

TR 1960

August 25, 2006

1887.01

**FILE COPY  
RECEIVED**

JAN 19 2007

COUNTY OF SHASTA  
PERMIT COUNTER

Mark Rychik  
Romar Homes Inc.  
18540 Bywood Drive  
Cottonwood, CA 96022

Subject: CSA 17 Improvements to Provide Service to the Proposed Locust Road Development

PACE Civil Inc. has completed its impact study of the proposed 300-unit Locust Road Development on Shasta County Service Area No. 17 (CSA 17) sewage collection and treatment system.

The study included the following tasks:

- The existing collection system was entered into a computer model using the original CH2MHill design plans to determine the individual sewer capacities based upon diameter and slope.
- Design criteria was established based upon the peak wet weather flow with a possible 20-year reoccurrence as estimated from the record plant flow of December 31, 2005.
- The capacity of the existing Black Lane Service Area was compared to the anticipated peak wet weather flow of the existing connections, and as the service area is developed with Panorama Estates, pre-paid connections, and Locust Road Development.
- The Wastewater Treatment Plant (WWTP) existing influent and proposed flows were compared to the existing design hydraulic and treatment capacities.

This report summarizes the study findings and provides a project cost estimate for the potential improvements.

### **BLACK LANE SEWER SERVICE AREA**

The CSA 17 collection system delivers sewage to the Black Lane and Main Pump Stations, which pump all sewage to the WWTP. The Black Lane Pump Station Service Area receives most of the sewage east of Locust Road, and the Main Pump Station Service Area pumps the remainder of the sewage – See Figure 1. The existing

392-acre Black Lane Service Area includes an estimated 120 existing and 132 pre-paid connections.

The original CH2MHill design plans were used to determine the sewer capacities of the Black Lane Service Area as shown on Figure 2. No record drawings were available. Sewers installed at different slopes to those shown on the design plans would result in different capacities of the sewers to what was estimated. In addition, the exiting sewers may have root intrusions or grease obstructions, which would reduce the estimated capacities. No allowances were made for these possibilities in the analysis. Cleaning, TV inspection, and invert measurements of the sewers is recommended to verify the capacities. Field measurements to determine the condition of the existing sewers and pump station capacity were beyond the scope of this study.

## DESIGN CRITERIA

The Cottonwood Wastewater Treatment Plant had an Average Dry Weather Flow (ADWF) of 0.26 MGD in 2005. CSA 17 has established a total of 1,322 existing Household Equivalents (HEs) (Gehres, 2006), thus the ADWF/HE is 200 GPD. This value is similar to the estimate of 220 GPD/HE derived in the 1996 Capacity Study prepared by Shasta County.

An HE in the Black Lane Pump Station collection system is estimated to be 260 GPD/HE. This is estimated from the 120 HEs in the service area and an ADWF of 0.031 MGD based on pump run times and an estimated 150 GPM pump capacity. The County's 1996 Capacity Study perhaps incorrectly cites a design capacity of 300 GPM, which must be with the two pumps added. Confirmation of the pump station firm capacity (one pump in operation) needs to be done.

The higher gallons per HE may be due to the Anderson Cottonwood Irrigation District canal, which raises the groundwater table during the summer, and thereby adds a summer inflow and infiltration (I&I) component. The summer I&I component has also been observed in the service areas adjacent to the ACID Canal in the City of Anderson. There is also the possibility that residents in this portion of the collection system simply produce more wastewater.

On December 31, 2005, the Cottonwood WWTP had a Peak Wet Weather Flow (PWWF) of "1.24 MGD" – See Figure 3. The influent channel screen may cause the influent flow meter to read high until it is activated, thus, the PWWF may have been 1.14 MGD. The ratio of PWWF/ADWF is 4.8 (1.24/0.26). Based upon this ratio, the Black Lane Service Area would have a PWWF of 0.15 MGD, which equates to 103 GPM. CSA 17 operators do not recall ever seeing a two pump run simultaneously at the Black Lane Pump Station. However, Figure 3 does appear to indicate a total of four pumps in operation on December 31st, which equates to two large pumps operating at the Main Pump Station and two pumps operating at the Black Lane Pump Station.

