **Traffic Safety** | | | |
| Used cones, signs & arrow board in accord with approved traffic control plan. | | | |
| **Land Use** | | | |
| Residential | Commercial | Industrial | Trunk |
| | X | | |

| | |
|---|---|
| Manhole Depth | 103" |
| Monitored Pipe Size | 10" |
| Inner Pipe Size (In/Out) | 10"/10" |
| Pipe Shape | Round |
| Pipe Condition | Good |
| Manhole Material | Lined |
| Silt | 0 |
| Velocity Profile Data | * |
| Velocity Profile Taken | 0.4 2-D |
| Sensor Offset | 16.81" |
| Sensor Dist. to Crown | 6.81" |
| Sensor Direction | Downstream |
| Flow Heading | East |

Meter Site Document

KPFF

2018.03 Locust Av FM MH

~40 S. Locust Av

Site

Manhole Before Install

Installation Process

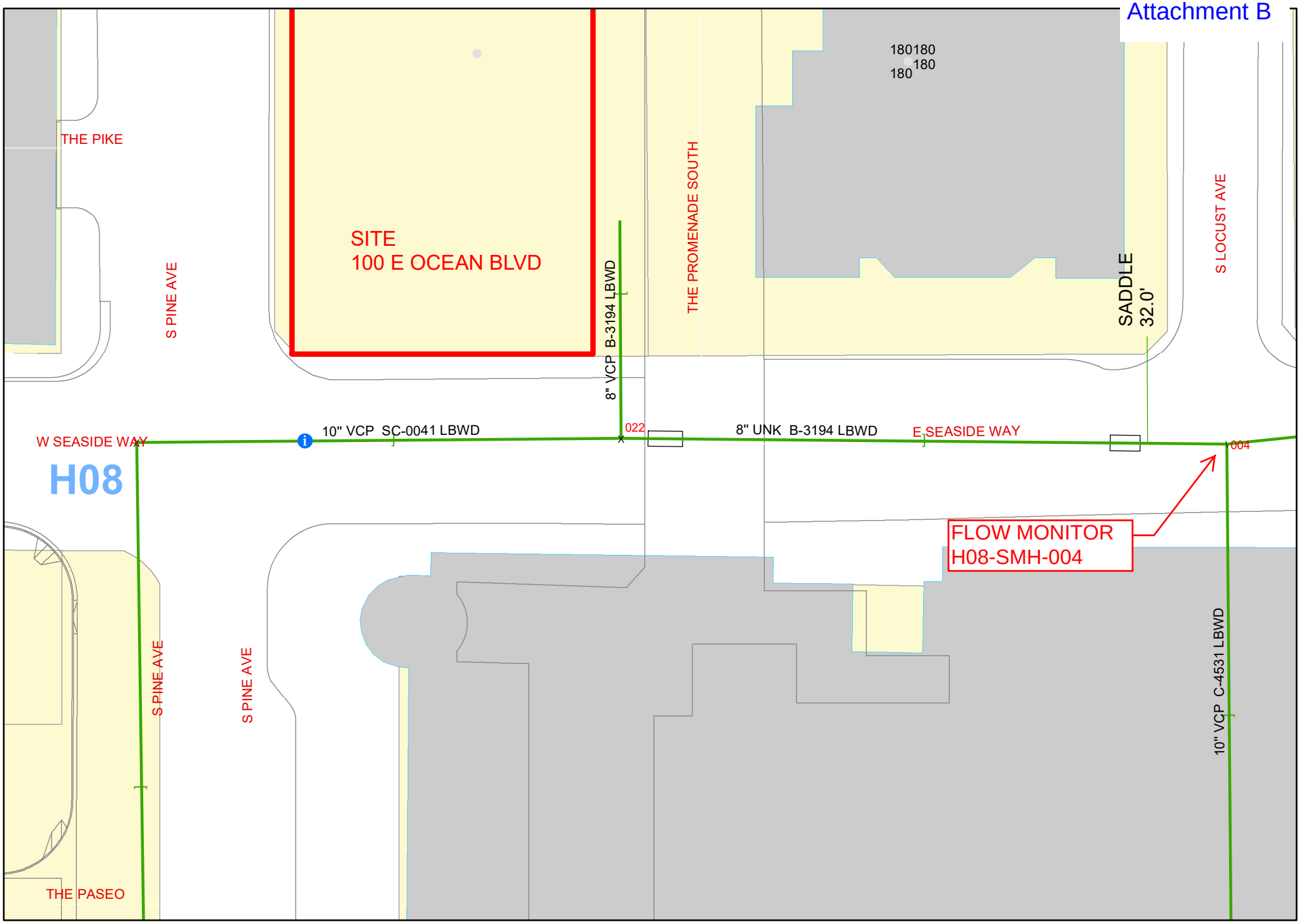
Installed

MH Condition

Downstream

# Attachment B

Attachment B




Disclaimer: This map and/or data are not an official record LBWD. It is compiled from data furnished by private contractors and other sources. Locations, sizes of geographic feature and facilities shown are based on these sources. This information is furnished strictly as a convenience. LBWD does not assume any responsibility for its accuracy or completeness.

N

1 inch = 50 feet

0 20 40 80 120 Feet

# Attachment C

## Methods & Procedures & Equipment

### *Methods and Procedures*

□tilit□ S□ste□s Science □ Software pro□ided □PFF Cons□lting □ngineers with an off the shelf□non-proprietar□ flow □onitoring sol□tion that incl□ded one state of the art Hach Flo-Dar□ □□ Sensor s□ste□ and one CCT□ inspection□The project co□rse of action is listed □elow□The □S□ tea□ □

- □ssessed per□itting and traffic control at the sites on Seaside Wa□in Long Beach□
- □alidated MH 4 for s□ita□ilit□for sewer flow □onitoring for the Beacon Hotel Project□
- Prepared the traffic control plans and o□tained a Cit□ □ncroach□ent Per□it□
- Coordinated with the LBWD Inspector for installation of e□□ip□ent and the CCT□ inspection□
- Installed and cali□rated the flow □onitoring e□□ip□ent per □an□fact□rer reco□ □endations□
- Inspected the northern lateral at MH □□□re□o□ed the flow □onitoring e□□ip□ent at MH 4□□alidated the data□and prepared the data reports□

### *Equipment*

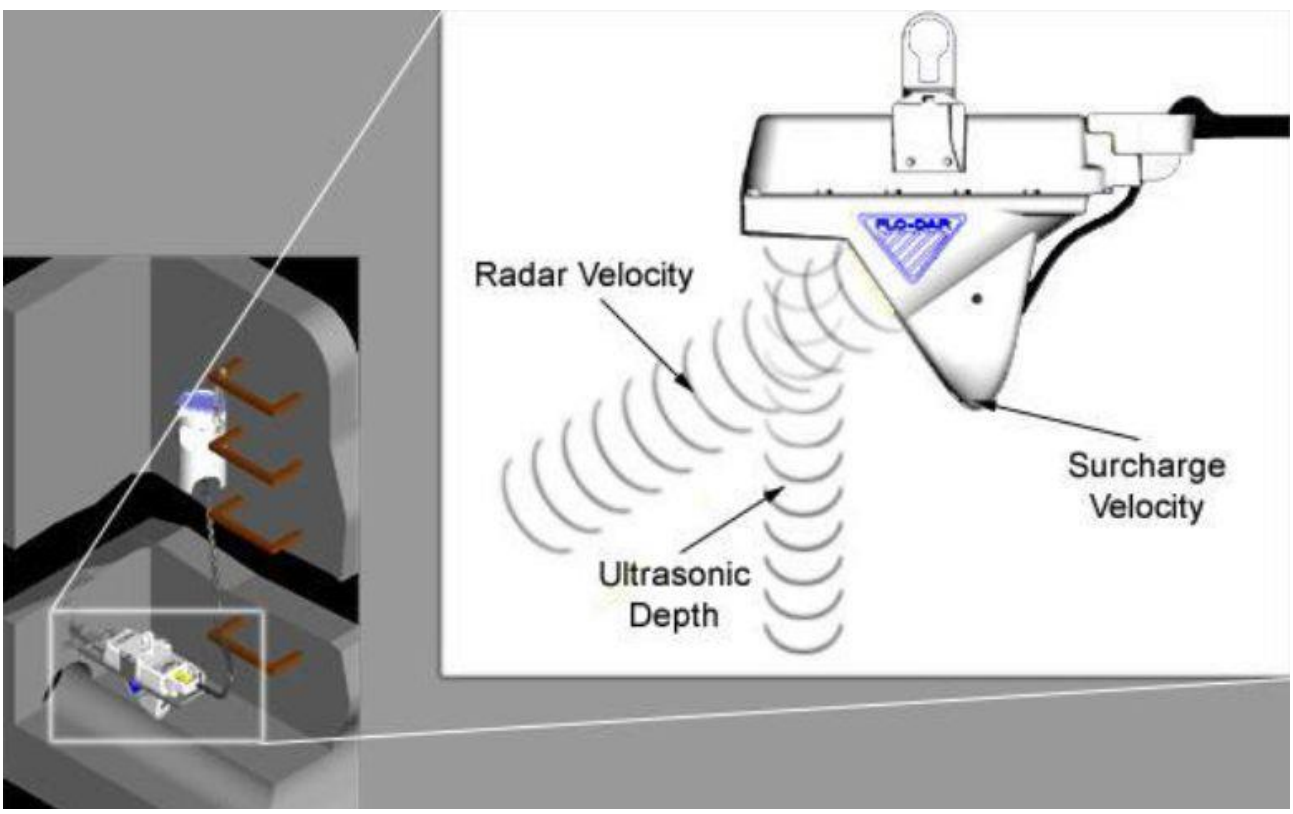



**Figure:** □□□ip□ent installed as part of the Sewer Flow Monitoring St□d□

**Figure:** We□-□na□led Flo-Dar□ □□ Sensor□Radar-Based □elocit□□□rea Flow Meter

***SPECIFICATIONS***

- **Enclosure**
  - IP□8 Waterproof rating□Pol□st□rene
- **Dimensions**
  - □□0□□ W □4□□□□ L □ □□□ D □ □ □□□□□ □ □□□□□ □ □□□□□ in□□□
  - With S□S□D □ □8□ □ □ □□□□□ in□□
- **Weight**
  - 4□8 □g □□0□□ l□s□□
- **Operating Temperature**
  - -□0 to □0□C □□4 to □□□□F□
- **Storage Temperature**
  - -40 to □0□C □-40 to □40□F□
- **Power Requirements**
  - S□pplied □□FL□00 Flow Logger□Flo-Logger□or Flo-Station

- **Interconnecting Cable**
  - Disconnect a□aila□le at □oth sensor and logger or Flo-Station
  - Pol□□rethane□0□400 □□0□0□□□in□dia□eter□IP□8
  - Standard length □ □ □□0 ft□□□a□i□ □□ □0□ □ □□000 ft□
- **Cables – available in two styles:**
  - connectors at □oth ends
  - connector fro□ sensor with open leads to desiccant h□□□desiccant h□□ with connector to logger□□ potting□sealant □it will □e incl□ded□This can □e □sed to r□n the ca□le thro□gh cond□it□
- **Certification**
  - Certified to□FCC Part □□□□4□□FCC ID□□IC-FLOD□R□4
  - Ind□str□Canada Spec□RSS□□0□□□□IC □o□□□□4□□-FLOD□R□4

S□RCH□RG□ D□PTH M□□S□R□M□□T

  - □□to □ero f□nction □aintains □ero error □elow 0□□ c□ □0□□ in□□

- **Method**
  - Pie□o-resisti□e press□re transd□cer with stainless steel diaphrag□
- **Range**
  - □□□ □ □□□8 in□□□o□erpress□re rating □□□ □f□ll scale

□□LOCIT□ M□□S□R□M□□T

- **Method**
  - Radar
- **Range**
  - 0□□□ to □□□0 □ □s □0□□□ to □0 ft□s□
- **Frequency Range**
  - □4□0□□ to □4□□□□GH□□□□□□ □W □□a□□□
- **Accuracy**
  - □0□□□ □□0□0□ □ □s □□0□□ ft□s□

D□PTH M□□S□R□M□□T

- **Method**
  - □ltrasonic
- **Standard Operating Range from Flo-Dar® Housing to Liquid**
  - 0 to □□□4 c□ □0 to □0 in□□
- **Optional Extended Level Operating Range from Transducer Face to Liquid**
  - 0 to □□□ □ □0 to □0 ft□□ with 4□□8 c□ □□□ in□□ dead □and□ te□perat□re co□pensated□
- **Accuracy**
  - □□□ □□0□□□ c□ □□0□□ in□□

FLOW M□□S□R□M□□T

- **Method**
  - Based on Contin□it□ □□□ation
- **Accuracy**
  - □□□ of reading t□pical where flow is in a channel with □nifor□ flow conditions and is not s□rcharged□□□□ f□ll scale □a□□

