Appendix H

# TID EAST INTERCEPTOR

Engineers...Working Wonders With Water™

# PROJECT MEMORANDUM

| | | | |
|---|---|---|---|
| **Project Name:** | Sewage Disposal Master Plan | **Date:** | 03/25/2008 |
| **Client:** | City of Oroville | **Project Number:** | 7674A.00 |
| **Prepared By:** | Jason Nikaido | | |
| **Reviewed By:** | Scott Parker | | |
| **Subject:** | TID East Interceptor (Revised 3/24/2008) | | |
| **Distribution:** | Eric Teitelman, Rick Walls, Kent Westover | | |

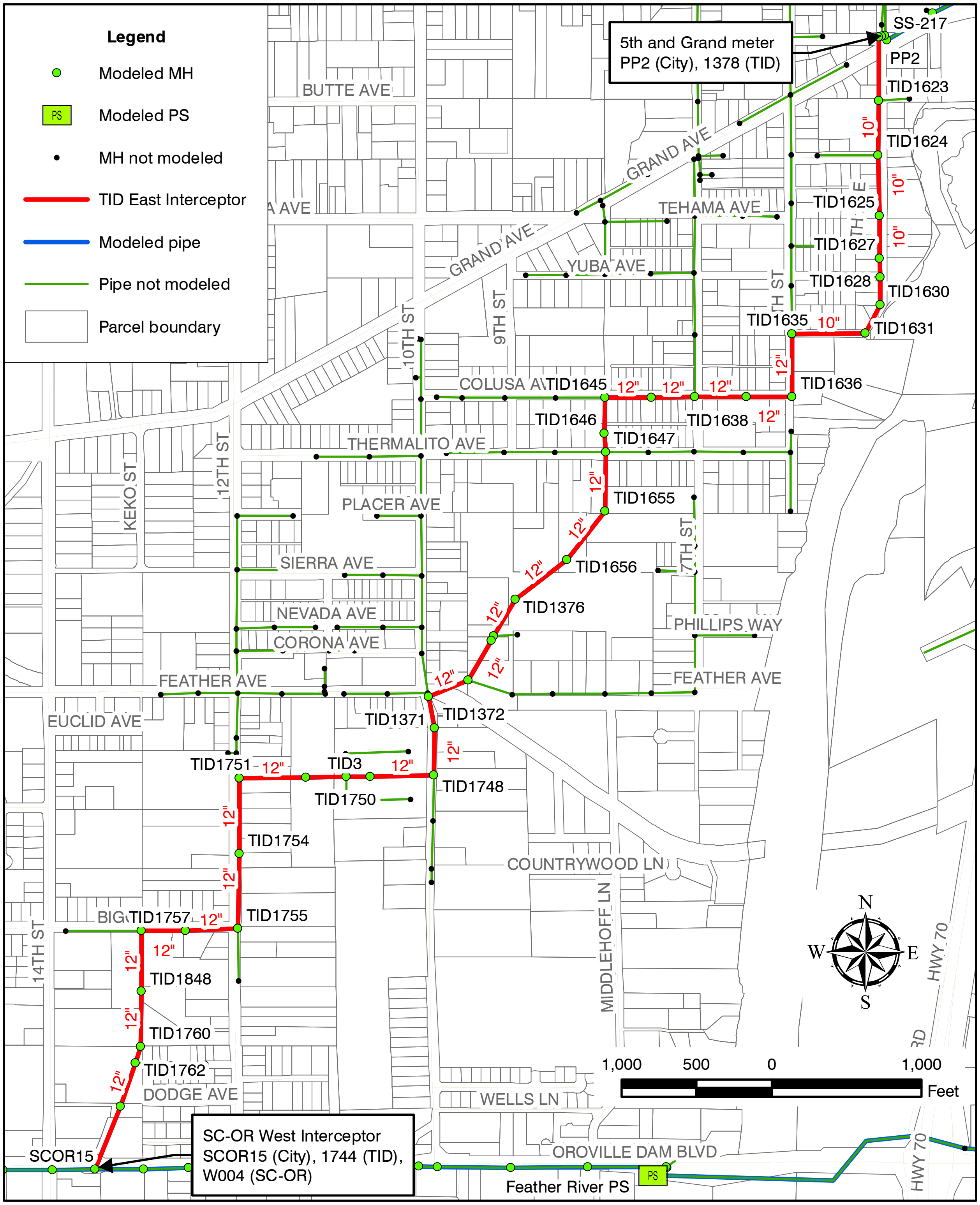
## Background

As part of the City's Sewage Disposal Master Plan (SDMP) Project, Carollo was tasked to evaluate the capacity in the Thermalito Irrigation District's (TID) East Interceptor. The East Interceptor conveys flow from the City's 5th and Grand meter tributary area and TID's Region 2. The interceptor terminates at SC-OR's West Interceptor along Oroville Dam Boulevard (see Figure 1). A Joint Use Facilities Agreement between the City and TID allocates 0.74 million gallons per day (mgd) of capacity to the City. The purpose of this task is to summarize the results of TID's Draft Sanitary Sewer System Conveyance Study completed by Northstar Engineering in April 2007 and the City's on-going SDMP. The two areas of discrepancy between the Conveyance Study and SDMP are in the assessment of interceptor flow capacity and wet weather flow estimation methodology.

## Interceptor Capacity

The first area of difference between the two studies is interceptor capacity. Pipeline capacity calculated by Manning's equation is directly dependent on pipe slope. The basis behind the pipe slopes presented in the Conveyance Study is unknown. The slopes for the SDMP are based on surveys performed by Northstar Engineering. Invert data was available for 28 of the 40 manholes along the interceptor. The remaining 12 inverts were interpolated. The Northstar survey effort also gathered rim elevations for all manholes along the interceptor.