$$1.14 \text{ MGD} = 800 \text{ GPM} - 2 \times 250 \text{ GPM [Main Pump Station]} - 2 \times 150 \text{ GPM [Black Lane Pump Station]}$$

There were no pump run hours recorded for the larger pumps at the Main Pump Station; therefore it appears that two pumps were in operation at Black Lane Pump Station. When the two large pumps are in operation at the Main Pump Station, headloss increases in the common force main leading into the WWTP, which appears to drive the Black Lane Pump Station pumps back to delivering only 100 GPM per pump – See Figure 3.

Based upon an ADWF of 0.26 MGD and a PWWF of 1.24 MGD, CSA 17 would have an I&I rate of 880 GPD/Acre. The initial I&I rate for Panorama Estates and the proposed Locust Road Development with the new sewer system is based upon 400 GPD/Acre. The initial I&I rate typically increase over time when the system develops leaks and the I&I rate can increase to a high of 1,500 GPD.

The original sewer collection and pump station facilities were designed and constructed to accommodate the connections that were sold. This preliminary analysis suggests that the Black Lane Pump Station is operating beyond its firm pumping capacity of only one pump in operation. The Black Lane Pump Station appears to be running on two pumps during peak wet weather conditions. This finding needs to be investigated further and then if confirmed the pumps need to be upgraded to accommodate the existing and proposed flows.

## PROPOSED DEVELOPMENTS

Romar Homes is proposing to construct 60 homes on 40 acres in Panorama Estates and 300 homes on 60 acres in the Locust Road Development. The Locust Road Development will have a high density of 5 units per acre compared to Panorama Estates at 1.5 units per acre. Changing the housing density will alter the estimates contained herein.

Based upon the design criteria established, Panorama Estates and Locust Road Development could potentially quadruple the number of active HEs in the Black Lane Service Area from 120 to 480. Panorama Estates and Locust Road Development could eventually contribute an ADWF of 0.07 to 0.09 MGD and a PWWF of 0.2 to 0.3 MGD, respectively to the PWWF, depending on an I&I addition of 600 to 1,500 GPD/Acre as summarized below in Table 1.

**Table 1  
CSA 17 & Black Lane Service Area  
Existing & Proposed HE, ADWF & PWWF**

Service Area	Household Equivalents (HEs)	ADWF (MGD)	PWWF (MGD)
CSA 17 WWTP Design Capacity at ADWF = 200 GPD/HE	2,150	0.43	1.32
Existing CSA 17	1308	0.26	1.24
Existing Black Lane Service Area	120	0.04	0.2-0.3
Prepaid Black Lane Service Area	132	0.04	See Above
Panorama Estates	60	0.01	0.04-0.09
Locust Road Development	300	0.06	0.16-0.23
Existing Black Lane Service Area, all Black Lane Service Area pre-paid HEs, and Panorama & Locust Road Developments, and I&I at 400 to 1,500 GPD/Acre	612	0.15	0.5-1.0
Future CSA 17 with existing & pre-paid BLSA HEs, Panorama Estates and Locust Road Developments	1,800	0.4	1.7-2.6

Breakdowns of the existing and future flow estimates per sub-service area (B1-B7) are summarized in Table 2 and shown on Figure 2. PWWFs are given for: A) Existing HEs; B) Existing HEs plus Panorama Estates; C) Existing HEs, Panorama Estates, and all pre-paid HEs; D) Existing HEs, Panorama Estates, all pre-paid HEs, and Locust Road Development with I&I at 400 GPD/Acre; and, E) Existing HEs, Panorama Estates, all pre-paid HEs, and Locust Road Development with I&I at a worst case scenario of 1,500 GPD/Acre.

Existing service areas (B1 – B7) contribute flows that accumulate to an estimated existing PWWF of approximately 150 GPM, which could exceed the estimated capacity of one pump at the Black Lane Pump Station. The capacity of one pump at is dependent upon the number of pumps running at the Main Pump Station. The more pumps operating at the Main Pump Station increases head loss on the combined force main entering the WWTP, which pushes the pumps back on their operating curve.