S□RCH□RG□ CO□DITIO□S D□PTH□□□LOCIT□ D□PTH □Std with Flo-Dar□ Sensor□

- **Surcharge depth supplied by Flo-Dar® sensor.**

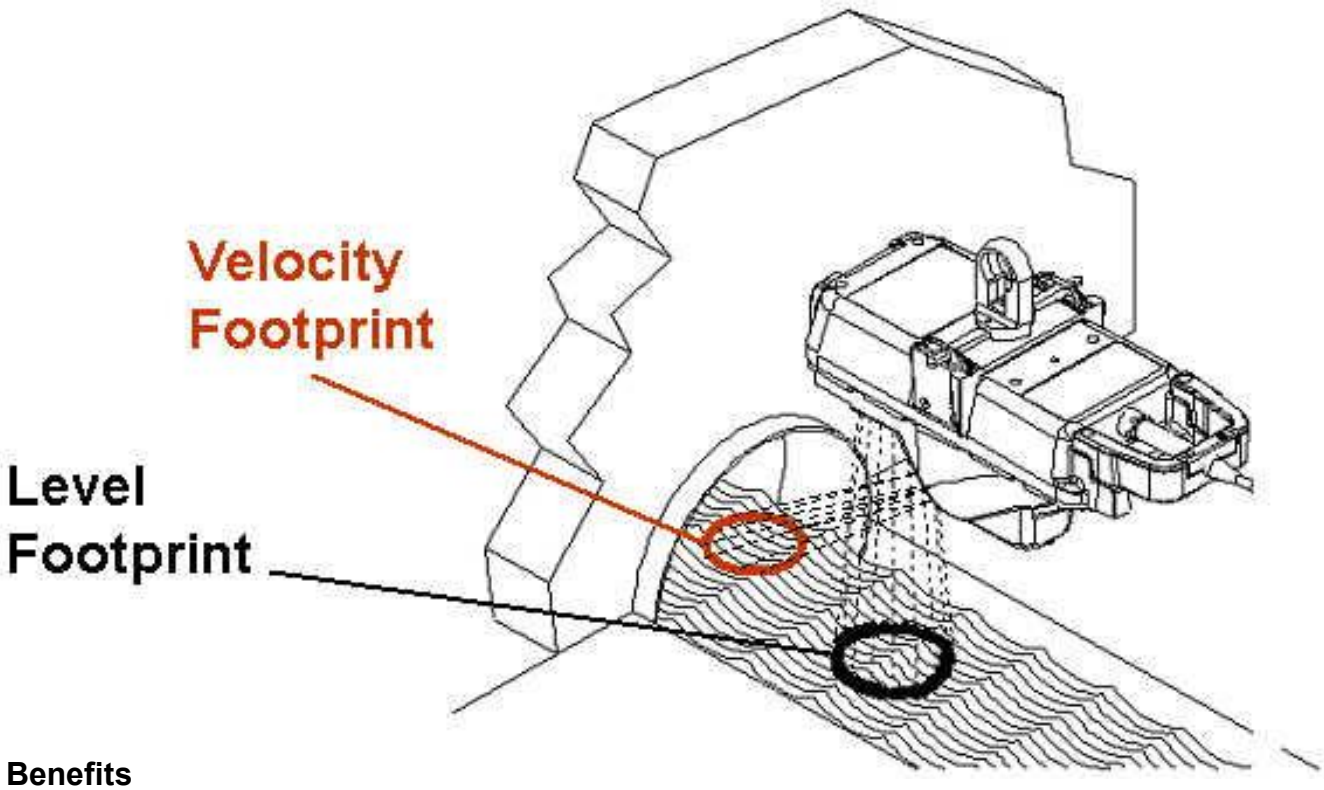
□□LOCIT□ □Optional S□rcharge □elocit□Sensor□

- **Method**
  - □lectro□agnetic
- **Range**
  - □4□8 □□s □□□□ft□s□
- **Accuracy**
  - □0□□□ft□s or 4□ of reading□whiche□er is greater□
- **Zero Stability**
  - □0□0□ft□s

The Flo-Dar□ Open Channel Flow Meters pro□ide an inno□ati□e approach to open channel flow □onitoring□Co□□ining digital Doppler radar □elocit□ sensing with □ltrasonic p□lse echo le□el sensing Flo-Dar□ pro□ides acc□rate open channel flow □onitoring witho□t the fo□ling pro□le□s associated with s□□□erged sensors□

**Perfect solution for Difficult Flow Conditions:**

- Flows with High Solids Content
- High Te□perat□re Flows
- Ca□stic Flows
- Large Man-Made Channel
- High □elocities
- Shallow Flows




**Benefits**

- Personnel have no contact with the flow during installation
- Maintenance caused by sensor fouling is eliminated
- Field Replaceable/Interchangeable Sensors and Monitors

**How It Works**

Flo-Dar transmits a digital Doppler radar beam that interacts with the fluid and reflects back signals at a different frequency than that which was transmitted. These reflected signals are compared with the transmitted frequency. The resulting frequency shift provides an accurate measure of the velocity and the direction of the flow. Level is detected by ultrasonic pulse echo. Flow is then calculated based on the Continuity Equation.

*Q = V x A, Where Q = Flow, V = Average Velocity and A = Area*

**Accurate Flow Measurements**

Flo-Dar provides the user with highly accurate flow measurements under a wide range of flows and site conditions. By measuring the velocity of the fluid from above, Flo-Dar eliminates accuracy problems inherent with submerged sensors including sensor distances, high solids content and distribution of reflectors.

## US³ Company Information

***US³*** is a California Corporation **Federal ID No. 33-0729605** and □□alifies as a Minorit□ B□siness □nterprise□ □S□ has certified as an MB□ with the California P□□lic □tilit□ Co□ □ission's a□thori□ed clearingho□se□**Verification Number: 97ES0008.**

***US³*** is a specialt□ ser□ice co□pan□ for the Water □ Waste Water ind□str□□ pro□iding □onitoring and control for □tilities since □□□□□□S□ is in the forefront of this ind□str□ □□ ta□ing the pro□en technological approaches de□eloped in other high-tech ind□stries and appl□ing the□ to protect one of o□r □ost precio□s nat□ral reso□rces - o□r water□

***US³*** engineers and technical personnel ha□e applied ad□anced instr□□entation s□ste□ technolog□ to water□wastewater open channel flow □onitoring□ pipeline e□al□ation□ engineering□and data anal□sis□all co□pled to the power of the Internet□This □ni□□e integrated s□ste□s approach allows the co□pan□ to □ring greater insight and intelligence to gathering infor□ation a□o□t water□wastewater s□ste□ perfor□ance of o□r clients□and in t□rn□to s□pport the f□lfill□ent of their co□ □it□ents to □anage and cost effecti□el□design□ operate□and □aintain these s□ste□s□

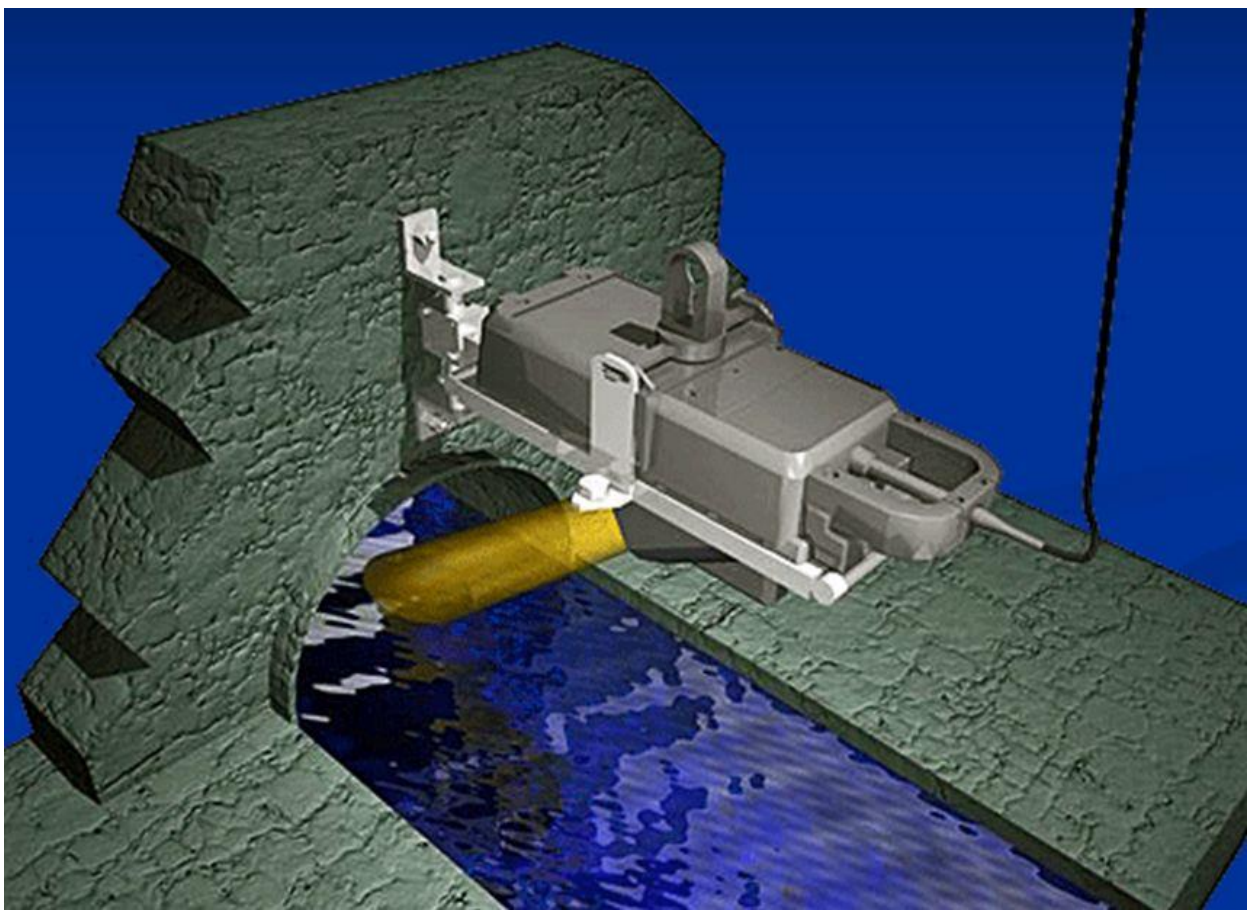


**Figure:** □S□ □tili□es e□cl□si□el□Hach March-McBirne□Flo-Dar□ Meters

Moreo□er□ ***US³*** s□pports M□nicipalities□ Cons□lting □ngineering fir□s and other water□waste water s□ste□s integrators □□ pro□iding te□porar□ technical ser□ices for engineering□software progra□□ing and technical site □aintenance and cali□ration site s□pport wor□□pri□aril□in the Water and Waste Water ind□stries□

**Figure:** □ll technicians are certified for Confined Space □ntr□□

**Name, Title, Address and Telephone numbers of persons to contact concerning this report.**

**Darlene Szczublewski, PE**
**Senior Civil Engineer**
darlene□s□c□□□lews□i□ □sc□□ed□co□

□□□0 Pioneer Wa□□S□ite F
□l Cajon□C□ □□0□0
□□□-□4□-4□8□ □wor□□
□□□-□4□-□□04 □cell□

**Tom Williams**
**Engineering Manager**
to□ □willia□s□ □sc□□ed□co□

□□□0 Pioneer Wa□□S□ite F
□l Cajon□C□ □□0□0
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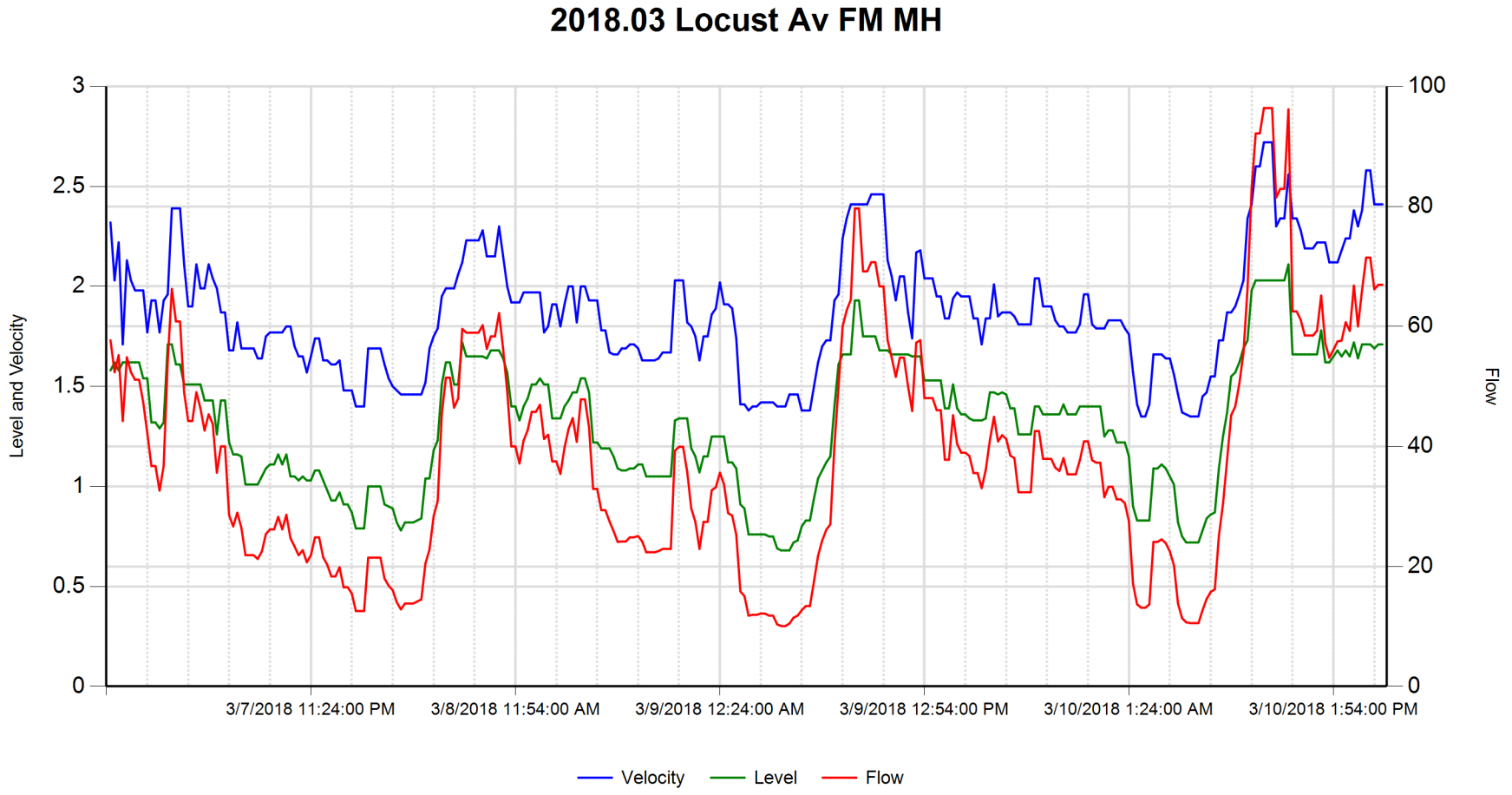
Utility Systems Science and Software