The difference in pipe slope is illustrated in the pipe profile in Figure 2. Both the Conveyance Study and SDMP are consistent until manhole TID1647. After this point, the two pipe slopes diverge greatly. The Conveyance Study pipeline continues at a slope of 0.00195 while the SDMP at slope of 0.0044 to 0.008. The steeper slope in the SDMP pipeline results in a 50 percent increase in capacity, from 1.02 to 1.57 mgd.




# Figure 1
## TID EAST INTERCEPTOR
## SEWAGE DISPOSAL MASTER PLAN
CITY OF OROVILLE

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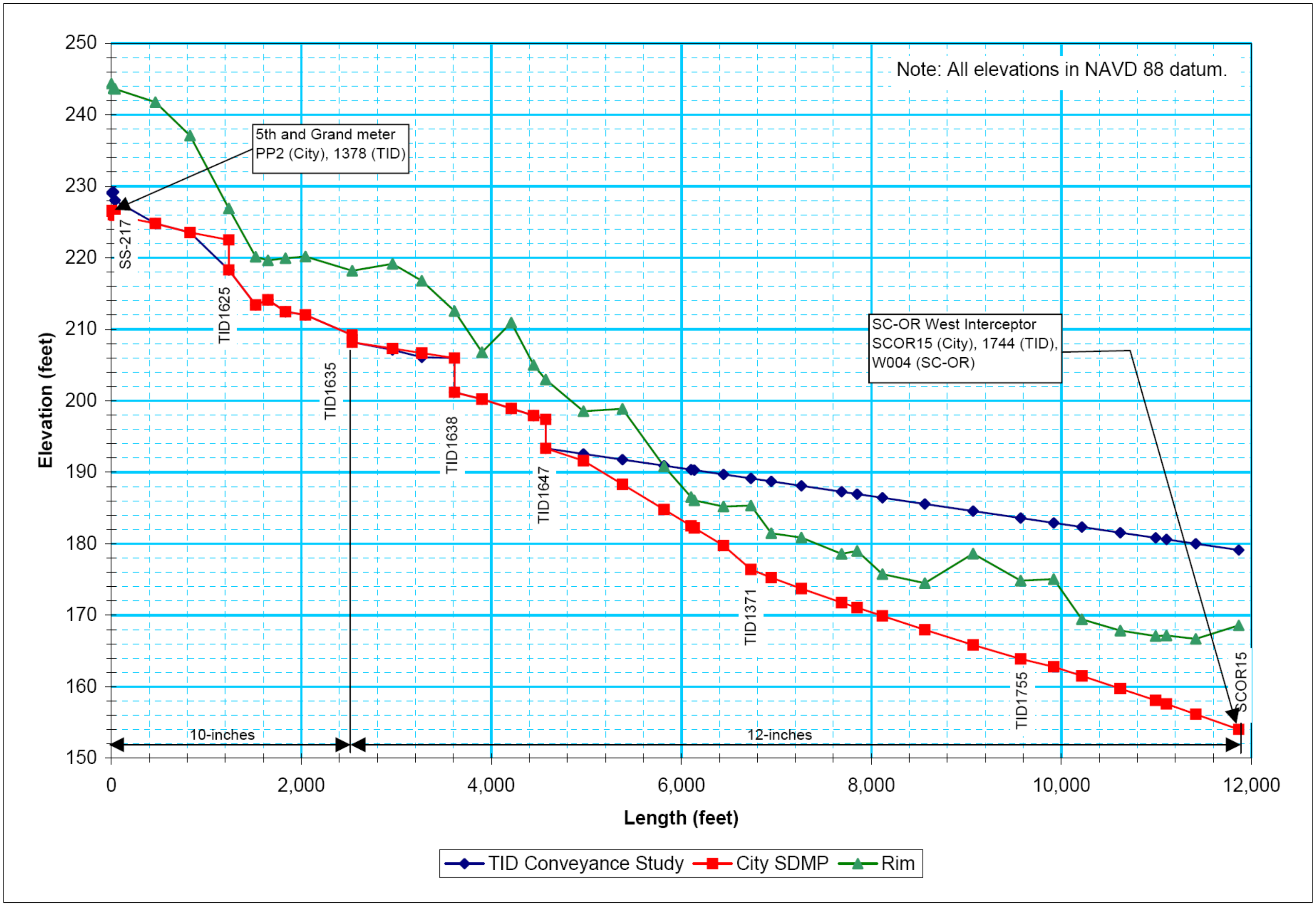


**Figure 2**
**TID EAST INTERCEPTOR PROFILE**
**SEWAGE DISPOSAL MASTER PLAN**
CITY OF OROVILLE

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March 24, 2008

## Methodology

The second area of difference is methodology. The methodologies for estimating average dry weather flows (ADWF) and peak wet weather flows (PWWF) are described below. The biggest differences are in the estimation of wet weather flow.

### *Conveyance Study*

#### Dry Weather Flow

Flow factors according to land use type are applied to individual sewer basins. The dry weather flow calculation methodology is consistent with industry standards

#### Wet Weather Flow

Inflow and infiltration (I/I) is estimated by applying a wet weather peaking factor of 4.7 and in addition, an I/I factor of 650 gallons per acre per day (gpad) to average dry weather flows. The basis for these values was identified as flow data from the 5th and Grand meter and SC-OR West Interceptor. A review of historical flows at the 5th and Grand meter observed many discrepancies during normal and wet weather events due to meter blockage. This may result in inaccurate determination of peak flow values. In addition, I/I estimation is double calculated since both a wet weather peaking factor and I/I factor are used. In the absence of flow metering data, this methodology could be considered acceptable. However, flow-metering data shows that wet weather flows are grossly overestimated with the above factors. Flow monitoring performed for the City's SDMP has observed wet weather peaking factors from 2.66 to 3.97 in the area of the City east of Highway 70 and north of the Feather River, values well below the 4.7 value, coupled with the 650 gpad I/I factor assumed in the Conveyance Study.

