BRAEMAR RANCH

SEWER EXTENSION FEASIBILITY FINAL REPORT

CITY OF SANTA BARBARA

January 5, 2007

CLIENT: **City of Santa Barbara**

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WORK ORDER NO.: **16743.01**

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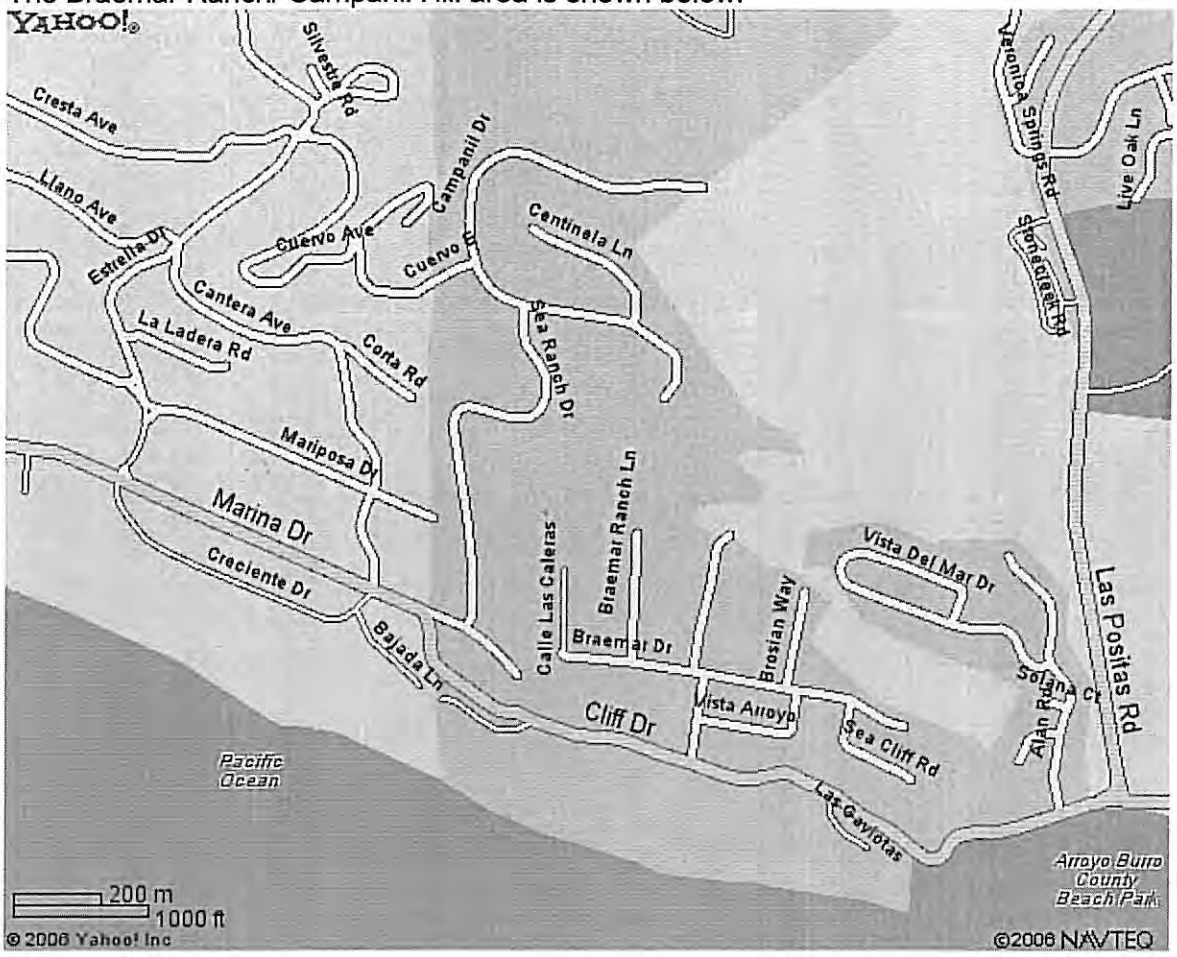
INTRODUCTION AND SCOPE OF STUDY

The City of Santa Barbara is considering a sewer extension project for the Braemar Ranch area. Funding for this study has been provided by the County of Santa Barbara, Public Health Department Environmental Services Division. The Braemar Ranch/Campanil Hill residential community is located mostly in the City of Santa Barbara. Thirteen parcels within Braemar Ranch are located in the unincorporated area of Santa Barbara County.