Report Date: 03/15/2018
Customer: US3
Group: Long Beach
SiteID: 3013

# Statistics for 2018.03 Locust Av FM MH: 03/07/2018 thru 03/14/2018

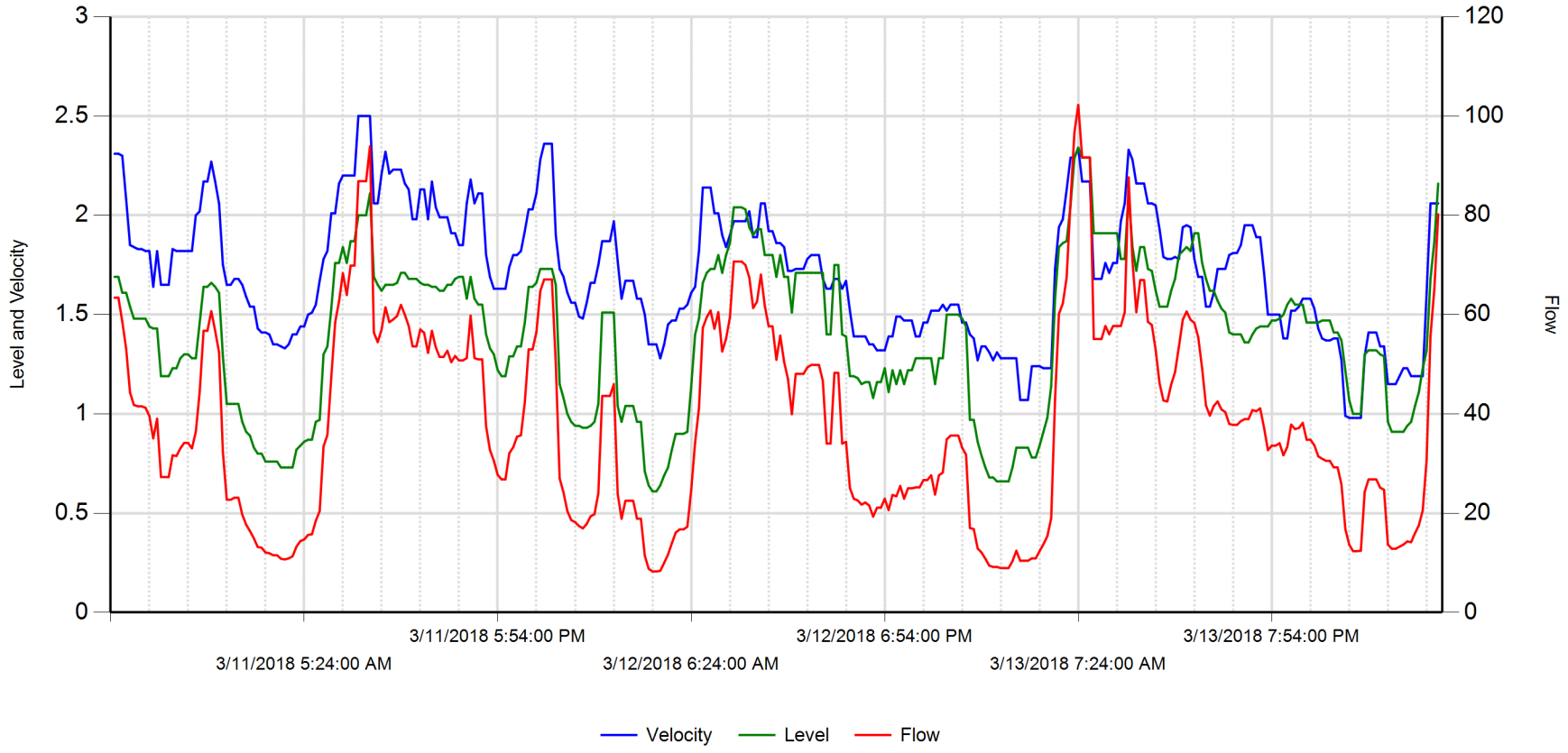
| | Flow (GPM) | | | Flow (MGD) | | | Velocity (FPS) | | | Level (inches) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **Avg** | **Max** | **Min** | **Avg** | **Max** | **Min** | **Avg** | **Max** | **Min** | **Avg** | **Max** | **Min** | **Total Gal** | **Rain** |
| 3/7/18 | 37.30 | 66.25 | 20.69 | 0.05 | 0.10 | 0.03 | 1.89 | 2.39 | 1.57 | 1.32 | 1.71 | 1.01 | 53,711 | |
| 3/8/18 | 32.60 | 62.22 | 12.57 | 0.05 | 0.09 | 0.02 | 1.80 | 2.30 | 1.40 | 1.23 | 1.72 | 0.78 | 46,950 | |
| 3/9/18 | 37.53 | 79.65 | 10.07 | 0.05 | 0.11 | 0.01 | 1.86 | 2.46 | 1.38 | 1.31 | 1.93 | 0.68 | 54,043 | |
| 3/10/18 | 45.97 | 96.39 | 10.56 | 0.07 | 0.14 | 0.02 | 1.98 | 2.72 | 1.35 | 1.43 | 2.11 | 0.72 | 66,190 | |
| 3/11/18 | 40.61 | 93.89 | 10.69 | 0.06 | 0.14 | 0.02 | 1.86 | 2.50 | 1.33 | 1.36 | 2.11 | 0.73 | 58,481 | |
| **Week:** | **38.80** | **96.39** | **10.07** | **0.06** | **0.14** | **0.01** | **1.87** | **2.72** | **1.33** | **1.33** | **2.11** | **0.68** | **279,375** | |
| 3/12/18 | 35.80 | 70.69 | 8.26 | 0.05 | 0.10 | 0.01 | 1.65 | 2.14 | 1.28 | 1.38 | 2.04 | 0.61 | 51,554 | |
| 3/13/18 | 41.45 | 102.22 | 8.96 | 0.06 | 0.15 | 0.01 | 1.67 | 2.34 | 1.07 | 1.48 | 2.34 | 0.66 | 59,683 | |
| 3/14/18 | 24.37 | 80.21 | 12.36 | 0.04 | 0.12 | 0.02 | 1.31 | 2.06 | 0.98 | 1.22 | 2.16 | 0.91 | 35,092 | |
| **Week:** | **33.87** | **102.22** | **8.26** | **0.05** | **0.15** | **0.01** | **1.55** | **2.34** | **0.98** | **1.36** | **2.34** | **0.61** | **146,330** | |
| **Totals:** | **36.95** | **102.22** | **8.26** | **0.05** | **0.15** | **0.01** | **1.75** | **2.72** | **0.98** | **1.34** | **2.34** | **0.61** | **425,705** | |




| | Velocity (fps) | Level (in) | Flow (gpm) | | |
|---|---|---|---|---|---|
| Average | 1.872 | 1.311 | 38.073 | **RainFall** | Inches |
| Maximum | 2.720 | 2.110 | 96.389 | | |
| Minimum | 1.350 | 0.680 | 10.069 | | |

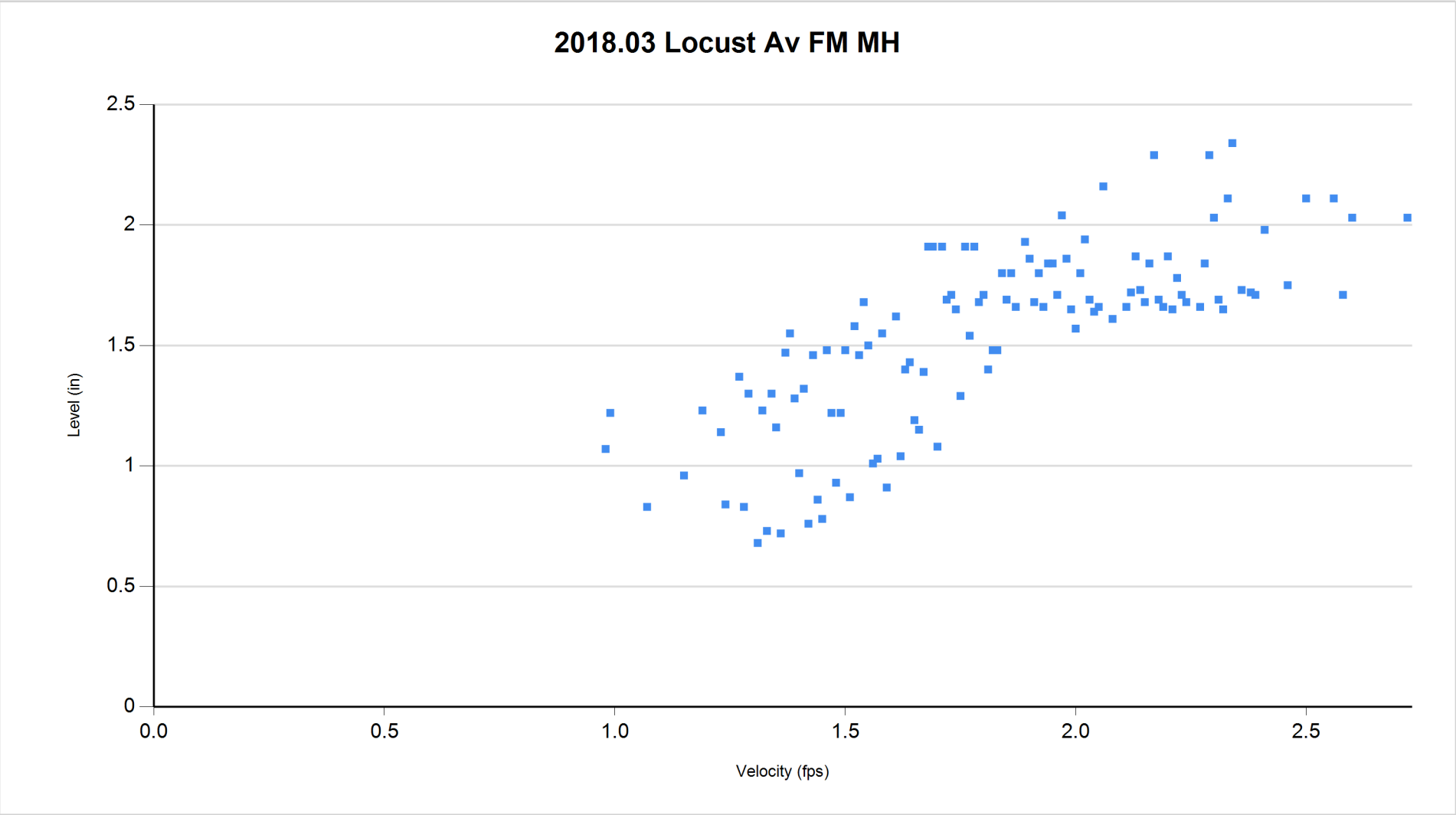
3/15/2018 1:26:09 PM

# 2018.03 Locust Av FM MH




| | Velocity (fps) | Level (in) | Flow (gpm) | | |
|---|---|---|---|---|---|
| Average | 1.713 | 1.395 | 38.422 | **RainFall** | Inches |
| Maximum | 2.500 | 2.340 | 102.222 | | |
| Minimum | 0.980 | 0.610 | 8.264 | | |