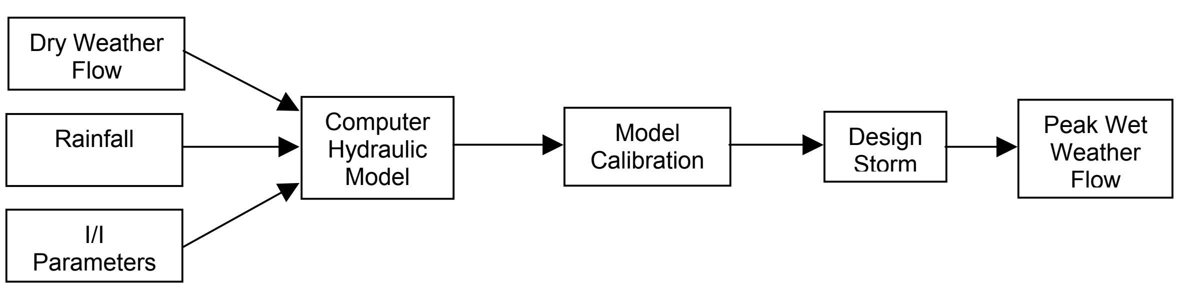
### *Sewage Disposal Master Plan*

#### Dry Weather Flow

The City's SDMP also uses land use based flow factors to estimate normal sewer flow generation. Land use from the City's 2030 General Plan is used to project future flows. This methodology meets industry standards.

#### Wet Weather Flow

The SDMP uses a methodology based on rainfall dependent I/I and a computer hydraulic model and is illustrated in the flow chart below.




- <u>Computer hydraulic model</u>: Dry weather flow, rainfall, and I/I parameters are input to the model and are used to simulate historical events and predict future flows.

- Model calibration: The model was calibrated to a rainfall event from December 28, 2005 to January 6, 2006 (see Figure 3). This period was chosen for the high rainfall volume and good flow metering data. Good flow metering data is qualified as observing an average dry weather flow of approximately 0.25 mgd before and after the rainfall event with a normal diurnal pattern. In addition, the flow data must observe an expected response to rainfall. These conditions made the calibration period ideal since the peak 24-hour rainfall measured 3.24 inches at the Oroville Dam rain gauge. This rainfall volume within the 24-hour period exhibits a recurrence frequency just below 5 years. A 5-year event is estimated at 3.5 inches based on the National Oceanographic and Atmospheric Administration's (NOAA) Atlas 2 Precipitation Frequency Maps. Flows were calibrated to the Feather River Pump Station and 5th and Grand meters. Of the 5th and Grand flow meter data examined for the time period from 2005 to present, this particular storm event was the only suitable occurrence that approached a 5-year recurrence interval, and exhibited appropriate dry weather/wet weather/dry weather flow response.

- Simulation of design storm: The calibrated model was then simulated with a 10-year, 24-hour design storm applied to predict peak wet weather flow (see Figure 4).

The use of a calibrated hydraulic model in the estimation of I/I is superior to unitary factors and results in more realistic flow projections. The method used in the SDMP is preferred when detailed flow metering and rainfall data are available. There is a relatively high level of confidence in the predicted flows at the 5th and Grand meter since modeled flow (0.77 mgd) varied from measured flow (0.76 mgd) by only 1.2 percent. A difference between modeled flows and actual flows of less than 10 percent is widely considered acceptable in the industry.

One benchmark used for assessing the efficacy of whether unitary flow factors make sense is the evaluation against I/I factors determined through system flow monitoring. Table 1 presents a comparison of I/I factors based on the calculated flows presented in the Conveyance Study and temporary flow monitoring conducted in February through May 2007 for the City. The parameter for the Conveyance Study is significant compared to the performance of the rest of the City's collection system. The two adjacent subbasins, Basin C1 and Basin 6, exhibited RDI/I flow factors of 55 and 22 percent below the Conveyance Study estimates, respectively. It should be noted that Basin C1 comprises 20 percent of the contribution to the 5th and Grand Subbasin. Given the disparity in flow factors relative to the performance of the City as a whole and the adjacent basins, the use of unitary flow factors of this magnitude to project wet weather flows in this circumstance must be questioned.

# Existing Flows

ADWF and PWWF for the Conveyance Study and SDMP were compared. ADWF for the Conveyance Study and SDMP are equivalent both in value and distribution. However, PWWF varies significantly as estimated by the methods described previously. PWWF for the Conveyance Study was calculated as ADWF multiplied by a peaking factor of 4.7 plus an I/I factor of 650 gpd per acre. This results in a PWWF of 1.24 mgd for the City at the 5th and Grand meter and 1.93 mgd for City and TID combined at SC-OR's West Interceptor. (see Table 2).

PWWF for the SDMP is rainfall dependent. The rainfall event used is a 10-Year, 24-Hour Design Storm occurring on the peak dry weather flow. The I/I parameters are based on wet weather calibration using flow data from the SDMP's temporary flow monitoring program and permanent meters (i.e. 5th and Grand meter, Feather River Pump Station). The PWWF estimated for the SDMP are 0.83 mgd for the City and 1.41 mgd for the City and TID combined.