Portions of the Braemar Ranch/Campanil Hill area are currently served by the City sewer system. Certain parcels within this area could be served by the exiting City sewer mains without modifications to the sewer collection system. The remaining parcels are unable to be served by the existing sewer mains and would need a sewer main extension in order to be served.

The primary purpose of this project is to identify feasible options for the sewer main extension to serve as many parcels, in and out of the City limits. The City would also like to avoid constructing public sewers within private property and would like to realign existing sewer mains currently located within easements. This report describes the recommended improvements as well as alternative concepts to achieve the City's goals. Additionally, a preliminary construction cost estimate and costs per benefiting parcel are included.

The Braemar Ranch/ Campanil Hill area is shown below.



In summary, the recommended system includes public 8-inch diameter gravity sewer mains connecting to the existing sewer collection system. Approximately 9,505 feet of 8-inch diameter gravity sewer main would be required with 2,860 feet of 3-inch diameter force main. The existing building sewers would connect to the public sewer with private gravity sewer laterals if conditions permit, or use private pumping systems. The City's existing Braemar Lift Station would receive flow from the area and has sufficient capacity to convey the sewage to the wastewater treatment plant.

The estimated cost of design, public agency approvals, and construction of the public sewer extension is approximately $4,365,280 dollars. The cost for easements and any environmental mitigation cannot be estimated at this time but would need to be included in the final project budget. The cost to fund the public sewer main extension, abandon the existing septic systems, and install private sewer facilities is expected to range between $51,243 and $75,243 per participating residence depending on the extent of improvements required on private property to connect to the public sewer main, the need for pump facilities, and if an out of agency service agreement is required.

EXISTING CONDITIONS

Exhibit 1, at the back of this report, includes an overview of existing conditions. A portion of the Braemar Ranch community is currently served by the City's sewer collection system which gravity flows to the Braemar Lift Station. The sewer collection system consists of 8-inch VCP and PVC sewer mains built between 1950 and 1970 at depths ranging from 6 to 20 feet. The pipe slopes range between 0.4% to 27.5% due to the substantial elevation changes in Braemar Ranch.

The lift station is located at the corner of Cliff Drive and Alan Road. It pumps flow from Braemar Ranch and some of the surrounding communities using two (2) 1000 gallon per minute (GPM) pumps. The lift station currently transfers an average of approximately 277,700 gallons per day (GPD) and has a maximum capacity of 2.88 million gallons per day (MGD). The pump records and the existing sewer flow rate calculations are included in Appendix A.

An existing gravity sewer located in Sea Ranch Road was constructed in the 1960's, but was never connected to the existing sewage collection system. The sewer is an 8-inch VCP with an approximate slope of 13%. City staff performed a video inspection in April 2006 to assess the condition of the sewer. The inspection revealed root penetration, cracking and a gap between pipes at one location. This segment of sewer would require rehabilitation.

There are three segments of sewer main located within easements on private property that the City would like to abandon. The first sewer main crosses private property (APN 047-110-001) and connects Campanil Drive to a main that flows to Vista Del Mar Drive. The second connects Vista Arroyo with Cliff Drive. And the third sewer main connects the north end of Brosian Way to Vista Del Mar. In order to accomplish abandonment, new mains would be required in Campanil Drive and Vista Arroyo to reverse the direction of flow. The new sewers would connect to mains in Sea Ranch Road and Yankee Farm Road. Additionally a new sewer main at the north end of Brosian Way would redirect the flow from the sewer mains on private property around to Cliff Drive.

One parcel located at the corner of Cliff Drive and Sea Ledge Lane recently completed a temporary connection to the City's sewer. A private pump station and force lateral delivers sewage to an existing manhole in Braemar Drive. The force lateral crosses private property in order to access the existing sewer collection system.

This study addresses 120 parcels in the study area that are not currently served by a permanent connection to the City's sewer system. Up to 27 of these could potentially be served by the existing system. An extension of the sewer system is expected to be necessary to serve the remaining 93, and potentially some of the 27 mentioned above. Some parcels that would be served by the extension are outside the City limits and service would be linked to annexation under current City policy.

SURVEY INFORMATION

A survey of the existing road centerline and specific sewer manholes was completed in June 2006 for the following areas in Braemar Ranch:

- Cliff Drive from the existing sewer manhole MH-B11-017 to Yankee Farm Road
- Braemar Drive near Calle Las Caleras
- Sea Cliff Road
- Braemar Drive from the existing sewer cleanout CO-B11-002 to the Santa Barbara City limit

Exhibit 2 shows the spot elevations and manhole information (NAVD88) that were surveyed and used to verify the existing Braemar Ranch topographic information. The spot elevations were used to determine the depth of the proposed sewer pipe while the sewer inverts were used to approximate the pipe slope. The data confirms that the proposed gravity sewers would have a slope greater than 0.4% with a maximum depth of 15 feet and therefore are feasible at the areas of concern.