3/15/2018 1:26:09 PM




3/07/2018 thru 3/14/2018

3/15/2018 1:26:09 PM

Utility Systems Science and Software

Report Date: 03/15/2018
Customer: US3
Group: Long Beach
SiteID: 3013

# Data for 2018.03 Locust Av FM MH: 3/07/2018 thru 3/14/2018

| TimeStamp | Level (in) | Flow (gpm) | Velocity (fps) |
|---|---|---|---|
| 2018/03/07 11:09 | 1.58 | 57.71 | 2.32 |
| 2018/03/07 11:24 | 1.62 | 52.36 | 2.03 |
| 2018/03/07 11:39 | 1.58 | 55.21 | 2.22 |
| 2018/03/07 11:54 | 1.62 | 44.24 | 1.71 |
| 2018/03/07 12:09 | 1.62 | 54.86 | 2.13 |
| 2018/03/07 12:24 | 1.62 | 52.36 | 2.03 |
| 2018/03/07 12:39 | 1.62 | 51.11 | 1.98 |
| 2018/03/07 12:54 | 1.62 | 51.11 | 1.98 |
| 2018/03/07 13:09 | 1.54 | 47.36 | 1.98 |
| 2018/03/07 13:24 | 1.54 | 42.22 | 1.77 |
| 2018/03/07 13:39 | 1.32 | 36.74 | 1.93 |
| 2018/03/07 13:54 | 1.32 | 36.74 | 1.93 |
| 2018/03/07 14:09 | 1.29 | 32.64 | 1.77 |
| 2018/03/07 14:24 | 1.32 | 36.74 | 1.93 |
| 2018/03/07 14:39 | 1.71 | 54.31 | 1.96 |
| 2018/03/07 14:54 | 1.71 | 66.25 | 2.39 |
| 2018/03/07 15:09 | 1.61 | 60.83 | 2.39 |
| 2018/03/07 15:24 | 1.61 | 60.83 | 2.39 |
| 2018/03/07 15:39 | 1.51 | 49.03 | 2.11 |
| 2018/03/07 15:54 | 1.51 | 44.24 | 1.90 |
| 2018/03/07 16:09 | 1.51 | 44.24 | 1.90 |
| 2018/03/07 16:24 | 1.51 | 49.03 | 2.11 |
| 2018/03/07 16:39 | 1.51 | 46.32 | 1.99 |
| 2018/03/07 16:54 | 1.43 | 42.64 | 1.99 |
| 2018/03/07 17:09 | 1.43 | 45.35 | 2.11 |
| 2018/03/07 17:24 | 1.43 | 43.75 | 2.04 |
| 2018/03/07 17:39 | 1.26 | 35.62 | 1.99 |
| 2018/03/07 17:54 | 1.43 | 40.00 | 1.87 |
| 2018/03/07 18:09 | 1.43 | 40.00 | 1.87 |
| 2018/03/07 18:24 | 1.22 | 28.54 | 1.68 |
| 2018/03/07 18:39 | 1.16 | 26.67 | 1.68 |
| 2018/03/07 18:54 | 1.16 | 28.96 | 1.82 |
| 2018/03/07 19:09 | 1.15 | 26.46 | 1.69 |
| 2018/03/07 19:24 | 1.01 | 21.87 | 1.69 |
| 2018/03/07 19:39 | 1.01 | 21.87 | 1.69 |
| 2018/03/07 19:54 | 1.01 | 21.87 | 1.69 |
| 2018/03/07 20:09 | 1.01 | 21.25 | 1.64 |
| 2018/03/07 20:24 | 1.05 | 22.50 | 1.64 |
| 2018/03/07 20:39 | 1.09 | 25.42 | 1.75 |

| TimeStamp | Level (in) | Flow (gpm) | Velocity (fps) |
|---|---|---|---|
| 2018/03/07 20:54 | 1.11 | 26.18 | 1.77 |
| 2018/03/07 21:09 | 1.11 | 26.18 | 1.77 |
| 2018/03/07 21:24 | 1.16 | 28.26 | 1.77 |
| 2018/03/07 21:39 | 1.11 | 26.18 | 1.77 |
| 2018/03/07 21:54 | 1.16 | 28.61 | 1.80 |
| 2018/03/07 22:09 | 1.05 | 24.72 | 1.80 |
| 2018/03/07 22:24 | 1.05 | 23.33 | 1.70 |
| 2018/03/07 22:39 | 1.03 | 21.87 | 1.65 |
| 2018/03/07 22:54 | 1.05 | 22.71 | 1.65 |
| 2018/03/07 23:09 | 1.03 | 20.69 | 1.57 |
| 2018/03/07 23:24 | 1.03 | 21.87 | 1.65 |
| 2018/03/07 23:39 | 1.08 | 24.86 | 1.74 |
| 2018/03/07 23:54 | 1.08 | 24.86 | 1.74 |
| 2018/03/08 00:09 | 1.03 | 21.53 | 1.63 |
| 2018/03/08 00:24 | 0.98 | 20.28 | 1.63 |
| 2018/03/08 00:39 | 0.93 | 18.33 | 1.61 |
| 2018/03/08 00:54 | 0.93 | 18.33 | 1.61 |
| 2018/03/08 01:09 | 0.97 | 19.86 | 1.63 |
| 2018/03/08 01:24 | 0.91 | 16.53 | 1.48 |
| 2018/03/08 01:39 | 0.91 | 16.53 | 1.48 |
| 2018/03/08 01:54 | 0.87 | 15.49 | 1.48 |
| 2018/03/08 02:09 | 0.79 | 12.57 | 1.40 |
| 2018/03/08 02:24 | 0.79 | 12.57 | 1.40 |
| 2018/03/08 02:39 | 0.79 | 12.57 | 1.40 |
| 2018/03/08 02:54 | 1.00 | 21.46 | 1.69 |
| 2018/03/08 03:09 | 1.00 | 21.46 | 1.69 |
| 2018/03/08 03:24 | 1.00 | 21.46 | 1.69 |
| 2018/03/08 03:39 | 1.00 | 21.46 | 1.69 |
| 2018/03/08 03:54 | 0.91 | 17.99 | 1.61 |
| 2018/03/08 04:09 | 0.90 | 16.81 | 1.54 |
| 2018/03/08 04:24 | 0.89 | 16.04 | 1.50 |
| 2018/03/08 04:39 | 0.82 | 14.03 | 1.48 |
| 2018/03/08 04:54 | 0.78 | 12.85 | 1.46 |
| 2018/03/08 05:09 | 0.82 | 13.82 | 1.46 |
| 2018/03/08 05:24 | 0.82 | 13.82 | 1.46 |
| 2018/03/08 05:39 | 0.82 | 13.82 | 1.46 |
| 2018/03/08 05:54 | 0.83 | 14.17 | 1.46 |
| 2018/03/08 06:09 | 0.84 | 14.51 | 1.46 |
| 2018/03/08 06:24 | 1.04 | 20.49 | 1.52 |
| 2018/03/08 06:39 | 1.04 | 22.85 | 1.69 |
| 2018/03/08 06:54 | 1.18 | 28.33 | 1.75 |
| 2018/03/08 07:09 | 1.23 | 30.90 | 1.79 |
| 2018/03/08 07:24 | 1.51 | 45.42 | 1.95 |
| 2018/03/08 07:39 | 1.62 | 51.46 | 1.99 |
| 2018/03/08 07:54 | 1.62 | 51.46 | 1.99 |

| TimeStamp | Level (in) | Flow (gpm) | Velocity (fps) |
|---|---|---|---|
| 2018/03/08 08:09 | 1.51 | 46.46 | 1.99 |
| 2018/03/08 08:24 | 1.51 | 47.99 | 2.06 |
| 2018/03/08 08:39 | 1.72 | 59.58 | 2.12 |
| 2018/03/08 08:54 | 1.65 | 58.96 | 2.23 |
| 2018/03/08 09:09 | 1.65 | 58.96 | 2.23 |
| 2018/03/08 09:24 | 1.65 | 58.96 | 2.23 |
| 2018/03/08 09:39 | 1.65 | 58.96 | 2.23 |
| 2018/03/08 09:54 | 1.65 | 60.21 | 2.28 |
| 2018/03/08 10:09 | 1.64 | 56.25 | 2.15 |
| 2018/03/08 10:24 | 1.68 | 58.33 | 2.15 |
| 2018/03/08 10:39 | 1.68 | 58.33 | 2.15 |
| 2018/03/08 10:54 | 1.68 | 62.22 | 2.30 |
| 2018/03/08 11:09 | 1.64 | 56.25 | 2.15 |
| 2018/03/08 11:24 | 1.57 | 49.10 | 2.00 |
| 2018/03/08 11:39 | 1.40 | 40.00 | 1.92 |
| 2018/03/08 11:54 | 1.40 | 40.00 | 1.92 |
| 2018/03/08 12:09 | 1.33 | 37.15 | 1.92 |
| 2018/03/08 12:24 | 1.40 | 40.97 | 1.97 |
| 2018/03/08 12:39 | 1.44 | 42.71 | 1.97 |
| 2018/03/08 12:54 | 1.51 | 45.76 | 1.97 |
| 2018/03/08 13:09 | 1.51 | 45.76 | 1.97 |
| 2018/03/08 13:24 | 1.54 | 46.94 | 1.97 |
| 2018/03/08 13:39 | 1.51 | 41.25 | 1.77 |
| 2018/03/08 13:54 | 1.51 | 41.94 | 1.80 |
| 2018/03/08 14:09 | 1.34 | 37.50 | 1.91 |
| 2018/03/08 14:24 | 1.34 | 37.50 | 1.91 |
| 2018/03/08 14:39 | 1.34 | 35.42 | 1.80 |
| 2018/03/08 14:54 | 1.40 | 39.79 | 1.91 |
| 2018/03/08 15:09 | 1.43 | 42.92 | 2.00 |
| 2018/03/08 15:24 | 1.47 | 44.72 | 2.00 |
| 2018/03/08 15:39 | 1.47 | 40.76 | 1.82 |
| 2018/03/08 15:54 | 1.54 | 47.85 | 2.00 |
| 2018/03/08 16:09 | 1.54 | 47.85 | 2.00 |
| 2018/03/08 16:24 | 1.47 | 43.19 | 1.93 |
| 2018/03/08 16:39 | 1.22 | 32.92 | 1.93 |
| 2018/03/08 16:54 | 1.22 | 32.92 | 1.93 |
| 2018/03/08 17:09 | 1.19 | 29.37 | 1.78 |
| 2018/03/08 17:24 | 1.19 | 29.37 | 1.78 |
| 2018/03/08 17:39 | 1.19 | 27.50 | 1.67 |
| 2018/03/08 17:54 | 1.15 | 25.90 | 1.66 |
| 2018/03/08 18:09 | 1.09 | 24.10 | 1.66 |
| 2018/03/08 18:24 | 1.08 | 24.17 | 1.69 |
| 2018/03/08 18:39 | 1.08 | 24.17 | 1.69 |
| 2018/03/08 18:54 | 1.09 | 24.86 | 1.71 |
| 2018/03/08 19:09 | 1.09 | 24.86 | 1.71 |

| TimeStamp | Level (in) | Flow (gpm) | Velocity (fps) |
|---|---|---|---|
| 2018/03/08 19:24 | 1.11 | 25.07 | 1.69 |
| 2018/03/08 19:39 | 1.11 | 24.17 | 1.63 |
| 2018/03/08 19:54 | 1.05 | 22.36 | 1.63 |
| 2018/03/08 20:09 | 1.05 | 22.36 | 1.63 |
| 2018/03/08 20:24 | 1.05 | 22.36 | 1.63 |
| 2018/03/08 20:39 | 1.05 | 22.57 | 1.64 |
| 2018/03/08 20:54 | 1.05 | 22.92 | 1.67 |
| 2018/03/08 21:09 | 1.05 | 22.92 | 1.67 |
| 2018/03/08 21:24 | 1.05 | 22.92 | 1.67 |
| 2018/03/08 21:39 | 1.33 | 39.31 | 2.03 |
| 2018/03/08 21:54 | 1.34 | 39.93 | 2.03 |
| 2018/03/08 22:09 | 1.34 | 39.93 | 2.03 |
| 2018/03/08 22:24 | 1.34 | 35.76 | 1.82 |
| 2018/03/08 22:39 | 1.19 | 29.65 | 1.80 |
| 2018/03/08 22:54 | 1.15 | 27.43 | 1.75 |
| 2018/03/08 23:09 | 1.07 | 22.92 | 1.63 |
| 2018/03/08 23:24 | 1.15 | 27.43 | 1.75 |
| 2018/03/08 23:39 | 1.15 | 27.43 | 1.75 |
| 2018/03/08 23:54 | 1.25 | 32.71 | 1.86 |
| 2018/03/09 00:09 | 1.25 | 33.19 | 1.89 |
| 2018/03/09 00:24 | 1.25 | 35.62 | 2.02 |
| 2018/03/09 00:39 | 1.25 | 33.68 | 1.91 |
| 2018/03/09 00:54 | 1.12 | 28.89 | 1.91 |
| 2018/03/09 01:09 | 1.12 | 28.47 | 1.89 |
| 2018/03/09 01:24 | 1.09 | 25.28 | 1.74 |
| 2018/03/09 01:39 | 0.91 | 15.83 | 1.41 |
| 2018/03/09 01:54 | 0.89 | 15.07 | 1.41 |
| 2018/03/09 02:09 | 0.76 | 11.81 | 1.38 |
| 2018/03/09 02:24 | 0.76 | 11.94 | 1.40 |
| 2018/03/09 02:39 | 0.76 | 11.94 | 1.40 |
| 2018/03/09 02:54 | 0.76 | 12.15 | 1.42 |
| 2018/03/09 03:09 | 0.76 | 12.15 | 1.42 |
| 2018/03/09 03:24 | 0.75 | 11.81 | 1.42 |
| 2018/03/09 03:39 | 0.75 | 11.81 | 1.42 |
| 2018/03/09 03:54 | 0.69 | 10.35 | 1.40 |
| 2018/03/09 04:09 | 0.68 | 10.07 | 1.40 |
| 2018/03/09 04:24 | 0.68 | 10.07 | 1.40 |
| 2018/03/09 04:39 | 0.68 | 10.49 | 1.46 |
| 2018/03/09 04:54 | 0.72 | 11.46 | 1.46 |
| 2018/03/09 05:09 | 0.73 | 11.81 | 1.46 |
| 2018/03/09 05:24 | 0.80 | 12.71 | 1.38 |
| 2018/03/09 05:39 | 0.83 | 13.40 | 1.38 |
| 2018/03/09 05:54 | 0.83 | 13.40 | 1.38 |
| 2018/03/09 06:09 | 0.94 | 17.50 | 1.50 |
| 2018/03/09 06:24 | 1.04 | 21.81 | 1.62 |