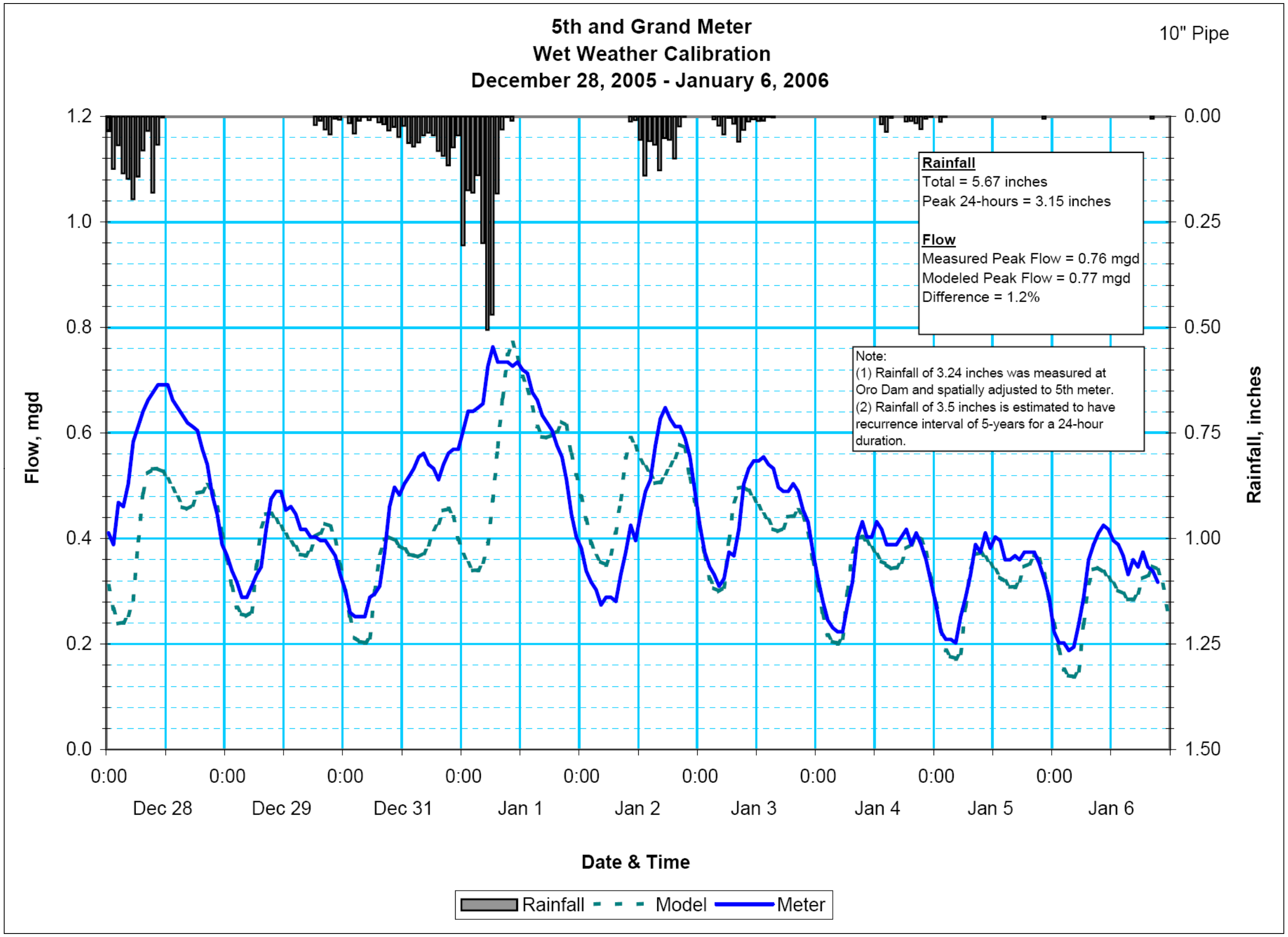



**Figure 3**
**5TH AND GRAND METER CALIBRATION**
**DECEMBER 28, 2005 TO JANUARY 6, 2006**
**SEWAGE DISPOSAL MASTER PLAN**
CITY OF OROVILLE