SEWER EXTENSION ALTERNATIVES

A conceptual sewer main extension exhibit was provided by City staff. It identified parcels currently served by the existing sewer, parcels which could be served by the existing sewer and parcels that could be served with a sewer main extension. Exhibit 1 includes parcels in the area that are both in and out of the City limits.

The following is a list of design criteria used to determine the feasibility of the project:

- Slope greater than 0.4% for gravity sewers
- Depth less than 15 feet for sewer extensions
- Depth less than 25 feet for sewer rerouting
- Less than 75% of full capacity for existing and proposed peak flow in sewers
- Existing and proposed combined flow to lift station less than lift station capacity

Additionally, the City and homeowners based on the cost of the project will determine if the project is feasible.

Up to 101 parcels will benefit from extending the sewer collection system. There are several possible sewer routes and the area has been subdivided into the sewer

extension segments listed in Table 1. See Appendix C pages 1 and 2 for the Pipe Lengths by Area Table used to calculate the values in Table 1. Exhibit 1 shows the parcels in each category, the existing sewer mains, and the proposed sewer main routes with approximate inverts at the back of this report.

Table 1- Sewer Extension Segments

Sewer Label	Sewer Extension Location	Gravity or Force [5]	Approximate Length (ft) [1]	Additional Number of Parcels Served
A1	Cliff Drive	Gravity	855	1
	Private Drive	Gravity	980	8
A2	Cliff Drive	Gravity	1320	19
B	Yankee Farm Road	Gravity	900	6
C	Calle Las Caleras	Gravity	830	8
D	Sea Ranch Road	Gravity	1105	11
D1 [2]	Marina Drive & Braemar	Gravity	735 [2]	5
D2 [2]	Marina Drive & Cliff	Gravity	930 [2]	5
D3 [2]	Marina Drive & Cliff	Gravity	745 [2]	5
D4 [2]	Marina Drive & Cliff	Gravity	1365 [2]	5
E	Sea Cliff	Gravity	780	3
F1	Braemar Drive	Force	950	11
F2	Sea Cliff	Force	460	5
G	Sea Ledge Lane	Force	1450	8
H	Sea Ranch Road	Gravity	1907 [3]	16
J	Campinil Drive & Sea Ranch Road	Gravity	740	[4]
K	Vista Arroyo	Gravity	1020	[4]
L	Brosian Way	Gravity	230	[4]
Subtotal for Areas A1 through E- Gravity Mains			7515	61
Subtotal for Area H- Rehabilitation Only			1907	16
Subtotal for Areas F1 through G- Force Mains			2860	24
Subtotal for Areas J through L- Rerouting			1990	[4]
Subtotal for Areas A1 through E and J through L			9505	61