| TimeStamp | Level (in) | Flow (gpm) | Velocity (fps) |
|---|---|---|---|
| 2018/03/09 06:39 | 1.08 | 24.31 | 1.70 |
| 2018/03/09 06:54 | 1.12 | 26.11 | 1.73 |
| 2018/03/09 07:09 | 1.15 | 27.01 | 1.73 |
| 2018/03/09 07:24 | 1.40 | 40.14 | 1.93 |
| 2018/03/09 07:39 | 1.61 | 50.00 | 1.96 |
| 2018/03/09 07:54 | 1.66 | 60.00 | 2.24 |
| 2018/03/09 08:09 | 1.66 | 62.71 | 2.34 |
| 2018/03/09 08:24 | 1.66 | 64.44 | 2.41 |
| 2018/03/09 08:39 | 1.93 | 79.65 | 2.41 |
| 2018/03/09 08:54 | 1.93 | 79.65 | 2.41 |
| 2018/03/09 09:09 | 1.75 | 69.17 | 2.41 |
| 2018/03/09 09:24 | 1.75 | 69.17 | 2.41 |
| 2018/03/09 09:39 | 1.75 | 70.69 | 2.46 |
| 2018/03/09 09:54 | 1.75 | 70.69 | 2.46 |
| 2018/03/09 10:09 | 1.68 | 66.67 | 2.46 |
| 2018/03/09 10:24 | 1.68 | 66.67 | 2.46 |
| 2018/03/09 10:39 | 1.68 | 57.71 | 2.13 |
| 2018/03/09 10:54 | 1.66 | 54.79 | 2.05 |
| 2018/03/09 11:09 | 1.66 | 51.60 | 1.93 |
| 2018/03/09 11:24 | 1.66 | 54.79 | 2.05 |
| 2018/03/09 11:39 | 1.66 | 54.79 | 2.05 |
| 2018/03/09 11:54 | 1.66 | 50.00 | 1.87 |
| 2018/03/09 12:09 | 1.65 | 45.90 | 1.74 |
| 2018/03/09 12:24 | 1.65 | 57.29 | 2.17 |
| 2018/03/09 12:39 | 1.65 | 57.71 | 2.18 |
| 2018/03/09 12:54 | 1.53 | 48.06 | 2.04 |
| 2018/03/09 13:09 | 1.53 | 48.06 | 2.04 |
| 2018/03/09 13:24 | 1.53 | 48.06 | 2.04 |
| 2018/03/09 13:39 | 1.53 | 46.04 | 1.95 |
| 2018/03/09 13:54 | 1.53 | 46.04 | 1.95 |
| 2018/03/09 14:09 | 1.39 | 37.78 | 1.84 |
| 2018/03/09 14:24 | 1.39 | 37.78 | 1.84 |
| 2018/03/09 14:39 | 1.51 | 45.21 | 1.94 |
| 2018/03/09 14:54 | 1.39 | 40.42 | 1.97 |
| 2018/03/09 15:09 | 1.36 | 38.96 | 1.95 |
| 2018/03/09 15:24 | 1.36 | 38.96 | 1.95 |
| 2018/03/09 15:39 | 1.34 | 38.40 | 1.95 |
| 2018/03/09 15:54 | 1.33 | 35.56 | 1.84 |
| 2018/03/09 16:09 | 1.33 | 35.56 | 1.84 |
| 2018/03/09 16:24 | 1.33 | 33.06 | 1.71 |
| 2018/03/09 16:39 | 1.34 | 36.11 | 1.84 |
| 2018/03/09 16:54 | 1.47 | 41.04 | 1.84 |
| 2018/03/09 17:09 | 1.47 | 44.93 | 2.01 |
| 2018/03/09 17:24 | 1.46 | 40.83 | 1.85 |
| 2018/03/09 17:39 | 1.47 | 41.87 | 1.87 |

| TimeStamp | Level (in) | Flow (gpm) | Velocity (fps) |
|---|---|---|---|
| 2018/03/09 17:54 | 1.46 | 41.25 | 1.87 |
| 2018/03/09 18:09 | 1.39 | 38.47 | 1.87 |
| 2018/03/09 18:24 | 1.39 | 38.06 | 1.85 |
| 2018/03/09 18:39 | 1.26 | 32.36 | 1.81 |
| 2018/03/09 18:54 | 1.26 | 32.36 | 1.81 |
| 2018/03/09 19:09 | 1.26 | 32.36 | 1.81 |
| 2018/03/09 19:24 | 1.26 | 32.36 | 1.81 |
| 2018/03/09 19:39 | 1.40 | 42.57 | 2.04 |
| 2018/03/09 19:54 | 1.40 | 42.57 | 2.04 |
| 2018/03/09 20:09 | 1.36 | 37.92 | 1.90 |
| 2018/03/09 20:24 | 1.36 | 37.92 | 1.90 |
| 2018/03/09 20:39 | 1.36 | 37.92 | 1.90 |
| 2018/03/09 20:54 | 1.36 | 36.46 | 1.83 |
| 2018/03/09 21:09 | 1.36 | 35.90 | 1.80 |
| 2018/03/09 21:24 | 1.41 | 38.06 | 1.80 |
| 2018/03/09 21:39 | 1.36 | 35.35 | 1.77 |
| 2018/03/09 21:54 | 1.36 | 35.35 | 1.77 |
| 2018/03/09 22:09 | 1.36 | 35.35 | 1.77 |
| 2018/03/09 22:24 | 1.40 | 37.71 | 1.81 |
| 2018/03/09 22:39 | 1.40 | 40.83 | 1.96 |
| 2018/03/09 22:54 | 1.40 | 40.83 | 1.96 |
| 2018/03/09 23:09 | 1.40 | 37.71 | 1.81 |
| 2018/03/09 23:24 | 1.40 | 37.29 | 1.79 |
| 2018/03/09 23:39 | 1.40 | 37.29 | 1.79 |
| 2018/03/09 23:54 | 1.25 | 31.53 | 1.79 |
| 2018/03/10 00:09 | 1.28 | 33.26 | 1.83 |
| 2018/03/10 00:24 | 1.28 | 33.26 | 1.83 |
| 2018/03/10 00:39 | 1.22 | 31.18 | 1.83 |
| 2018/03/10 00:54 | 1.22 | 31.18 | 1.83 |
| 2018/03/10 01:09 | 1.22 | 30.56 | 1.79 |
| 2018/03/10 01:24 | 1.15 | 27.50 | 1.76 |
| 2018/03/10 01:39 | 0.90 | 17.08 | 1.57 |
| 2018/03/10 01:54 | 0.83 | 13.68 | 1.41 |
| 2018/03/10 02:09 | 0.83 | 13.12 | 1.35 |
| 2018/03/10 02:24 | 0.83 | 13.12 | 1.35 |
| 2018/03/10 02:39 | 0.83 | 13.68 | 1.41 |
| 2018/03/10 02:54 | 1.09 | 24.10 | 1.66 |
| 2018/03/10 03:09 | 1.09 | 24.10 | 1.66 |
| 2018/03/10 03:24 | 1.11 | 24.51 | 1.66 |
| 2018/03/10 03:39 | 1.09 | 23.89 | 1.64 |
| 2018/03/10 03:54 | 1.05 | 22.50 | 1.64 |
| 2018/03/10 04:09 | 1.01 | 20.21 | 1.56 |
| 2018/03/10 04:24 | 0.82 | 13.82 | 1.46 |
| 2018/03/10 04:39 | 0.75 | 11.39 | 1.37 |
| 2018/03/10 04:54 | 0.72 | 10.69 | 1.36 |

| TimeStamp | Level (in) | Flow (gpm) | Velocity (fps) |
|---|---|---|---|
| 2018/03/10 05:09 | 0.72 | 10.56 | 1.35 |
| 2018/03/10 05:24 | 0.72 | 10.56 | 1.35 |
| 2018/03/10 05:39 | 0.72 | 10.56 | 1.35 |
| 2018/03/10 05:54 | 0.78 | 12.71 | 1.45 |
| 2018/03/10 06:09 | 0.84 | 14.58 | 1.47 |
| 2018/03/10 06:24 | 0.86 | 15.76 | 1.55 |
| 2018/03/10 06:39 | 0.87 | 16.18 | 1.55 |
| 2018/03/10 06:54 | 1.09 | 25.14 | 1.73 |
| 2018/03/10 07:09 | 1.25 | 30.42 | 1.73 |
| 2018/03/10 07:24 | 1.37 | 37.78 | 1.87 |
| 2018/03/10 07:39 | 1.55 | 45.21 | 1.87 |
| 2018/03/10 07:54 | 1.57 | 46.67 | 1.90 |
| 2018/03/10 08:09 | 1.62 | 50.49 | 1.96 |
| 2018/03/10 08:24 | 1.69 | 55.56 | 2.03 |
| 2018/03/10 08:39 | 1.73 | 66.39 | 2.34 |
| 2018/03/10 08:54 | 1.98 | 83.06 | 2.41 |
| 2018/03/10 09:09 | 2.03 | 92.15 | 2.60 |
| 2018/03/10 09:24 | 2.03 | 92.15 | 2.60 |
| 2018/03/10 09:39 | 2.03 | 96.39 | 2.72 |
| 2018/03/10 09:54 | 2.03 | 96.39 | 2.72 |
| 2018/03/10 10:09 | 2.03 | 96.39 | 2.72 |
| 2018/03/10 10:24 | 2.03 | 81.46 | 2.30 |
| 2018/03/10 10:39 | 2.03 | 82.92 | 2.34 |
| 2018/03/10 10:54 | 2.03 | 82.92 | 2.34 |
| 2018/03/10 11:09 | 2.11 | 96.18 | 2.56 |
| 2018/03/10 11:24 | 1.66 | 62.50 | 2.34 |
| 2018/03/10 11:39 | 1.66 | 62.50 | 2.34 |
| 2018/03/10 11:54 | 1.66 | 61.11 | 2.28 |
| 2018/03/10 12:09 | 1.66 | 58.47 | 2.19 |
| 2018/03/10 12:24 | 1.66 | 58.47 | 2.19 |
| 2018/03/10 12:39 | 1.66 | 58.47 | 2.19 |
| 2018/03/10 12:54 | 1.66 | 59.31 | 2.22 |
| 2018/03/10 13:09 | 1.78 | 65.14 | 2.22 |
| 2018/03/10 13:24 | 1.62 | 57.22 | 2.22 |
| 2018/03/10 13:39 | 1.62 | 54.79 | 2.12 |
| 2018/03/10 13:54 | 1.65 | 56.11 | 2.12 |
| 2018/03/10 14:09 | 1.68 | 57.50 | 2.12 |
| 2018/03/10 14:24 | 1.65 | 57.64 | 2.18 |
| 2018/03/10 14:39 | 1.68 | 60.69 | 2.24 |
| 2018/03/10 14:54 | 1.65 | 59.24 | 2.24 |
| 2018/03/10 15:09 | 1.72 | 66.81 | 2.38 |
| 2018/03/10 15:24 | 1.64 | 60.00 | 2.30 |
| 2018/03/10 15:39 | 1.71 | 66.04 | 2.38 |
| 2018/03/10 15:54 | 1.71 | 71.46 | 2.58 |
| 2018/03/10 16:09 | 1.71 | 71.46 | 2.58 |