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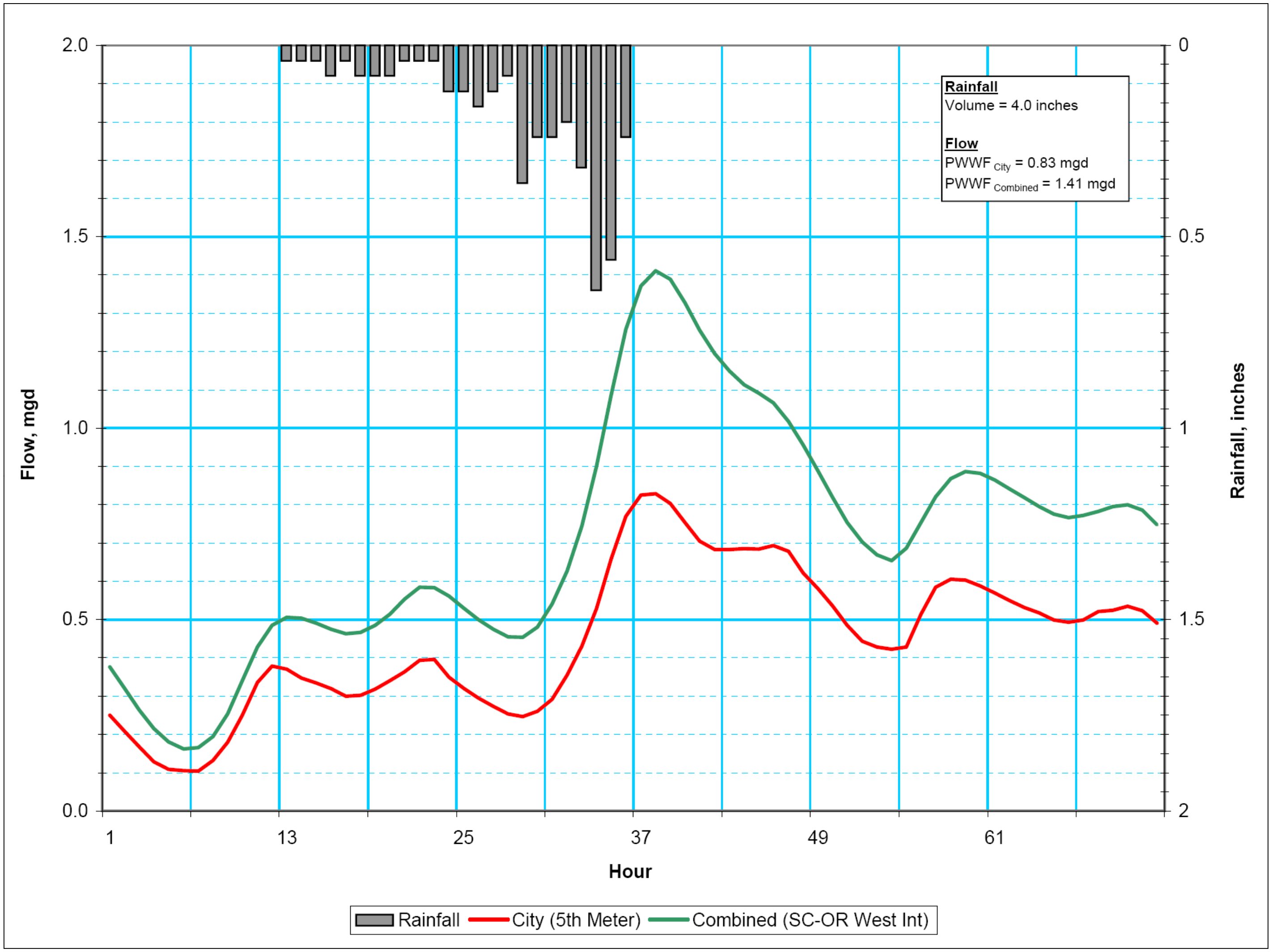


**Figure 4**
**10-YEAR, 24-HOUR DESIGN STORM HYDROGRAPH**
**EXISTING FLOWS**
**SEWAGE DISPOSAL MASTER PLAN**
CITY OF OROVILLE

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March 24, 2008

**Table 1 Inflow and Infiltration Factor Comparison**
**Sewage Disposal Master Plan**
**City of Oroville**

| Basin | Area (Acres) | PWWF[1] (MGD)[2] | ADWF[3] (MGD) | Peak I/I[4] Flow (MGD) | Peak I/I Rate[5] (GPAD)[6] | Peaking Factor[7] |
|---|---|---|---|---|---|---|
| **<u>Conveyance Study</u>** | | | | | | |
| 5th and Grand | 260.71 | 1.24 | 0.25 | 0.99 | 3,797 | 4.96 |
| **<u>Sewage Disposal Master Plan</u>[8]** | | | | | | |
| C1 | 53.03 | 0.15 | 0.06 | 0.09 | 1,697 | 2.50 |
| 6 | 179.05 | 0.66 | 0.17 | 0.53 | 2,960 | 3.88 |
| City-Wide[9] | 1,710.59 | 6.59 | 1.84 | 3.59 | 2,099 | 3.58 |

Notes:
1. PWWF = Peak Wet Weather Flow.
2. MGD = million gallons per day.
3. ADWF = Average Dry Weather Flow.
4. I/I = Inflow and Infiltration
5. Peak I/I rate = Peak I/I flow divided by area.
6. GPAD = gallons per acre per day.
7. Peaking factor is the ratio of PWWF to ADWF and is an indication of system inflow.
8. Temporary flow monitoring performed from February 7 to May 9, 2007.
9. Excludes TID, 5th and Grand basin, and Airport.

**Table 2 Existing Flow Comparison**
**Sewage Disposal Master Plan**
**City of Oroville**

| Flow Type | TID Conveyance Study | City SDMP |
|---|---|---|
| City of Oroville | | |
| ADWF[1] (mgd)[2] | 0.25 | 0.25 |
| PWWF[3] (mgd) | 1.24[4] | 0.83[5] |
| City & TID Combined[6] | | |
| ADWF (mgd) | 0.36 | 0.36 |
| PWWF (mgd) | 1.93 | 1.41 |
| Interceptor Capacity Exceeded[7] | Yes | No |
| Percent of Capacity | 123% | 90% |

Notes:

1. ADWF = Average Dry Weather Flow.
2. mgd = million gallons per day.
3. PWWF = Peak Wet Weather Flow.
4. $PWWF_{TID}$ = ADWF x PF + I/I. PF = 4.0 - 4.7 and I/I estimated at 650 gpd per acre.
5. $PWWF_{City}$ = 10-Year, 24-Hour Design Storm at PDWF. Based on wet weather calibration to City's temporary flow monitoring program and permanent meter data (5th and Grand).
6. Location: Prior to entering SC-OR's West Interceptor on Oroville Dam Blvd.
7. Existing interceptor capacity estimated at 1.57 mgd.

Based on the flows and capacity estimated in the SDMP, the East Interceptor is not at capacity. Approximately 1.41 mgd of the 1.57 mgd in full pipe capacity (90 percent) is used. A remainder of 0.16 mgd of capacity remains. Pipe flows and capacities are presented in Table 3.