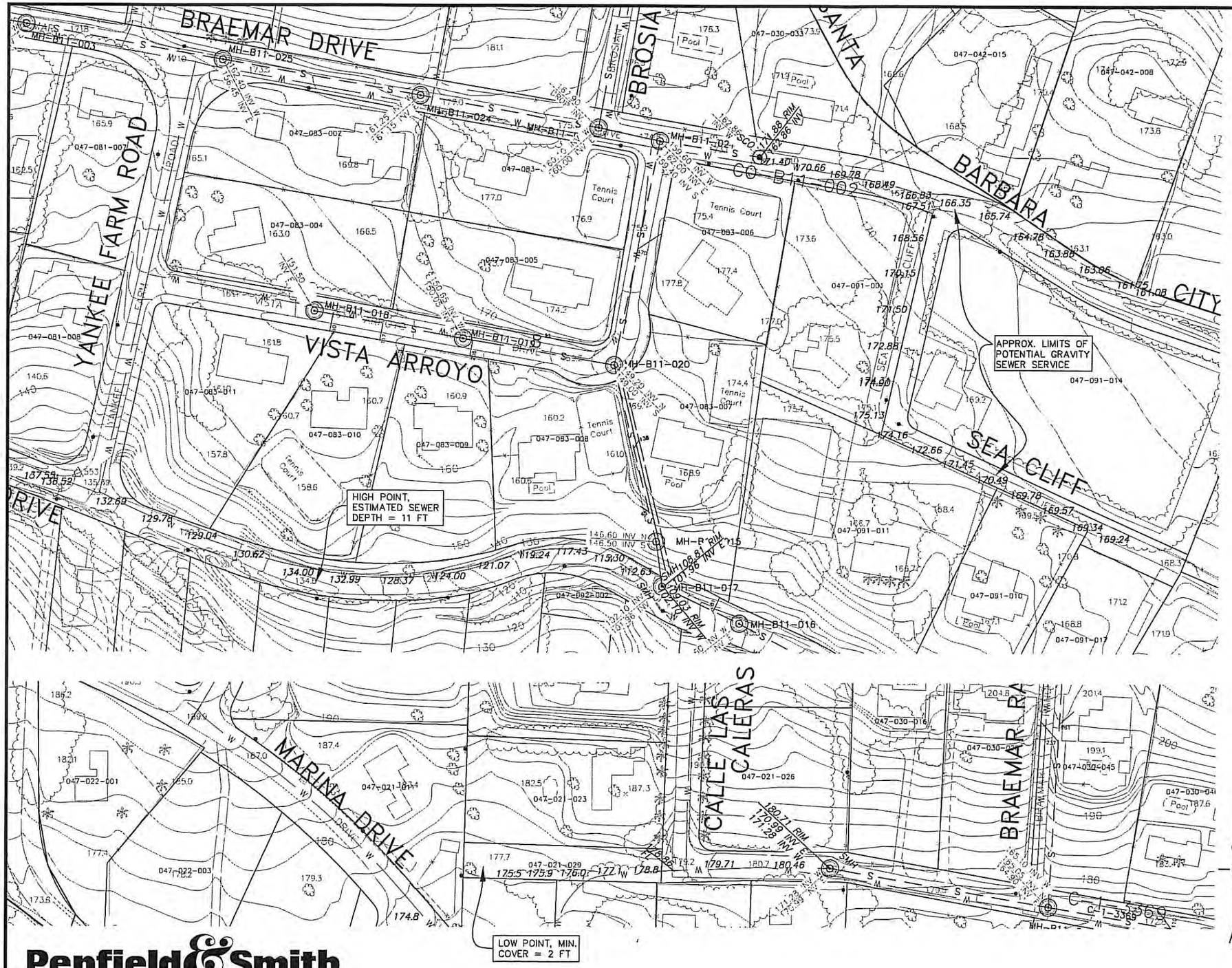
Notes:
1. The approximate lengths are not field measurements. These lengths are based on the proposed slope and horizontal length from Exhibit 1. See Appendix C pages 1 and 2.
2. D3 is the preferred option; D1, D2, and D4 are not included in the subtotals.
3. Existing sewer main not in service; requires some rehabilitation.
4. Sewer main realignment; no additional parcels served.
5. All new gravity mains and rerouted mains are 8" HDPE; all force mains are 3" HDPE.

Sewer Extension Descriptions

Sewer A1 & A2

Sewer A1 will serve ten parcels along a private road off Cliff Drive south of Yankee Farm Road. An easement would be required and the sewer main in Cliff Drive would need to be extended to Yankee Farm Road.

Sewer A2 will serve an additional nineteen parcels and would extend in Cliff Drive between Yankee Farm Road and approximately 200 feet west of Sea Ledge Lane.



LEGEND

--S--	EXISTING SEWER MAIN
—W—	EXISTING CITY WATER MAIN
130.50 INV W / 130.30 INV E	EXISTING SEWER MAIN INVERTS
◎	EXISTING SEWER MANHOLE
169.34	EXISTING STREET CENTERLINE SPOT ELEVATIONS

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SANTA BARBARA	CAMARILLO SANTA MARIA	LANCASTER
16743.01	16743S1.dwg	1"=150'

SURVEY INFORMATION
BRAEMAR RANCH
SEWER EXTENSION FEASIBILITY
CITY OF SANTA BARBARA

EXHIBIT 2

Sewer B

Sewer B is located in Yankee Farm Road and will serve six parcels. This portion of Yankee Farm Road is private and an easement will be required. Sewer B would tie into the existing Braemar Drive sewer and no additional extension would be required.

Sewer C

Sewer C is located in Calle Las Caleras and would serve ten parcels. The sewer would connect to the existing system in the east side of Braemar Drive. No additional extension would be required.

Sewer D

Sewer D is located in Sea Ranch Road and would serve eleven parcels. In order to connect to the existing system, a main would be necessary between Sewer D and either Sewer C or Sewer A2. There are four options for this as described below and shown on Exhibit 3. Each option varies on which parcels could potentially have a gravity connection. If a gravity connection is not probable then an individual pump and force main is needed.