| TimeStamp | Level (in) | Flow (gpm) | Velocity (fps) |
|---|---|---|---|
| 2018/03/10 16:24 | 1.69 | 66.18 | 2.41 |
| 2018/03/10 16:39 | 1.71 | 66.94 | 2.41 |
| 2018/03/10 16:54 | 1.71 | 66.94 | 2.41 |
| 2018/03/10 17:09 | 1.69 | 63.40 | 2.31 |
| 2018/03/10 17:24 | 1.69 | 63.40 | 2.31 |
| 2018/03/10 17:39 | 1.61 | 58.61 | 2.30 |
| 2018/03/10 17:54 | 1.61 | 53.12 | 2.08 |
| 2018/03/10 18:09 | 1.54 | 44.31 | 1.85 |
| 2018/03/10 18:24 | 1.48 | 41.81 | 1.84 |
| 2018/03/10 18:39 | 1.48 | 41.53 | 1.83 |
| 2018/03/10 18:54 | 1.48 | 41.53 | 1.83 |
| 2018/03/10 19:09 | 1.48 | 41.25 | 1.82 |
| 2018/03/10 19:24 | 1.44 | 39.58 | 1.82 |
| 2018/03/10 19:39 | 1.43 | 35.07 | 1.64 |
| 2018/03/10 19:54 | 1.43 | 39.03 | 1.82 |
| 2018/03/10 20:09 | 1.19 | 27.29 | 1.65 |
| 2018/03/10 20:24 | 1.19 | 27.29 | 1.65 |
| 2018/03/10 20:39 | 1.19 | 27.29 | 1.65 |
| 2018/03/10 20:54 | 1.23 | 31.67 | 1.83 |
| 2018/03/10 21:09 | 1.23 | 31.53 | 1.82 |
| 2018/03/10 21:24 | 1.28 | 33.06 | 1.82 |
| 2018/03/10 21:39 | 1.30 | 34.17 | 1.82 |
| 2018/03/10 21:54 | 1.30 | 34.17 | 1.82 |
| 2018/03/10 22:09 | 1.28 | 33.06 | 1.82 |
| 2018/03/10 22:24 | 1.28 | 36.39 | 2.00 |
| 2018/03/10 22:39 | 1.46 | 44.44 | 2.02 |
| 2018/03/10 22:54 | 1.64 | 56.74 | 2.17 |
| 2018/03/10 23:09 | 1.64 | 56.74 | 2.17 |
| 2018/03/10 23:24 | 1.66 | 60.69 | 2.27 |
| 2018/03/10 23:39 | 1.64 | 56.74 | 2.17 |
| 2018/03/10 23:54 | 1.61 | 52.43 | 2.06 |
| 2018/03/11 00:09 | 1.29 | 32.29 | 1.75 |
| 2018/03/11 00:24 | 1.05 | 22.71 | 1.65 |
| 2018/03/11 00:39 | 1.05 | 22.71 | 1.65 |
| 2018/03/11 00:54 | 1.05 | 23.12 | 1.68 |
| 2018/03/11 01:09 | 1.05 | 23.12 | 1.68 |
| 2018/03/11 01:24 | 0.96 | 19.72 | 1.65 |
| 2018/03/11 01:39 | 0.91 | 17.71 | 1.59 |
| 2018/03/11 01:54 | 0.89 | 16.39 | 1.54 |
| 2018/03/11 02:09 | 0.83 | 14.93 | 1.54 |
| 2018/03/11 02:24 | 0.80 | 13.19 | 1.43 |
| 2018/03/11 02:39 | 0.80 | 13.06 | 1.41 |
| 2018/03/11 02:54 | 0.76 | 12.08 | 1.41 |
| 2018/03/11 03:09 | 0.76 | 11.94 | 1.40 |
| 2018/03/11 03:24 | 0.76 | 11.53 | 1.35 |

| TimeStamp | Level (in) | Flow (gpm) | Velocity (fps) |
|---|---|---|---|
| 2018/03/11 03:39 | 0.76 | 11.53 | 1.35 |
| 2018/03/11 03:54 | 0.73 | 10.83 | 1.34 |
| 2018/03/11 04:09 | 0.73 | 10.69 | 1.33 |
| 2018/03/11 04:24 | 0.73 | 10.90 | 1.35 |
| 2018/03/11 04:39 | 0.73 | 11.32 | 1.40 |
| 2018/03/11 04:54 | 0.82 | 13.26 | 1.40 |
| 2018/03/11 05:09 | 0.84 | 14.37 | 1.44 |
| 2018/03/11 05:24 | 0.86 | 14.72 | 1.44 |
| 2018/03/11 05:39 | 0.87 | 15.62 | 1.50 |
| 2018/03/11 05:54 | 0.87 | 15.76 | 1.51 |
| 2018/03/11 06:09 | 0.96 | 18.47 | 1.55 |
| 2018/03/11 06:24 | 0.97 | 20.42 | 1.67 |
| 2018/03/11 06:39 | 1.30 | 33.47 | 1.78 |
| 2018/03/11 06:54 | 1.34 | 35.76 | 1.82 |
| 2018/03/11 07:09 | 1.53 | 47.43 | 2.01 |
| 2018/03/11 07:24 | 1.76 | 58.40 | 2.01 |
| 2018/03/11 07:39 | 1.76 | 62.64 | 2.16 |
| 2018/03/11 07:54 | 1.84 | 68.33 | 2.20 |
| 2018/03/11 08:09 | 1.76 | 63.96 | 2.20 |
| 2018/03/11 08:24 | 1.87 | 69.86 | 2.20 |
| 2018/03/11 08:39 | 1.87 | 69.86 | 2.20 |
| 2018/03/11 08:54 | 2.00 | 86.87 | 2.50 |
| 2018/03/11 09:09 | 2.00 | 86.87 | 2.50 |
| 2018/03/11 09:24 | 2.00 | 86.87 | 2.50 |
| 2018/03/11 09:39 | 2.11 | 93.89 | 2.50 |
| 2018/03/11 09:54 | 1.69 | 56.39 | 2.06 |
| 2018/03/11 10:09 | 1.65 | 54.44 | 2.06 |
| 2018/03/11 10:24 | 1.62 | 57.01 | 2.21 |
| 2018/03/11 10:39 | 1.65 | 61.46 | 2.32 |
| 2018/03/11 10:54 | 1.65 | 58.47 | 2.21 |
| 2018/03/11 11:09 | 1.65 | 59.03 | 2.23 |
| 2018/03/11 11:24 | 1.66 | 59.72 | 2.23 |
| 2018/03/11 11:39 | 1.71 | 61.94 | 2.23 |
| 2018/03/11 11:54 | 1.71 | 60.00 | 2.16 |
| 2018/03/11 12:09 | 1.68 | 57.71 | 2.13 |
| 2018/03/11 12:24 | 1.68 | 53.61 | 1.98 |
| 2018/03/11 12:39 | 1.68 | 53.61 | 1.98 |
| 2018/03/11 12:54 | 1.66 | 57.01 | 2.13 |
| 2018/03/11 13:09 | 1.65 | 56.32 | 2.13 |
| 2018/03/11 13:24 | 1.65 | 52.29 | 1.98 |
| 2018/03/11 13:39 | 1.64 | 56.74 | 2.17 |
| 2018/03/11 13:54 | 1.64 | 53.40 | 2.04 |
| 2018/03/11 14:09 | 1.62 | 51.46 | 1.99 |
| 2018/03/11 14:24 | 1.62 | 51.46 | 1.99 |
| 2018/03/11 14:39 | 1.65 | 52.71 | 1.99 |

| TimeStamp | Level (in) | Flow (gpm) | Velocity (fps) |
|---|---|---|---|
| 2018/03/11 14:54 | 1.65 | 50.42 | 1.91 |
| 2018/03/11 15:09 | 1.68 | 51.67 | 1.91 |
| 2018/03/11 15:24 | 1.69 | 50.76 | 1.85 |
| 2018/03/11 15:39 | 1.69 | 50.76 | 1.85 |
| 2018/03/11 15:54 | 1.58 | 51.25 | 2.06 |
| 2018/03/11 16:09 | 1.69 | 59.79 | 2.18 |
| 2018/03/11 16:24 | 1.58 | 51.25 | 2.06 |
| 2018/03/11 16:39 | 1.55 | 50.97 | 2.11 |
| 2018/03/11 16:54 | 1.55 | 50.97 | 2.11 |
| 2018/03/11 17:09 | 1.40 | 37.50 | 1.80 |
| 2018/03/11 17:24 | 1.33 | 32.71 | 1.69 |
| 2018/03/11 17:39 | 1.30 | 30.56 | 1.63 |
| 2018/03/11 17:54 | 1.22 | 27.71 | 1.63 |
| 2018/03/11 18:09 | 1.19 | 26.81 | 1.63 |
| 2018/03/11 18:24 | 1.19 | 26.81 | 1.63 |
| 2018/03/11 18:39 | 1.29 | 32.08 | 1.74 |
| 2018/03/11 18:54 | 1.29 | 33.26 | 1.80 |
| 2018/03/11 19:09 | 1.34 | 35.42 | 1.80 |
| 2018/03/11 19:24 | 1.34 | 35.69 | 1.82 |
| 2018/03/11 19:39 | 1.46 | 42.36 | 1.92 |
| 2018/03/11 19:54 | 1.64 | 52.99 | 2.03 |
| 2018/03/11 20:09 | 1.64 | 52.99 | 2.03 |
| 2018/03/11 20:24 | 1.66 | 56.46 | 2.11 |
| 2018/03/11 20:39 | 1.73 | 64.72 | 2.28 |
| 2018/03/11 20:54 | 1.73 | 67.08 | 2.36 |
| 2018/03/11 21:09 | 1.73 | 67.08 | 2.36 |
| 2018/03/11 21:24 | 1.73 | 67.08 | 2.36 |
| 2018/03/11 21:39 | 1.65 | 50.14 | 1.90 |
| 2018/03/11 21:54 | 1.15 | 27.01 | 1.73 |
| 2018/03/11 22:09 | 1.08 | 24.17 | 1.69 |
| 2018/03/11 22:24 | 1.00 | 20.42 | 1.61 |
| 2018/03/11 22:39 | 0.96 | 18.61 | 1.56 |
| 2018/03/11 22:54 | 0.94 | 18.19 | 1.56 |
| 2018/03/11 23:09 | 0.94 | 17.43 | 1.49 |
| 2018/03/11 23:24 | 0.93 | 16.94 | 1.48 |
| 2018/03/11 23:39 | 0.93 | 17.85 | 1.56 |
| 2018/03/11 23:54 | 0.94 | 19.37 | 1.66 |
| 2018/03/12 00:09 | 0.96 | 19.79 | 1.66 |
| 2018/03/12 00:24 | 1.05 | 24.03 | 1.75 |
| 2018/03/12 00:39 | 1.51 | 43.61 | 1.87 |
| 2018/03/12 00:54 | 1.51 | 43.61 | 1.87 |
| 2018/03/12 01:09 | 1.51 | 43.61 | 1.87 |
| 2018/03/12 01:24 | 1.51 | 45.97 | 1.97 |
| 2018/03/12 01:39 | 1.04 | 23.89 | 1.77 |
| 2018/03/12 01:54 | 0.96 | 18.89 | 1.58 |

| TimeStamp | Level (in) | Flow (gpm) | Velocity (fps) |
|---|---|---|---|
| 2018/03/12 02:09 | 1.04 | 22.50 | 1.67 |
| 2018/03/12 02:24 | 1.04 | 22.50 | 1.67 |
| 2018/03/12 02:39 | 1.04 | 22.50 | 1.67 |
| 2018/03/12 02:54 | 0.96 | 18.89 | 1.58 |
| 2018/03/12 03:09 | 0.96 | 18.89 | 1.58 |
| 2018/03/12 03:24 | 0.71 | 11.46 | 1.50 |
| 2018/03/12 03:39 | 0.64 | 8.82 | 1.35 |
| 2018/03/12 03:54 | 0.61 | 8.26 | 1.35 |
| 2018/03/12 04:09 | 0.61 | 8.26 | 1.35 |
| 2018/03/12 04:24 | 0.64 | 8.40 | 1.28 |
| 2018/03/12 04:39 | 0.69 | 10.00 | 1.35 |
| 2018/03/12 04:54 | 0.73 | 11.67 | 1.45 |
| 2018/03/12 05:09 | 0.82 | 13.96 | 1.47 |
| 2018/03/12 05:24 | 0.90 | 16.11 | 1.47 |
| 2018/03/12 05:39 | 0.90 | 16.74 | 1.53 |
| 2018/03/12 05:54 | 0.90 | 16.74 | 1.53 |
| 2018/03/12 06:09 | 0.91 | 17.29 | 1.55 |
| 2018/03/12 06:24 | 1.14 | 24.72 | 1.61 |
| 2018/03/12 06:39 | 1.40 | 34.24 | 1.64 |
| 2018/03/12 06:54 | 1.48 | 41.18 | 1.82 |
| 2018/03/12 07:09 | 1.66 | 57.36 | 2.14 |
| 2018/03/12 07:24 | 1.71 | 59.44 | 2.14 |
| 2018/03/12 07:39 | 1.73 | 60.83 | 2.14 |
| 2018/03/12 07:54 | 1.73 | 57.15 | 2.01 |
| 2018/03/12 08:09 | 1.80 | 60.49 | 2.01 |
| 2018/03/12 08:24 | 1.71 | 52.57 | 1.90 |
| 2018/03/12 08:39 | 1.80 | 55.14 | 1.84 |
| 2018/03/12 08:54 | 1.86 | 59.44 | 1.90 |
| 2018/03/12 09:09 | 2.04 | 70.69 | 1.97 |
| 2018/03/12 09:24 | 2.04 | 70.69 | 1.97 |
| 2018/03/12 09:39 | 2.04 | 70.69 | 1.97 |
| 2018/03/12 09:54 | 2.03 | 70.00 | 1.97 |
| 2018/03/12 10:09 | 1.94 | 67.50 | 2.02 |
| 2018/03/12 10:24 | 1.90 | 61.32 | 1.89 |
| 2018/03/12 10:39 | 1.93 | 62.64 | 1.89 |
| 2018/03/12 10:54 | 1.93 | 68.06 | 2.06 |
| 2018/03/12 11:09 | 1.80 | 61.81 | 2.06 |
| 2018/03/12 11:24 | 1.80 | 57.64 | 1.92 |
| 2018/03/12 11:39 | 1.80 | 57.64 | 1.92 |
| 2018/03/12 11:54 | 1.69 | 50.90 | 1.86 |
| 2018/03/12 12:09 | 1.80 | 55.76 | 1.86 |
| 2018/03/12 12:24 | 1.69 | 50.49 | 1.84 |
| 2018/03/12 12:39 | 1.69 | 47.01 | 1.72 |
| 2018/03/12 12:54 | 1.51 | 39.93 | 1.72 |
| 2018/03/12 13:09 | 1.71 | 48.06 | 1.73 |