## Future Flows

A comparison of future flows was also performed with large differences observed (see Table 4). The Conveyance study projects a future PWWF in the interceptor of 4.85 mgd while the SDMP estimates a PWWF of 1.86 mgd. The differences can be explained by the following:

- The SDMP uses the latest land use projections from the City that are more recent than those utilized in the Conveyance Study.
- The SDMP assumes existing I/I to remain the same while new development has a peak I/I factor of 400 gpad, a common value utilized by municipalities and sewer agencies that have standardized on contemporary sanitary sewer construction techniques.
- The Conveyance Study uses the aforementioned compounding peaking factor plus I/I factor methodology that overestimates the peak wet weather flow.

At future flow conditions, both the SDMP and the Conveyance Study project that the East Interceptor capacity will be exceeded. The SDMP estimates future PWWF to be 18 percent over capacity while the Conveyance Study estimates PWWF to be 209 percent over capacity.

## Conclusion

Based on the flows developed for the SDMP and slopes calculated through surveyed data, the East Interceptor does not appear to be at capacity in the current flow condition. Peak wet weather flows are estimated at 1.41 mgd with a capacity in the 12-inch pipeline of 1.57 mgd (90 percent capacity). There appears to be sufficient capacity available to allow for any development currently in progress. At the 2030 buildout condition, the East Interceptor is anticipated to convey flow in excess of its current capacity. To avoid capacity exceedances in the future condition, portions of the line will need to be expanded.