## COLLECTION SYSTEM CAPACITY

Initially there is enough remaining capacity in the Black Lane Service Area sewer mains to accommodate flows from Panorama Estates and Locust Road Development. However, assuming that all of the pre-sold connections eventually connect and that over time, the I&I rate increases from roughly 400 GPD/Acre to 1,500 GPD/Acre, the analysis suggests that with the inclusion of the Locust Road Development the sewer mains will eventually be at or slightly beyond capacity. Analysis suggests that this excess loading on the sewers would result in a surcharge of the sewers.

The ultimate demand analysis "E" includes flow from sewer connections that have been pre-paid. If these connections are excluded from the analysis, then there appears to be enough capacity with a small safety margin remaining in the sewers to the Black Lane Pump Station. Ultimate build out of the properties within the existing service area is not included in this study. Instead, only the existing HEs, pre-paid HEs, and proposed development HEs were considered to be contributory to the sewage flow. Additional growth in the Black Lane Service Area will require the paralleling of some sewers and possibly further improvement of the Black Lane Pump Station to accommodate future growth in the area with or with the addition of the Locust Road Development.

A review of the water treatment plant's flow records suggest that the Black Lane Lift Station is operating beyond its firm capacity with both pumps in operation – See Figure 3. At a minimum, the pumps at the Black Lane Pump Station should be upgraded if the County elects to allow the Locust Road Development to connect to the collection system. Furthermore, if allowed to connect to the collection system, 400-feet of 8-inch sewer on Black Lane west of the Pump Station will have to be paralleled with 400-feet of minimum 10-inch, or replaced with minimum 12-inch sewer to accommodate higher flows from the development. A cost analysis estimating the costs to improve the pump station and install the parallel sewer main is shown on Table 3. Note that the analysis assumes that there is enough room in the existing pump station to accommodate the new, larger pumps.

The 6-inch force main from the Black Lane Pump Station to the Wastewater Treatment Facility can accommodate the combined flows from the existing HEs, Panorama Estates, and the proposed Locust Road Development with existing I&I rates. However, should I&I increase to an average of 1,500 GPD/Acre, or a significant number of pre-paid connections hookup to the system, then larger pumps will be required and the force main would have substantial headloss associated with the higher flows. The 6-inch force main would then have to be paralleled or replaced with a larger pipe.

## **COTTONWOOD WWTP CAPACITY**

With Panorama Estates, Locust Road Development, and all the pre-paid connections added, the combined ADWF will be increased to approximately 0.4 MGD, which is just below the design ADWF of 0.43 MGD. The existing PWWF of 1.24 MGD would increase to 1.7 to 2.6 MGD, depending on I&I rates, which is substantially above the design PWWF of 1.32 MGD. The Cottonwood WWTP will have to be expanded to process the PWWF, perhaps through the addition of a 1.5 MG flow equalization basin with return pump station.

There may also be additional improvements required by the California Regional Water Quality Control Board in order to allow expansion of the facilities. Growth impact from areas west of I-5 has not been included in this analysis.

## **FACILITIES EXPANSION COSTS**

Improvements to the Black Lane Service Area Collection System will include approximately 400 feet of 10-inch sewer replacement at an estimated cost of \$125,000. The Black Lane Pump Station needs to have two new pumps and potentially a larger electrical service panel and emergency generator. The pump station modifications are estimated to cost approximately \$156,000, depending on the required improvements.

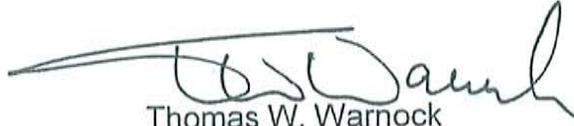
Improvements at the Cottonwood WWTP to accommodate PWWF include a 1.5 MG Emergency Retention Basin and ERB Return Pump Station. The ERB will require a double liner to meet CVRWQCB requirements and costs approximately \$914,000. The ERB Return Pump Station will return stored sewage to the headworks. The ERB will need to have provisions for floating surface aerators to reduce the potential for odors. The ERB Return Pump Station will cost approximately \$781,000.