Option 1

Sewer D1 could serve parcel 5 by gravity while the other four parcels would require individual force laterals. In addition, D1 requires an easement across private property. The easement would be approximately 380 feet long across APN 047-021-011 and APN 047-021-029 which is the longest easement and it crosses the lower portion of the property. It would connect to Sewer C in Braemar Road before connecting to the existing system.

Option 2

Another route to connect Sewer D is also through private property (D2). It follows the property line on APN 047-022-003 with an approximate 320 foot easement and connects to Sewer A2 before connecting to the existing sewer system. D2 would serve parcels 1, 2, 3, and 4 by gravity connections, but parcel 5 would require an individual force lateral.

Option 3- Preferred Option

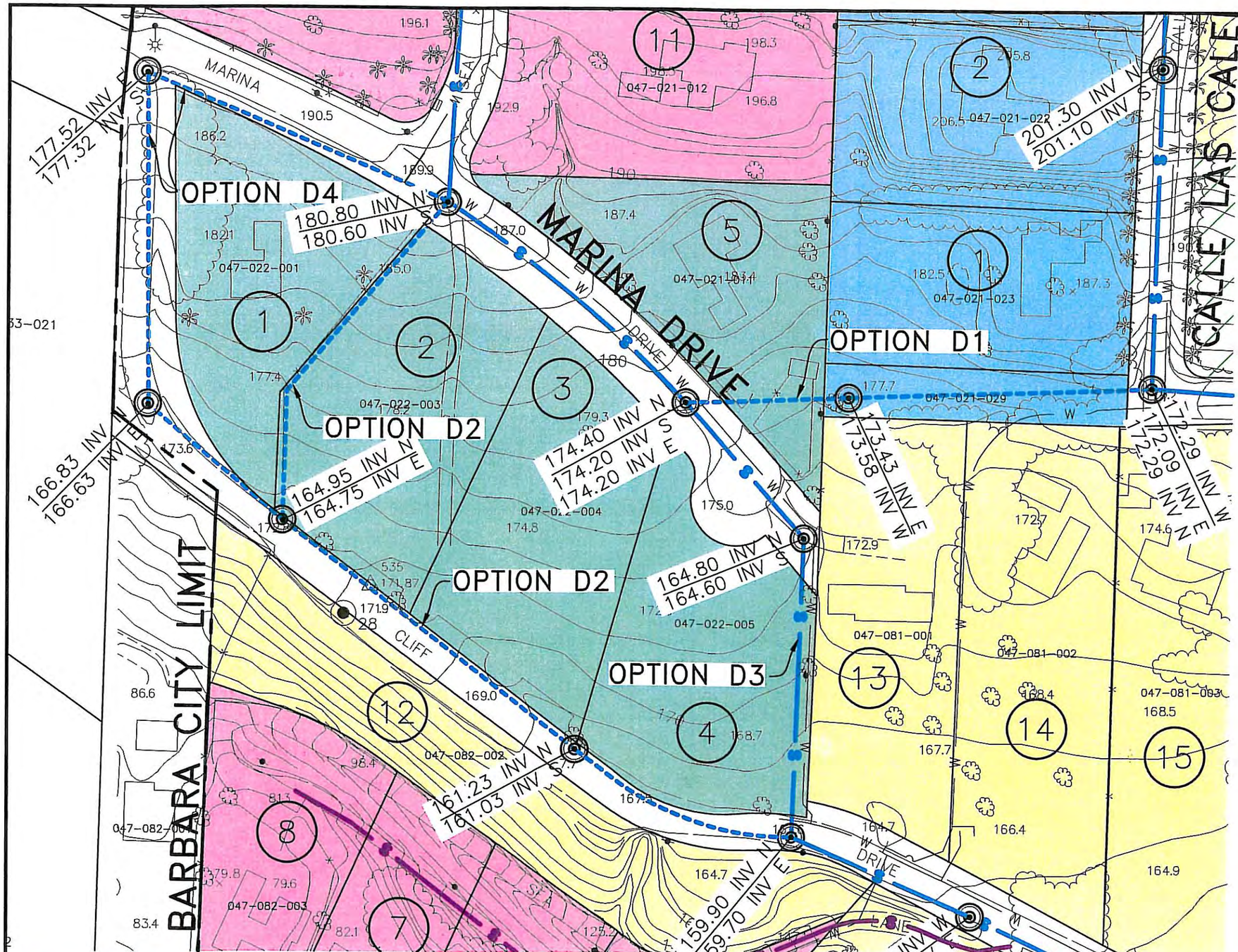
The third route to connect Sewer D to the proposed sewer main on Cliff Drive is also through private property (D3). It follows the property line on APN 047-022-005 with an approximate 220 foot long easement. This is the best easement option since the sewer main could potentially be located in an existing utility easement along the property line and it is the shortest. D3 would connect to Sewer A2 before connecting to the existing sewer system. Parcels 4 and 5 are capable of a gravity connection to the sewer main.