| TimeStamp | Level (in) | Flow (gpm) | Velocity (fps) |
|---|---|---|---|
| 2018/03/12 13:24 | 1.71 | 48.06 | 1.73 |
| 2018/03/12 13:39 | 1.71 | 48.06 | 1.73 |
| 2018/03/12 13:54 | 1.71 | 49.37 | 1.78 |
| 2018/03/12 14:09 | 1.71 | 49.86 | 1.80 |
| 2018/03/12 14:24 | 1.71 | 49.86 | 1.80 |
| 2018/03/12 14:39 | 1.71 | 49.86 | 1.80 |
| 2018/03/12 14:54 | 1.71 | 46.67 | 1.68 |
| 2018/03/12 15:09 | 1.40 | 34.03 | 1.63 |
| 2018/03/12 15:24 | 1.40 | 34.03 | 1.63 |
| 2018/03/12 15:39 | 1.75 | 48.26 | 1.68 |
| 2018/03/12 15:54 | 1.75 | 48.26 | 1.68 |
| 2018/03/12 16:09 | 1.40 | 34.03 | 1.63 |
| 2018/03/12 16:24 | 1.39 | 34.37 | 1.67 |
| 2018/03/12 16:39 | 1.19 | 25.07 | 1.52 |
| 2018/03/12 16:54 | 1.19 | 22.92 | 1.39 |
| 2018/03/12 17:09 | 1.18 | 22.57 | 1.39 |
| 2018/03/12 17:24 | 1.15 | 21.74 | 1.39 |
| 2018/03/12 17:39 | 1.16 | 22.15 | 1.39 |
| 2018/03/12 17:54 | 1.16 | 21.53 | 1.35 |
| 2018/03/12 18:09 | 1.08 | 19.31 | 1.35 |
| 2018/03/12 18:24 | 1.16 | 21.11 | 1.32 |
| 2018/03/12 18:39 | 1.16 | 21.11 | 1.32 |
| 2018/03/12 18:54 | 1.23 | 22.92 | 1.32 |
| 2018/03/12 19:09 | 1.11 | 20.62 | 1.39 |
| 2018/03/12 19:24 | 1.22 | 23.68 | 1.39 |
| 2018/03/12 19:39 | 1.15 | 23.40 | 1.49 |
| 2018/03/12 19:54 | 1.22 | 25.49 | 1.49 |
| 2018/03/12 20:09 | 1.15 | 22.92 | 1.47 |
| 2018/03/12 20:24 | 1.22 | 25.00 | 1.47 |
| 2018/03/12 20:39 | 1.22 | 25.00 | 1.47 |
| 2018/03/12 20:54 | 1.28 | 25.21 | 1.39 |
| 2018/03/12 21:09 | 1.28 | 25.21 | 1.39 |
| 2018/03/12 21:24 | 1.28 | 26.67 | 1.46 |
| 2018/03/12 21:39 | 1.28 | 26.67 | 1.46 |
| 2018/03/12 21:54 | 1.28 | 27.64 | 1.52 |
| 2018/03/12 22:09 | 1.15 | 23.75 | 1.52 |
| 2018/03/12 22:24 | 1.28 | 27.64 | 1.52 |
| 2018/03/12 22:39 | 1.28 | 28.19 | 1.55 |
| 2018/03/12 22:54 | 1.50 | 34.86 | 1.52 |
| 2018/03/12 23:09 | 1.50 | 35.62 | 1.55 |
| 2018/03/12 23:24 | 1.50 | 35.62 | 1.55 |
| 2018/03/12 23:39 | 1.50 | 35.62 | 1.55 |
| 2018/03/12 23:54 | 1.48 | 33.19 | 1.46 |
| 2018/03/13 00:09 | 1.44 | 31.81 | 1.46 |
| 2018/03/13 00:24 | 0.97 | 17.01 | 1.40 |

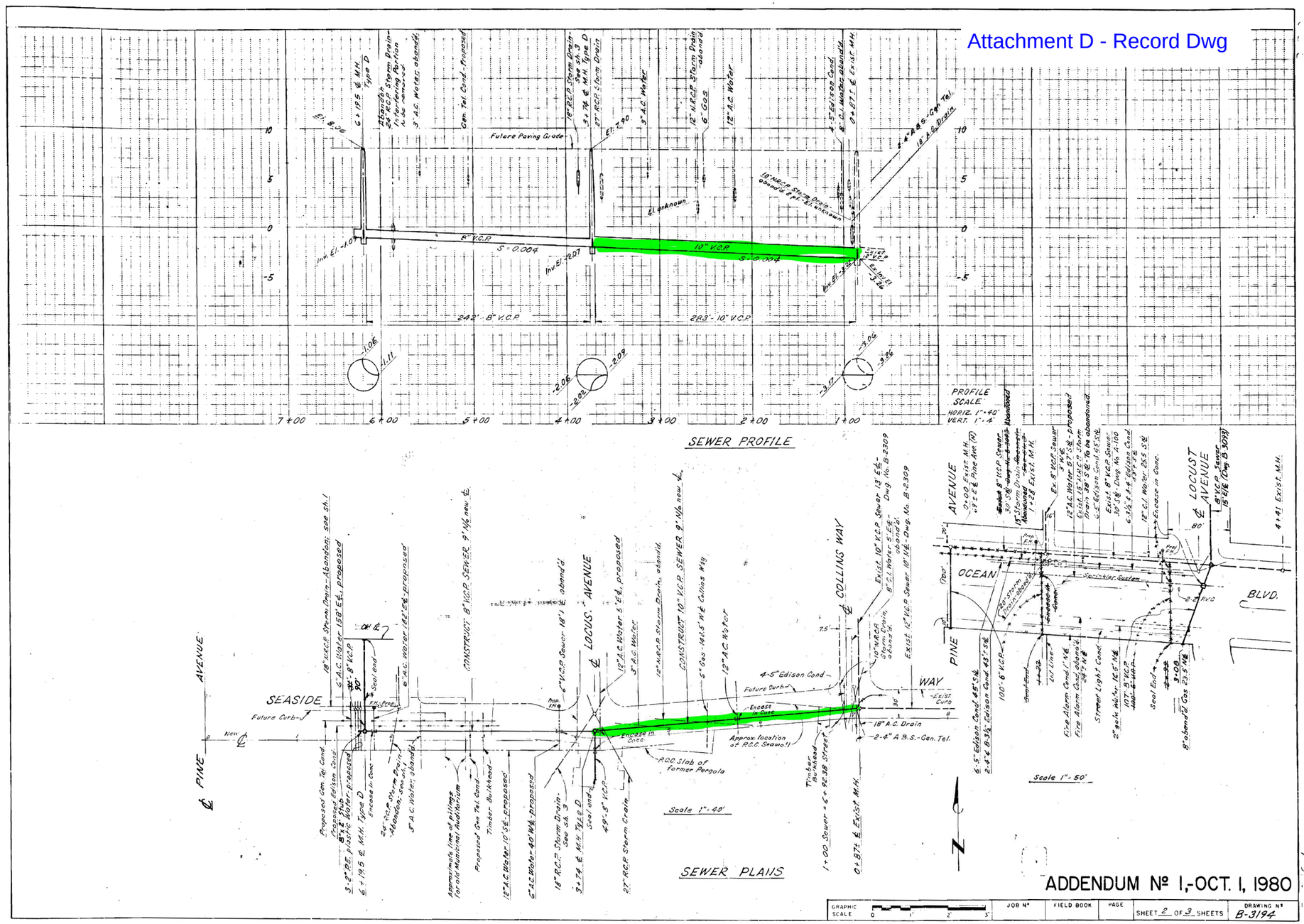
| TimeStamp | Level (in) | Flow (gpm) | Velocity (fps) |
|---|---|---|---|
| 2018/03/13 00:39 | 0.97 | 16.81 | 1.38 |
| 2018/03/13 00:54 | 0.86 | 12.92 | 1.27 |
| 2018/03/13 01:09 | 0.79 | 12.08 | 1.34 |
| 2018/03/13 01:24 | 0.73 | 10.83 | 1.34 |
| 2018/03/13 01:39 | 0.68 | 9.44 | 1.31 |
| 2018/03/13 01:54 | 0.68 | 9.17 | 1.27 |
| 2018/03/13 02:09 | 0.66 | 9.17 | 1.31 |
| 2018/03/13 02:24 | 0.66 | 8.96 | 1.28 |
| 2018/03/13 02:39 | 0.66 | 8.96 | 1.28 |
| 2018/03/13 02:54 | 0.66 | 8.96 | 1.28 |
| 2018/03/13 03:09 | 0.73 | 10.35 | 1.28 |
| 2018/03/13 03:24 | 0.83 | 12.43 | 1.28 |
| 2018/03/13 03:39 | 0.83 | 10.42 | 1.07 |
| 2018/03/13 03:54 | 0.83 | 10.42 | 1.07 |
| 2018/03/13 04:09 | 0.83 | 10.42 | 1.07 |
| 2018/03/13 04:24 | 0.78 | 10.90 | 1.24 |
| 2018/03/13 04:39 | 0.78 | 10.90 | 1.24 |
| 2018/03/13 04:54 | 0.84 | 12.36 | 1.24 |
| 2018/03/13 05:09 | 0.91 | 13.75 | 1.23 |
| 2018/03/13 05:24 | 0.98 | 15.35 | 1.23 |
| 2018/03/13 05:39 | 1.14 | 18.96 | 1.23 |
| 2018/03/13 05:54 | 1.58 | 42.99 | 1.73 |
| 2018/03/13 06:09 | 1.84 | 60.14 | 1.94 |
| 2018/03/13 06:24 | 1.86 | 62.22 | 1.98 |
| 2018/03/13 06:39 | 1.87 | 67.50 | 2.13 |
| 2018/03/13 06:54 | 2.05 | 82.78 | 2.29 |
| 2018/03/13 07:09 | 2.29 | 96.67 | 2.29 |
| 2018/03/13 07:24 | 2.34 | 102.22 | 2.34 |
| 2018/03/13 07:39 | 2.29 | 91.67 | 2.17 |
| 2018/03/13 07:54 | 2.29 | 91.67 | 2.17 |
| 2018/03/13 08:09 | 2.29 | 91.67 | 2.17 |
| 2018/03/13 08:24 | 1.91 | 55.07 | 1.68 |
| 2018/03/13 08:39 | 1.91 | 55.07 | 1.68 |
| 2018/03/13 08:54 | 1.91 | 55.07 | 1.68 |
| 2018/03/13 09:09 | 1.91 | 57.71 | 1.76 |
| 2018/03/13 09:24 | 1.91 | 56.04 | 1.71 |
| 2018/03/13 09:39 | 1.91 | 57.71 | 1.76 |
| 2018/03/13 09:54 | 1.91 | 57.71 | 1.76 |
| 2018/03/13 10:09 | 1.78 | 57.71 | 1.97 |
| 2018/03/13 10:24 | 1.78 | 60.49 | 2.06 |
| 2018/03/13 10:39 | 2.11 | 87.64 | 2.33 |
| 2018/03/13 10:54 | 1.84 | 70.90 | 2.28 |
| 2018/03/13 11:09 | 1.72 | 60.49 | 2.16 |
| 2018/03/13 11:24 | 1.84 | 66.94 | 2.16 |
| 2018/03/13 11:39 | 1.84 | 66.94 | 2.16 |