The project construction cost estimate is summarized in Table 3. The total project cost is estimated at \$2,000,000, based upon other similar public works projects constructed in the north state. The construction cost estimate does not include indirect costs for ROW acquisition or easements. The construction cost estimate is for construction in 2006. Construction costs have taken major increases due to materials availability and unstable oil prices. For example, PVC pipe prices spiked 40% in 2005, due to Hurricane Katrina. Other materials are being impacted as well, including cement, copper, ductile pipe, and all products that are used in construction of water and wastewater facilities.

Shasta County Department of Public Works participated in a discussion of this project with the Developer and PACE on June 21, 2006. This report attempts to address the issues that were discussed at that meeting, and now needs to be reviewed and commented on by all parties. A copy has been forwarded to Shasta County DPW to

facilitate the process. Please feel free to contact us if you have any questions or comments.

Sincerely,

A handwritten signature in black ink, appearing to read "T. Warnock". The signature is fluid and cursive, with a long horizontal stroke extending to the left.

Thomas W. Warnock  
Principal Engineer

TWW  
Enclosures  
c/enc: Pat Minturn, Shasta County DPW  
M:\Jobs\1887.01\Word Documents\Sewer System Requirements.doc

TABLE 1

COUNTY SERVICE AREA NO. 17

COTTONWOOD WASTEWATER TREATMENT PLANT  
 ADDITION OF PANORAMA ESTATES & LOCUST ROAD DEVELOPMENTS TO BLACK LANE PUMP STATION

JOB NO.: 1887.01  
 DATE: 8/24/06  
 BY: TWW

DESIGN CRITERIA	
Average Dry Weather Flow Per HE (GPD/HE) <sup>(1)</sup>	200
ADWF (MGD)	0.26
ADWF Peaking Factor <sup>(3)</sup>	2.3
Peak Wet Weather Flow (MGD)	1.24
BLPS HE ADWF Factor <sup>(6)</sup>	1.30
Max Day III (GPD/Acre)	400
PWWF/ADWF <sup>(2)</sup>	4.8
PWWF/AWWF	2.6

Service Area <sup>(6)</sup>	HEs Paid Not		Sq.Ft.	Acres
	Exist HEs	Connected <sup>(5)</sup>		
B1	42	9	1,089,221	25.0
B2	26	7	2,830,484	65.0
B3	3	4	476,590	10.9
B4	19	51	3,672,987	84.3
B5	2		188,305	4.3
B6	10	35	4,411,579	101
B7	18	26	4,402,088	101
<b>TOTALS</b>	<b>120</b>	<b>132</b>	<b>17,071,254</b>	<b>392</b>

PANORAMA ESTATES & LOCUST ROAD DEVELOPMENTS			
Service Area	Proposed HEs	Sq.Ft.	Acres
LOCUST ROAD	300	2613600	60
PANORAMA ESTATES	60	1742400	40
<b>TOTAL</b>	<b>480</b>		<b>492</b>

ADWF (GPD)	EXISTING		A' PWWF (GPM)	B' PWWF (GPM)	C' PWWF (GPM)	D' PWWF (GPM)	E' PWWF (GPM)
	Peak ADWF (GPD)	PWWF (GPD)					
10,920	25,116	29,322	20	20	23	23	42
6,760	15,548	37,952	26	26	29	29	78
780	1,794	5,756	4	4	5	5	14
4,940	11,362	42,468	29	29	46	46	110
520	1,196	2,649	2	2	2	2	5
2,600	5,980	45,110	31	31	43	43	120
4,680	10,764	48,703	34	34	42	42	119
<b>31,200</b>	<b>71,760</b>	<b>211,961</b>	<b>147</b>	<b>147</b>	<b>189</b>	<b>189</b>	<b>489</b>