**Table 3 - East Interceptor Capacity**
**Sewage Disposal Master Plan**
**City of Oroville**

| | | | | | | TID Sanitary Sewer System Conveyance Study[1] | | | | | | | City Sewage Disposal Master Plan[2] | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Model Pipe ID** | **Model Upstream MHID** | **Model Downstream MHID** | **Diameter** | **Manning's n** | **Length** | **Upstream MH Invert[3]** | **Downstream MH Invert** | **Slope[4]** | **Capacity, Full Pipe** | **ADWF** | **PWWF[5]** | **q/Q** | **Upstream MH Invert** | **Downstream MH Invert** | **Slope** | **Capacity, Full Pipe** | **ADWF** | **PWWF[6]** | **q/Q** |
| | | | (Inches) | | (Feet) | (Feet) | (Feet) | (Ft/ft) | (mgd) | (mgd) | (mgd) | | (Feet) | (Feet) | (Ft/ft) | (mgd) | (mgd) | (mgd) | |
| SS-217_PP2 | SS-217 | PP2[7] | 10 | 0.013 | 23.24 | 229.09 | 229.19 | -0.00430 | --- | 0.25 | 1.24 | --- | 226.55 | 226.02 | 0.02277 | 2.14 | 0.25 | 0.83 | 0.39 |
| PP2_PP2A | PP2 | PP2A | 10 | 0.013 | 15.69 | 229.19 | 228.07 | 0.07136 | 3.78 | 0.25 | 1.24 | 0.33 | 226.02 | 225.94 | 0.00497 | 1.00 | 0.25 | 0.83 | 0.83 |
| PP2A_TID1623 | PP2A | TID1623 | 10 | 0.013 | 424.81 | 228.01 | 224.79 | 0.00758 | 1.23 | 0.26 | 1.27 | 1.03 | 225.94 | 224.79 | 0.00271 | 0.74 | 0.25 | 0.83 | 1.12 |
| TID1623_TID1624 | TID1623 | TID1624 | 10 | 0.013 | 364.35 | 224.79 | 223.54 | 0.00343 | 0.83 | 0.26 | 1.27 | 1.53 | 224.79 | 223.54 | 0.00344 | 0.83 | 0.26 | 0.86 | 1.03 |
| TID1624_TID1625 | TID1624 | TID1625 | 10 | 0.013 | 407.78 | 223.54 | 218.30 | 0.01285 | 1.61 | 0.26 | 1.27 | 0.79 | 223.54 | 222.50 | 0.00254 | 0.71 | 0.26 | 0.86 | 1.21 |
| TID1625_TID1627 | TID1625 | TID1627 | 10 | 0.013 | 282.95 | 218.30 | 213.41 | 0.01728 | 1.86 | 0.26 | 1.27 | 0.68 | 218.30 | 213.41 | 0.01731 | 1.86 | 0.26 | 0.87 | 0.46 |
| TID1627_TID1628 | TID1627 | TID1628 | 10 | 0.013 | 128.86 | 213.41 | 214.12 | -0.00551 | --- | 0.26 | 1.27 | --- | 213.41 | 214.12 | -0.00549 | --- | 0.26 | 0.87 | --- |
| TID1628_TID1630 | TID1628 | TID1630 | 10 | 0.013 | 185.38 | 214.12 | 212.45 | 0.00901 | 1.34 | 0.26 | 1.27 | 0.94 | 214.12 | 212.45 | 0.00896 | 1.34 | 0.26 | 0.87 | 0.65 |
| TID1630_TID1631 | TID1630 | TID1631 | 10 | 0.013 | 210.03 | 212.45 | 212.01 | 0.00209 | 0.65 | 0.26 | 1.27 | 1.96 | 212.45 | 212.01 | 0.00210 | 0.65 | 0.26 | 0.87 | 1.35 |
| TID1631_TID1635 | TID1631 | TID1635 | 10 | 0.013 | 492.66 | 212.01 | 209.19 | 0.00572 | 1.07 | 0.26 | 1.27 | 1.19 | 212.01 | 209.19 | 0.00572 | 1.07 | 0.26 | 0.88 | 0.82 |
| TID1635_TID1636 | TID1635 | TID1636 | 12 | 0.013 | 423.85 | 208.18 | 207.12 | 0.00250 | 1.15 | 0.26 | 1.34 | 1.16 | 208.18 | 207.31 | 0.00206 | 1.05 | 0.26 | 0.91 | 0.87 |
| TID1636_TID1637 | TID1636 | TID1637 | 12 | 0.013 | 308.02 | 207.12 | 206.08 | 0.00338 | 1.34 | 0.26 | 1.34 | 1.00 | 207.31 | 206.68 | 0.00205 | 1.04 | 0.27 | 0.91 | 0.87 |
| TID1637_TID1638 | TID1637 | TID1638 | 12 | 0.013 | 343.96 | 206.08 | 205.97 | 0.00032 | 0.41 | 0.26 | 1.34 | 3.25 | 206.68 | 205.97 | 0.00204 | 1.04 | 0.27 | 0.91 | 0.88 |
| TID1638_TID1644 | TID1638 | TID1644 | 12 | 0.013 | 289.94 | 201.18 | 200.22 | 0.00331 | 1.33 | 0.31 | 1.59 | 1.20 | 201.18 | 200.22 | 0.00333 | 1.33 | 0.31 | 1.10 | 0.83 |
| TID1644_TID1645 | TID1644 | TID1645 | 12 | 0.013 | 307.88 | 200.22 | 198.92 | 0.00422 | 1.50 | 0.31 | 1.59 | 1.06 | 200.22 | 198.92 | 0.00422 | 1.50 | 0.31 | 1.10 | 0.74 |
| TID1645_TID1646 | TID1645 | TID1646 | 12 | 0.013 | 235.85 | 198.92 | 197.93 | 0.00420 | 1.49 | 0.31 | 1.59 | 1.07 | 198.92 | 197.92 | 0.00422 | 1.50 | 0.31 | 1.11 | 0.74 |
| TID1646_TID1647 | TID1646 | TID1647 | 12 | 0.013 | 126.63 | 197.93 | 197.39 | 0.00426 | 1.50 | 0.31 | 1.59 | 1.06 | 197.92 | 197.39 | 0.00422 | 1.50 | 0.31 | 1.11 | 0.74 |
| TID1647_TID1655 | TID1647 | TID1655 | 12 | 0.013 | 397.79 | 193.35 | 192.57 | 0.00196 | 1.02 | 0.32 | 1.66 | 1.63 | 193.35 | 191.61 | 0.00437 | 1.52 | 0.31 | 1.15 | 0.75 |
| TID1655_TID1656 | TID1655 | TID1656 | 12 | 0.013 | 410.37 | 192.57 | 191.77 | 0.00195 | 1.02 | 0.32 | 1.66 | 1.63 | 191.61 | 188.31 | 0.00805 | 2.07 | 0.31 | 1.15 | 0.55 |
| TID1656_TID1376 | TID1656 | TID1376 | 12 | 0.013 | 437.51 | 191.77 | 190.92 | 0.00194 | 1.01 | 0.32 | 1.66 | 1.64 | 188.31 | 184.79 | 0.00805 | 2.07 | 0.31 | 1.14 | 0.55 |
| TID1376_TID3056 | TID1376 | TID3056 | 12 | 0.013 | 284.85 | 190.92 | 190.36 | 0.00197 | 1.02 | 0.32 | 1.66 | 1.63 | 184.79 | 182.49 | 0.00805 | 2.07 | 0.32 | 1.14 | 0.55 |
| TID3056_TID1375 | TID3056 | TID1375 | 12 | 0.013 | 33.89 | 190.36 | 190.30 | 0.00177 | 0.97 | 0.32 | 1.66 | 1.71 | 182.49 | 182.22 | 0.00806 | 2.07 | 0.32 | 1.16 | 0.56 |
| TID1375_TID1373 | TID1375 | TID1373 | 12 | 0.013 | 307.03 | 190.30 | 189.70 | 0.00195 | 1.02 | 0.32 | 1.66 | 1.63 | 182.22 | 179.75 | 0.00805 | 2.07 | 0.32 | 1.16 | 0.56 |
| TID1373_TID1371 | TID1373 | TID1371 | 12 | 0.013 | 288.94 | 189.70 | 189.14 | 0.00194 | 1.01 | 0.32 | 1.71 | 1.69 | 179.75 | 176.41 | 0.01157 | 2.48 | 0.32 | 1.21 | 0.49 |
| TID1371_TID1372 | TID1371 | TID1372 | 12 | 0.013 | 214.09 | 189.14 | 188.72 | 0.00196 | 1.02 | 0.34 | 1.81 | 1.77 | 176.41 | 175.25 | 0.00540 | 1.69 | 0.34 | 1.28 | 0.76 |
| TID1372_TID1748 | TID1372 | TID1748 | 12 | 0.013 | 316.69 | 188.72 | 188.10 | 0.00196 | 1.02 | 0.34 | 1.81 | 1.78 | 175.25 | 173.73 | 0.00480 | 1.60 | 0.34 | 1.28 | 0.80 |
| TID1748_TID1749 | TID1748 | TID1749 | 12 | 0.013 | 424.37 | 188.10 | 187.27 | 0.00196 | 1.02 | 0.34 | 1.81 | 1.78 | 173.73 | 171.77 | 0.00461 | 1.56 | 0.34 | 1.30 | 0.83 |
| TID1749_TID3 | TID1749 | TID3 | 12 | 0.013 | 163.50 | 187.27 | 186.95 | 0.00196 | 1.02 | 0.34 | 1.81 | 1.78 | 171.77 | 171.06 | 0.00435 | 1.52 | 0.34 | 1.30 | 0.85 |
| TID3_TID1750 | TID3 | TID1750 | 12 | 0.013 | 266.31 | 186.95 | 186.44 | 0.00192 | 1.01 | 0.34 | 1.81 | 1.80 | 171.06 | 169.90 | 0.00434 | 1.52 | 0.34 | 1.31 | 0.86 |
| TID1750_TID1751 | TID1750 | TID1751 | 12 | 0.013 | 446.28 | 186.44 | 185.56 | 0.00197 | 1.02 | 0.34 | 1.81 | 1.77 | 169.90 | 167.96 | 0.00435 | 1.52 | 0.34 | 1.31 | 0.86 |
| TID1751_TID1754 | TID1751 | TID1754 | 12 | 0.013 | 508.13 | 185.56 | 184.57 | 0.00195 | 1.02 | 0.35 | 1.91 | 1.88 | 167.96 | 165.85 | 0.00415 | 1.48 | 0.35 | 1.38 | 0.93 |
| TID1754_TID1755 | TID1754 | TID1755 | 12 | 0.013 | 499.43 | 184.57 | 183.60 | 0.00194 | 1.01 | 0.35 | 1.91 | 1.88 | 165.85 | 163.88 | 0.00396 | 1.45 | 0.35 | 1.39 | 0.96 |
| TID1755_TID1756 | TID1755 | TID1756 | 12 | 0.013 | 348.39 | 183.60 | 182.92 | 0.00195 | 1.02 | 0.35 | 1.91 | 1.88 | 163.88 | 162.78 | 0.00313 | 1.29 | 0.35 | 1.40 | 1.09 |
| TID1756_TID1757 | TID1756 | TID1757 | 12 | 0.013 | 296.62 | 182.92 | 182.34 | 0.00196 | 1.02 | 0.35 | 1.91 | 1.88 | 162.78 | 161.52 | 0.00428 | 1.51 | 0.35 | 1.40 | 0.93 |
| TID1757_TID1848 | TID1757 | TID1848 | 12 | 0.013 | 405.27 | 182.34 | 182.34 | 0.00000 | 1.02 | 0.35 | 1.91 | 1.88 | 161.52 | 159.73 | 0.00440 | 1.53 | 0.35 | 1.41 | 0.92 |
| TID1848_TID1760 | TID1848 | TID1760 | 12 | 0.013 | 371.15 | 182.34 | 182.34 | 0.00000 | 1.02 | 0.35 | 1.91 | 1.88 | 159.73 | 158.10 | 0.00441 | 1.53 | 0.35 | 1.41 | 0.92 |
| TID1760_TID1762 | TID1760 | TID1762 | 12 | 0.013 | 114.08 | 182.34 | 182.34 | 0.00001 | 1.02 | 0.36 | 1.93 | 1.90 | 158.10 | 157.60 | 0.00440 | 1.53 | 0.36 | 1.42 | 0.93 |
| TID1762_TID1763 | TID1762 | TID1763 | 12 | 0.013 | 309.05 | 182.34 | 182.33 | 0.00000 | 1.02 | 0.36 | 1.93 | 1.90 | 157.60 | 156.15 | 0.00468 | 1.58 | 0.36 | 1.42 | 0.90 |
| TID1763_SCOR15 | TID1763 | SCOR15[8] | 12 | 0.013 | 452.21 | 182.33 | 182.33 | 0.00000 | 1.02 | 0.36 | 1.93 | 1.90 | 156.15 | 154.03 | 0.00467 | 1.57 | 0.36 | 1.41 | 0.90 |