Option 4

The fourth option is to route the sewer in the public road right-of-way westerly along Marina Drive to Cliff Drive and connect to Sewer A2. Sewer D4 would serve parcels 1, 2, 3, and 4 with gravity connections and connect to Sewer A. The approximate length would be 1365 feet.

Sewer E

Sewer E is in Sea Cliff Drive and would serve 3 parcels. It would connect to the existing system at the east end of Braemar Drive.



LEGEND

- PROPOSED SEWER MAIN EXTENSION– GRAVITY
- PROPOSED SEWER MAIN EXTENSION– GRAVITY MAIN ALTERNATIVE
- MAIN PROPOSED SEWER MAIN EXTENSION– FORCEMAIN
- —W— EXISTING CITY WATER MAIN
- 130.50 INV W / 130.30 INV E — PROPOSED SEWER MAIN EXTENSION INVERTS
- PROPOSED SEWER MANHOLE
- (1) AREA PARCEL COUNT

N

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16743.01 16743S1.dwg 1"=100'

MARINA DRIVE EASEMENT OPTIONS
BRAEMAR RANCH
SEWER EXTENSION FEASIBILITY
CITY OF SANTA BARBARA

EXHIBIT 3

Sewer F1 & F2
Sewer F1 would be a low pressure sewer force main located at the east end of Braemar Drive. It would serve eleven parcels. It would connect to the gravity system at Sewer E. Sewer F2 would be located in Sea Cliff. It would serve five parcels and would also be a low pressure sewer force main. It would also connect to the gravity system at Sewer E.

Sewer G
Sewer G is located in Sea Ledge Lane and would serve eight parcels. The parcels in this area are all below Cliff Drive, necessitating a pumping system. There are several options including private pump stations and laterals for each parcel, private pump stations and a low pressure force main, or a combination of private pump stations with force laterals and gravity laterals to a pump station that would pump sewage via a force main to Sewer A. Pump station ownership and benefits are discussed in *Pump Station Ownership* below.

Sewer H
Sewer H is an existing sewer in Sea Ranch Road that is currently not connected to the existing sewer system. The pipe has suitable slopes, inverts, and capacity to be included in the sewer main extension project and connected to the sewer collection system. The video inspection information and capacity calculation are included in Appendix B and Appendix C pages 3, 4, and 5 respectively. After review of the inspection video, it appears that the sewer can be used with some rehabilitation. This sewer would serve sixteen parcels. It would connect to Sewer D, D1/D2/D3 or D4 and A2 and A1 before connecting to the existing system.