| TimeStamp | Level (in) | Flow (gpm) | Velocity (fps) |
|---|---|---|---|
| 2018/03/13 11:54 | 1.73 | 58.54 | 2.06 |
| 2018/03/13 12:09 | 1.72 | 57.92 | 2.06 |
| 2018/03/13 12:24 | 1.62 | 52.85 | 2.05 |
| 2018/03/13 12:39 | 1.54 | 46.18 | 1.93 |
| 2018/03/13 12:54 | 1.54 | 42.71 | 1.79 |
| 2018/03/13 13:09 | 1.54 | 42.50 | 1.78 |
| 2018/03/13 13:24 | 1.62 | 45.90 | 1.78 |
| 2018/03/13 13:39 | 1.68 | 48.40 | 1.79 |
| 2018/03/13 13:54 | 1.80 | 53.54 | 1.78 |
| 2018/03/13 14:09 | 1.82 | 58.96 | 1.94 |
| 2018/03/13 14:24 | 1.84 | 60.62 | 1.95 |
| 2018/03/13 14:39 | 1.82 | 58.96 | 1.94 |
| 2018/03/13 14:54 | 1.91 | 58.33 | 1.78 |
| 2018/03/13 15:09 | 1.91 | 55.42 | 1.69 |
| 2018/03/13 15:24 | 1.76 | 49.17 | 1.69 |
| 2018/03/13 15:39 | 1.68 | 41.67 | 1.54 |
| 2018/03/13 15:54 | 1.62 | 39.65 | 1.54 |
| 2018/03/13 16:09 | 1.62 | 41.60 | 1.61 |
| 2018/03/13 16:24 | 1.57 | 42.50 | 1.73 |
| 2018/03/13 16:39 | 1.53 | 40.90 | 1.73 |
| 2018/03/13 16:54 | 1.51 | 40.35 | 1.73 |
| 2018/03/13 17:09 | 1.41 | 37.99 | 1.80 |
| 2018/03/13 17:24 | 1.40 | 37.78 | 1.81 |
| 2018/03/13 17:39 | 1.40 | 37.78 | 1.81 |
| 2018/03/13 17:54 | 1.40 | 38.54 | 1.85 |
| 2018/03/13 18:09 | 1.36 | 38.96 | 1.95 |
| 2018/03/13 18:24 | 1.36 | 38.96 | 1.95 |
| 2018/03/13 18:39 | 1.40 | 40.76 | 1.95 |
| 2018/03/13 18:54 | 1.43 | 40.56 | 1.89 |
| 2018/03/13 19:09 | 1.44 | 41.11 | 1.89 |
| 2018/03/13 19:24 | 1.44 | 37.22 | 1.71 |
| 2018/03/13 19:39 | 1.44 | 32.71 | 1.50 |
| 2018/03/13 19:54 | 1.47 | 33.61 | 1.50 |
| 2018/03/13 20:09 | 1.47 | 33.61 | 1.50 |
| 2018/03/13 20:24 | 1.48 | 34.10 | 1.50 |
| 2018/03/13 20:39 | 1.50 | 31.67 | 1.38 |
| 2018/03/13 20:54 | 1.55 | 33.33 | 1.38 |
| 2018/03/13 21:09 | 1.58 | 37.85 | 1.52 |
| 2018/03/13 21:24 | 1.55 | 36.94 | 1.52 |
| 2018/03/13 21:39 | 1.55 | 37.15 | 1.54 |
| 2018/03/13 21:54 | 1.55 | 38.19 | 1.58 |
| 2018/03/13 22:09 | 1.46 | 34.79 | 1.58 |
| 2018/03/13 22:24 | 1.46 | 34.79 | 1.58 |
| 2018/03/13 22:39 | 1.46 | 33.68 | 1.53 |
| 2018/03/13 22:54 | 1.46 | 31.46 | 1.43 |

| TimeStamp | Level (in) | Flow (gpm) | Velocity (fps) |
|---|---|---|---|
| 2018/03/13 23:09 | 1.47 | 30.97 | 1.38 |
| 2018/03/13 23:24 | 1.47 | 30.56 | 1.37 |
| 2018/03/13 23:39 | 1.47 | 30.56 | 1.37 |
| 2018/03/13 23:54 | 1.41 | 29.24 | 1.38 |
| 2018/03/14 00:09 | 1.41 | 29.24 | 1.38 |
| 2018/03/14 00:24 | 1.37 | 25.76 | 1.27 |
| 2018/03/14 00:39 | 1.22 | 16.81 | 0.99 |
| 2018/03/14 00:54 | 1.07 | 13.68 | 0.98 |
| 2018/03/14 01:09 | 1.00 | 12.36 | 0.98 |
| 2018/03/14 01:24 | 1.00 | 12.36 | 0.98 |
| 2018/03/14 01:39 | 1.00 | 12.43 | 0.98 |
| 2018/03/14 01:54 | 1.30 | 24.31 | 1.29 |
| 2018/03/14 02:09 | 1.32 | 26.81 | 1.41 |
| 2018/03/14 02:24 | 1.32 | 26.81 | 1.41 |
| 2018/03/14 02:39 | 1.32 | 26.81 | 1.41 |
| 2018/03/14 02:54 | 1.30 | 25.14 | 1.34 |
| 2018/03/14 03:09 | 1.29 | 24.72 | 1.34 |
| 2018/03/14 03:24 | 0.96 | 13.68 | 1.15 |
| 2018/03/14 03:39 | 0.91 | 12.85 | 1.15 |
| 2018/03/14 03:54 | 0.91 | 12.85 | 1.15 |
| 2018/03/14 04:09 | 0.91 | 13.26 | 1.19 |
| 2018/03/14 04:24 | 0.91 | 13.68 | 1.23 |
| 2018/03/14 04:39 | 0.94 | 14.31 | 1.23 |
| 2018/03/14 04:54 | 0.96 | 14.17 | 1.19 |
| 2018/03/14 05:09 | 1.04 | 15.97 | 1.19 |
| 2018/03/14 05:24 | 1.11 | 17.57 | 1.19 |
| 2018/03/14 05:39 | 1.23 | 20.56 | 1.19 |
| 2018/03/14 05:54 | 1.32 | 30.76 | 1.61 |
| 2018/03/14 06:09 | 1.68 | 55.69 | 2.06 |
| 2018/03/14 06:24 | 1.87 | 65.21 | 2.06 |
| 2018/03/14 06:39 | 2.16 | 80.21 | 2.06 |

# Attachment D

Attachment D - Record Dwg




CERTIFICATE OF AUTHENTICITY

This is to certify this microphotograph is a true, accurate and complete reproduction of a record in the custody of the Bureau of Engineering. Said documents were delivered in the regular course of business for photographing. It is further certified that the microphotographic processes were accomplished in a manner and on film which meets with requirements of the National Bureau of Standards for permanent microphotographic copy.

Custodian of Records: HZH

Camera Operator: [signature]

Date Photographed: 7-22-81

B/3194 2A/3

# Attachment E

**FLOW ANALYSIS USING d/D RATIO PARAMETERS FROM KING'S HYDRAULICS HAND BOOK**

D= Diameter of pipe in inches ; d = depth of flow; Slope =S

| Diameter pipe D = | | **10** | | Slope S = | **0.004** | | Manning's n = | | **0.013** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| d/D | Ca | Cr | **Q** | **V** | d/D | Ca | Cr | **Q** | **V** | d/D | Ca | Cr | **Q** | **V** |
| 0.01 | 0.0013 | 0.007 | 0.0002 | 0.234 | 0.31 | 0.2074 | 0.176 | 0.289 | 2.009 | 0.61 | 0.502 | 0.280 | 0.955 | 2.739 |
| 0.02 | 0.0037 | 0.013 | 0.0009 | 0.353 | 0.32 | 0.2167 | 0.18 | 0.307 | 2.040 | 0.62 | 0.512 | 0.282 | 0.978 | 2.752 |
| 0.03 | 0.0069 | 0.020 | 0.0023 | 0.471 | 0.33 | 0.2260 | 0.185 | 0.326 | 2.077 | 0.63 | 0.521 | 0.284 | 1.000 | 2.765 |
| 0.04 | 0.0105 | 0.026 | 0.0041 | 0.561 | 0.34 | 0.2355 | 0.189 | 0.345 | 2.107 | 0.64 | 0.531 | 0.286 | 1.024 | 2.778 |
| 0.05 | 0.0147 | 0.033 | 0.0067 | 0.658 | 0.35 | 0.2450 | 0.193 | 0.364 | 2.137 | 0.65 | 0.540 | 0.288 | 1.046 | 2.791 |
| 0.06 | 0.0192 | 0.039 | 0.0098 | 0.735 | 0.36 | 0.2546 | 0.198 | 0.384 | 2.174 | 0.66 | 0.550 | 0.290 | 1.071 | 2.804 |
| 0.07 | 0.0242 | 0.045 | 0.0136 | 0.809 | 0.37 | 0.2642 | 0.202 | 0.404 | 2.203 | 0.67 | 0.559 | 0.292 | 1.093 | 2.816 |
| 0.08 | 0.0294 | 0.051 | 0.0180 | 0.880 | 0.38 | 0.2739 | 0.206 | 0.424 | 2.232 | 0.68 | 0.569 | 0.293 | 1.115 | 2.823 |
| 0.09 | 0.0350 | 0.057 | 0.0230 | 0.947 | 0.39 | 0.2836 | 0.21 | 0.445 | 2.261 | 0.69 | 0.578 | 0.295 | 1.138 | 2.836 |
| 0.10 | 0.0409 | 0.063 | 0.0288 | 1.013 | 0.4 | 0.2934 | 0.214 | 0.466 | 2.289 | 0.70 | 0.587 | 0.296 | 1.159 | 2.842 |
| 0.11 | 0.0470 | 0.070 | 0.0355 | 1.086 | 0.41 | 0.3032 | 0.218 | 0.488 | 2.318 | 0.71 | 0.596 | 0.298 | 1.182 | 2.855 |
| 0.12 | 0.0534 | 0.075 | 0.0422 | 1.138 | 0.42 | 0.3130 | 0.222 | 0.510 | 2.346 | 0.72 | 0.605 | 0.299 | 1.202 | 2.861 |
| 0.13 | 0.0600 | 0.081 | 0.0499 | 1.197 | 0.43 | 0.3239 | 0.226 | 0.534 | 2.374 | 0.73 | 0.614 | 0.300 | 1.223 | 2.868 |
| 0.14 | 0.0668 | 0.087 | 0.0583 | 1.256 | 0.44 | 0.3328 | 0.229 | 0.554 | 2.395 | 0.74 | 0.623 | 0.301 | 1.243 | 2.874 |
| 0.15 | 0.0739 | 0.093 | 0.0674 | 1.313 | 0.45 | 0.3428 | 0.233 | 0.577 | 2.423 | 0.75 | 0.632 | 0.302 | 1.264 | 2.880 |
| 0.16 | 0.0811 | 0.099 | 0.0771 | 1.369 | 0.46 | 0.3527 | 0.236 | 0.599 | 2.444 | 0.76 | 0.640 | 0.302 | 1.280 | 2.880 |
| 0.17 | 0.0885 | 0.104 | 0.0869 | 1.415 | 0.47 | 0.3627 | 0.240 | 0.622 | 2.471 | 0.77 | 0.649 | 0.303 | 1.301 | 2.887 |
| 0.18 | 0.0961 | 0.110 | 0.0980 | 1.469 | 0.48 | 0.3727 | 0.243 | 0.645 | 2.492 | 0.78 | 0.657 | 0.304 | 1.320 | 2.893 |
| 0.19 | 0.1039 | 0.115 | 0.1092 | 1.513 | 0.49 | 0.3827 | 0.247 | 0.669 | 2.519 | 0.79 | 0.666 | 0.304 | 1.338 | 2.893 |
| 0.20 | 0.1118 | 0.121 | 0.1215 | 1.565 | 0.50 | 0.3930 | 0.250 | 0.693 | 2.539 | 0.80 | 0.674 | 0.304 | 1.354 | 2.893 |
| 0.21 | 0.1199 | 0.126 | 0.1339 | 1.608 | 0.51 | 0.4030 | 0.253 | 0.716 | 2.560 | 0.81 | 0.681 | 0.304 | 1.368 | 2.893 |
| 0.22 | 0.1281 | 0.131 | 0.1468 | 1.650 | 0.52 | 0.4130 | 0.256 | 0.740 | 2.580 | 0.82 | 0.689 | 0.304 | 1.384 | 2.893 |
| 0.23 | 0.1365 | 0.136 | 0.1604 | 1.692 | 0.53 | 0.4230 | 0.259 | 0.764 | 2.600 | 0.83 | 0.697 | 0.304 | 1.400 | 2.893 |
| 0.24 | 0.1449 | 0.142 | 0.1752 | 1.741 | 0.54 | 0.4330 | 0.262 | 0.788 | 2.620 | 0.84 | 0.704 | 0.304 | 1.414 | 2.893 |
| 0.25 | 0.1535 | 0.147 | 0.1899 | 1.782 | 0.55 | 0.4430 | 0.265 | 0.812 | 2.640 | 0.85 | 0.712 | 0.303 | 1.427 | 2.887 |
| 0.26 | 0.1623 | 0.152 | 0.2054 | 1.822 | 0.56 | 0.4530 | 0.268 | 0.837 | 2.660 | 0.86 | 0.719 | 0.303 | 1.441 | 2.887 |
| 0.27 | 0.1711 | 0.157 | 0.2212 | 1.862 | 0.57 | 0.4620 | 0.270 | 0.858 | 2.673 | 0.87 | 0.725 | 0.302 | 1.450 | 2.880 |
| 0.28 | 0.1800 | 0.161 | 0.2367 | 1.893 | 0.58 | 0.4720 | 0.273 | 0.883 | 2.693 | 0.88 | 0.732 | 0.301 | 1.461 | 2.874 |
| 0.29 | 0.1890 | 0.166 | 0.2536 | 1.932 | 0.59 | 0.4820 | 0.275 | 0.906 | 2.706 | 0.89 | 0.738 | 0.299 | 1.466 | 2.861 |
| 0.30 | 0.1982 | 0.171 | 0.2713 | 1.971 | 0.60 | 0.4920 | 0.278 | 0.934 | 2.733 | 0.90 | 0.745 | 0.298 | 1.477 | 2.855 |

Where: $Q = VA$

$$Q = \frac{(1.486)(r^{2/3})(s^{1/2})(A)}{n}$$

$$Q = \frac{(1.486)(Cr*D)(s^{1/2})(Ca*D^2)}{n}$$

V = Velocity

A = Area

r = Hydraulic Radius

Ca = Area Coefficient (King's)

Cr = Circ. Pipe Hydraulic Radius Coefficient (King's)

Avg Flow

Peak Flow