ADWF (GPD)	PROPOSED		A' PWWF (GPM)	B' PWWF (GPM)	C' PWWF (GPM)	D' PWWF (GPM)	E' PWWF (GPM)
	Peak ADWF (GPD)	PWWF (GPD)					
60,000	138,000	162,000				113	158
12,000	27,600	43,600		30	30	30	61
<b>103,200</b>	<b>237,360</b>	<b>417,561</b>	<b>147</b>	<b>177</b>	<b>220</b>	<b>332</b>	<b>708</b>

- Notes:
1. COLUMN DESCRIPTIONS  
 A Existing collection system flows.  
 B Existing collection system flows plus Panorama Estates flow  
 C Existing collection system flows, Panorama Estates, and all pre-paid HEs.  
 D Existing collection system flows, Panorama Estates, all pre-paid HEs, Locust Road Development, and I&I at 400 GPD  
 E Existing collection system flows, Panorama Estates, all pre-paid HEs, Locust Road Development, and I&I at 1,500 GPD
  2. This peaking factor is based on Treatment Plant flows from late December 2005
  3. Estimate based established peaking factors and confirmed by CSA 17 PDWF/ADWF data
  4. The Black Lane Pump Station collection system's ADWF is 300 GPD/HE. Therefore a 1.5 multiplier is required to the HE from 200 GPD to concur with existing data.
  5. These are connections that were sold when the collection system was built, but they have not yet been installed.
  6. See Figure 2 for Service Area locations.
  7. This is an HE for the entire CSA 17 collection system.

**TABLE 3**  
**ROMAR HOMES - LOCUST ROAD DEVELOPMENT**  
**PRELIMINARY COST ESTIMATE FOR SEWER COLLECTION & TREATMENT<sup>(1, 2, 3, 4)</sup>**

ITEM NO.	DESCRIPTION	AMOUNT	UNITS	COST PER UNIT	TOTAL COST <sup>(5)</sup>
<b>COLLECTION SYSTEM IMPROVEMENTS</b>					
1	PUMP STATION & EMERGENCY POWER	1	LS	\$100,000	\$100,000
2	12-INCH SEWER	400	FT	\$200	\$80,000
<b>COTTONWOOD WWTP IMPROVEMENTS</b>					
3	1.5 MG EMERGENCY RETENTION BASIN				
a.	Excavation	10,200	CY	\$20	\$204,000
b.	Clay Liner	2700	CY	\$80	\$216,000
c.	Shotcrete Liner	900	CY	\$100	\$90,000
d.	Floating Surface Aerators	2	EA	\$5,000	\$10,000
e.	Aggregate Base Perimeter Road	100	CY	\$50	\$5,000
f.	Electrical	1	LS	\$20,000	\$20,000
g.	Piping	1	LS	\$40,000	\$40,000
	<b>Subtotal</b>				<b>\$585,000</b>
4	ERB RETURN PUMP STATION	1	LS	\$500,000	\$500,000
<b>SUB TOTAL</b>					<b>\$1,265,000</b>
<b>CONTINGENCY (25%)</b>					<b>\$316,300</b>
<b>ENGINEERING (25%)</b>					<b>\$395,300</b>
<b>ESTIMATED TOTAL PROJECT COST</b>					<b>\$1,976,600</b>

NOTES:  
<sup>(1)</sup> THIS ESTIMATE ASSUMES CONSTRUCTION WILL BE AT PREVAILING WAGE RATE FOR PUBLIC WORKS PROJECTS.  
<sup>(2)</sup> ASSUMES THERE IS ENOUGH LAND TO ADD IMPROVEMENTS AT BLACK LANE & WWTP.  
<sup>(3)</sup> COSTS FOR GRAVITY MAINS INTEGRAL TO THE DEVELOPMENT ARE NOT INCLUDED.  
<sup>(4)</sup> ASSUMES THAT THE CAPACITY OF THE EXISTING WASTEWATER TREATMENT PLANT WILL BE AVAILABLE TO THE DEVELOPMENT  
<sup>(5)</sup> COSTS BASED UPON CONSTRUCTION IN AUGUST 2006. ALLOWANCES FOR INFLATION SHOULD BE INCLUDED BASED UPON WHEN PROJECT IS CONSTRUCTED.