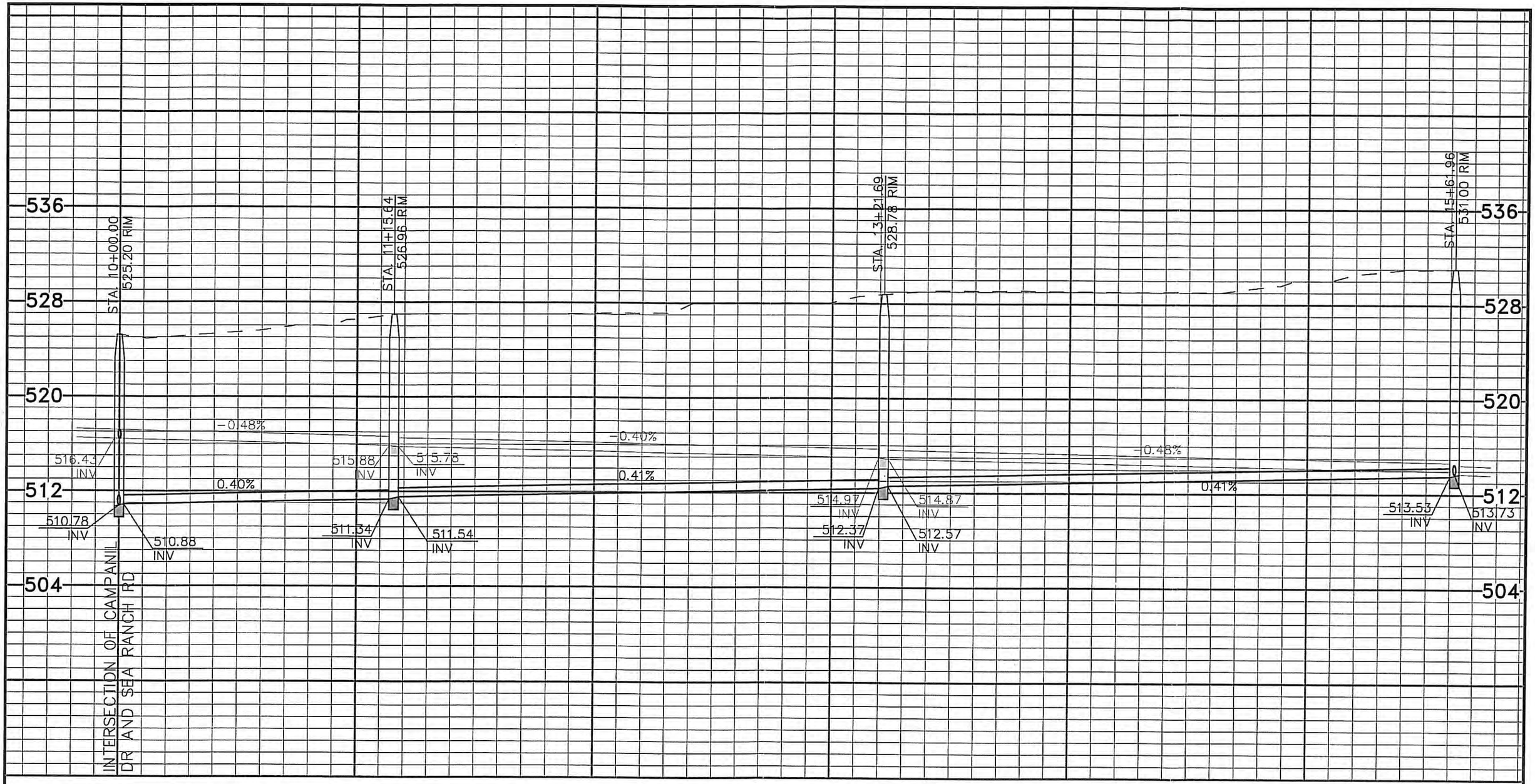
Sewer J
Sewer J would be used to redirect Campanil Hill area flow from an existing sewer in an easement to Sewer H. See Exhibit 4 for the proposed profile. It would then connect to Sewer D, D1/D2/D3 and A2 and A1 before connecting to the existing system.

Sewer K
Sewer K on Vista Arroyo would be used to redirect flow from an existing sewer in an easement to Sewer A1. See Exhibit 5 for the proposed profile. The existing sewer within the easement would be abandoned.

Sewer L
Sewer L is a sewer main realignment that would eliminate the sewer main in the easement connecting the upper end of Brosian Way with Vista del Mar and redirecting the flow into the existing Brosian Way sewer.

Gravity Lateral Connections
If an existing house is sufficiently uphill from the main, a standard 4-inch gravity sewer lateral would be required. The proposed laterals would connect to the existing house laterals upstream of the existing septic tank and connect to the public sewer mains.

Force Laterals
If the existing house lateral is at an elevation below the sewer main or if existing improvements preclude a gravity pipeline route, then an individual pump station and force lateral is required. The force lateral would connect to a low pressure sewer force main or connect directly to a gravity sewer main. See Appendix D for information on the individual pump stations.