Notes:
(1) TID Sanitary Sewer System Conveyance Study by Northstar Engineering (April 2007)
(2) Based on survey by Northstar Engineering. Invert and rim elevations from GIS database (pre October 2007) and 10/29/07 survey. Survey data available for 28 of 40 manholes. The remaining 12 inverts were interpolated.
(3) All elevations in NAVD 88 vertical datum
(4) Slopes may not match Conveyance Study exactly.
(5) PWWF = Peak Wet Weather Flow = ADWF x PF + I/I. PF = 4.7 and I/I factor estimated at 650 gpd per acre.
(6) PWWF = Flow from City's hydraulic model for 10-Year, 24-Hour Design Storm.
(7) 5th and Grand meter = PP2 (City), 1378 (TID)
(8) Connection to SC-OR West Interceptor = SCOR15 (City), 1744 (TID), W004 (SC-OR West Interceptor Phase II Study)

| Table 4 | Future Flow Comparison<br>Sewage Disposal Master Plan<br>City of Oroville | |
|---|---|---|
| **Flow Type** | **TID Conveyance Study[1]** | **City SDMP** |
| <u>City of Oroville</u> | | |
| ADWF[2] (mgd)[3] | N/A | 0.40 |
| PWWF[4] (mgd) | 2.42[5] | 1.10[6] |
| <u>City & TID Combined[7]</u> | | |
| ADWF (mgd) | N/A | 0.61 |
| PWWF (mgd) | 4.85 | 1.86 |
| Interceptor Capacity Exceeded[8] | Yes | Yes |
| Percent of Capacity | 309% | 118% |

Notes:

1. Full Build-Out condition
2. ADWF = Average Dry Weather Flow.
3. mgd = million gallons per day.
4. PWWF = Peak Wet Weather Flow.
5. $PWWF_{TID}$ = ADWF x PF + I/I. PF = 4.0 - 4.7 and I/I estimated at 650 gpd per acre.
6. $PWWF_{City}$ = 10-Year, 24-Hour Design Storm at PDWF. Based on wet weather calibration to City's temporary flow monitoring program and permanent meter data (5th and Grand).
7. Location: Prior to entering SC-OR's West Interceptor on Oroville Dam Blvd.
8. Existing interceptor capacity estimated at 1.57 mgd.