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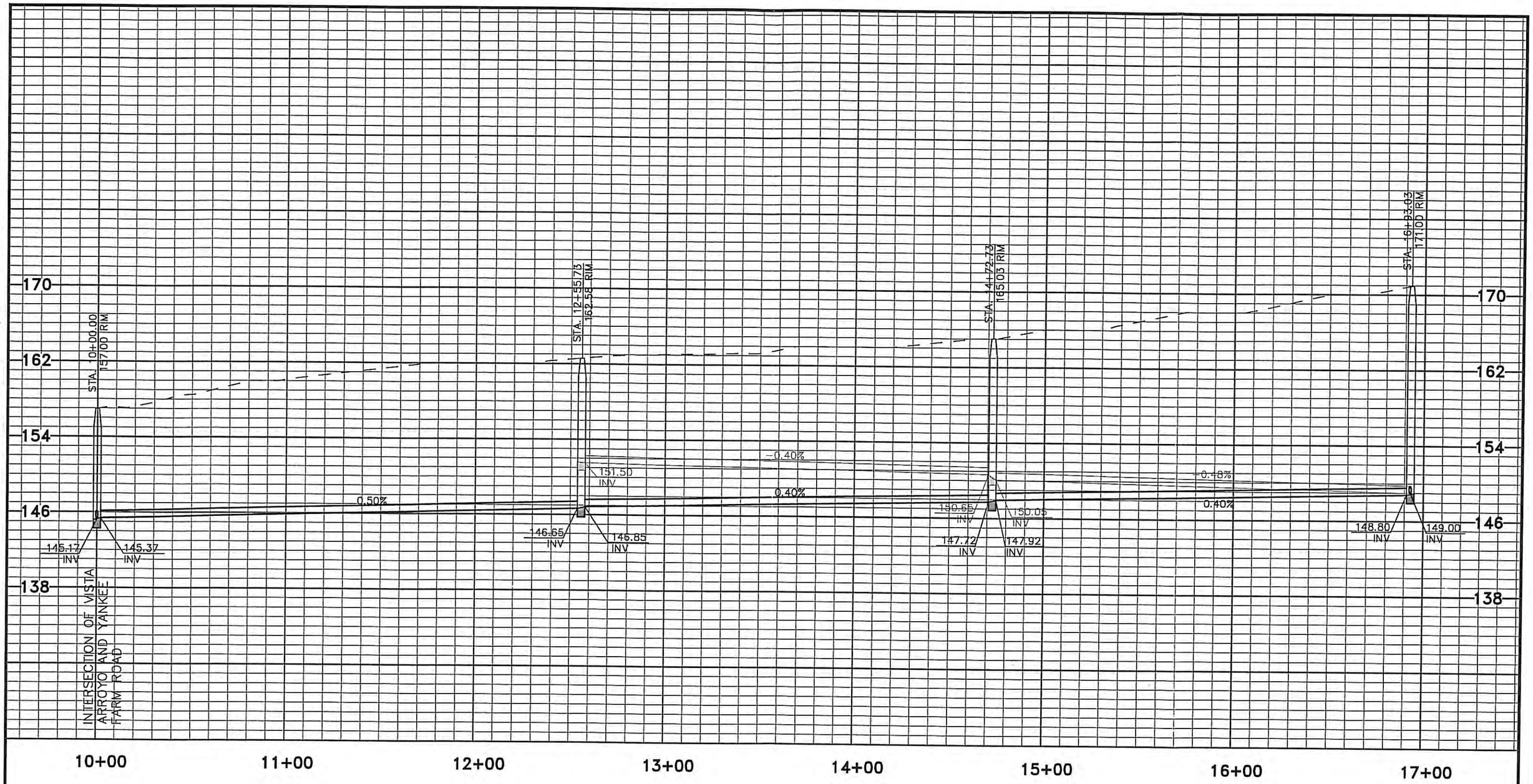
SANTA BARBARA CAMARILLO SANTA MARIA LANCASTER
16743.01 16743S1.dwg VERTICAL: 1"=8' HORIZONTAL: 1"=40'

CAMPANIL DRIVE NEAR SEA RANCH ROAD
BRAEMAR RANCH/ CAMPANIL HILL
SEWER EXTENSION FEASIBILITY
CITY OF SANTA BARBARA

EXHIBIT 4



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SANTA BARBARA CAMARILLO SANTA MARIA LANCASTER
16743.01 16743S1.dwg VERTICAL: 1"=10' HORIZONTAL: 1"=50'

PROPOSED SEWER AT VISTA ARROYO
BRAEMAR RANCH/ CAMPANIL HILL
SEWER EXTENSION FEASIBILITY
CITY OF SANTA BARBARA

EXHIBIT 5

ESTIMATED SEWAGE FLOW RATES

The City is in the process of developing a sewer collection model using an average daily demand of 1,200 gallons per day (GPD) per acre. An initial estimate of the additional flows to the sewer system was made using this demand rate. This value is much higher than the average value for a single family residential parcel and higher than typical values used by other sanitation districts in the area. The typical values range between 300 and 350 GPD per acre, based on an average number of people per single family unit.

Peak flow rates are typically estimated using a peaking factor between 2 and 3. Using the Braemar Lift Station information, the peaking factor for this project was calculated to be 2.5. See Appendix C, page 6 for the peaking factor calculations.

The total flow for all the additional parcels to be served by the sewer main extension using the criteria described above yields an average flow of 88,447 GPD. The peak of the additional flow is 154 GPM. See Appendix C, page 7 for calculations.

BRAEMAR PUMP STATION

The lift station currently pumps an average of approximately 277,700 gallons per day (GPD), based on the peak month, and has a maximum capacity of 2.88 million gallons per day (MGD); see Appendix A. The average pumping rate for the peak month was calculated based on the hours of operation between meter readings for each of the two 1,000 gpm pumps divided by the number of days in that time period.

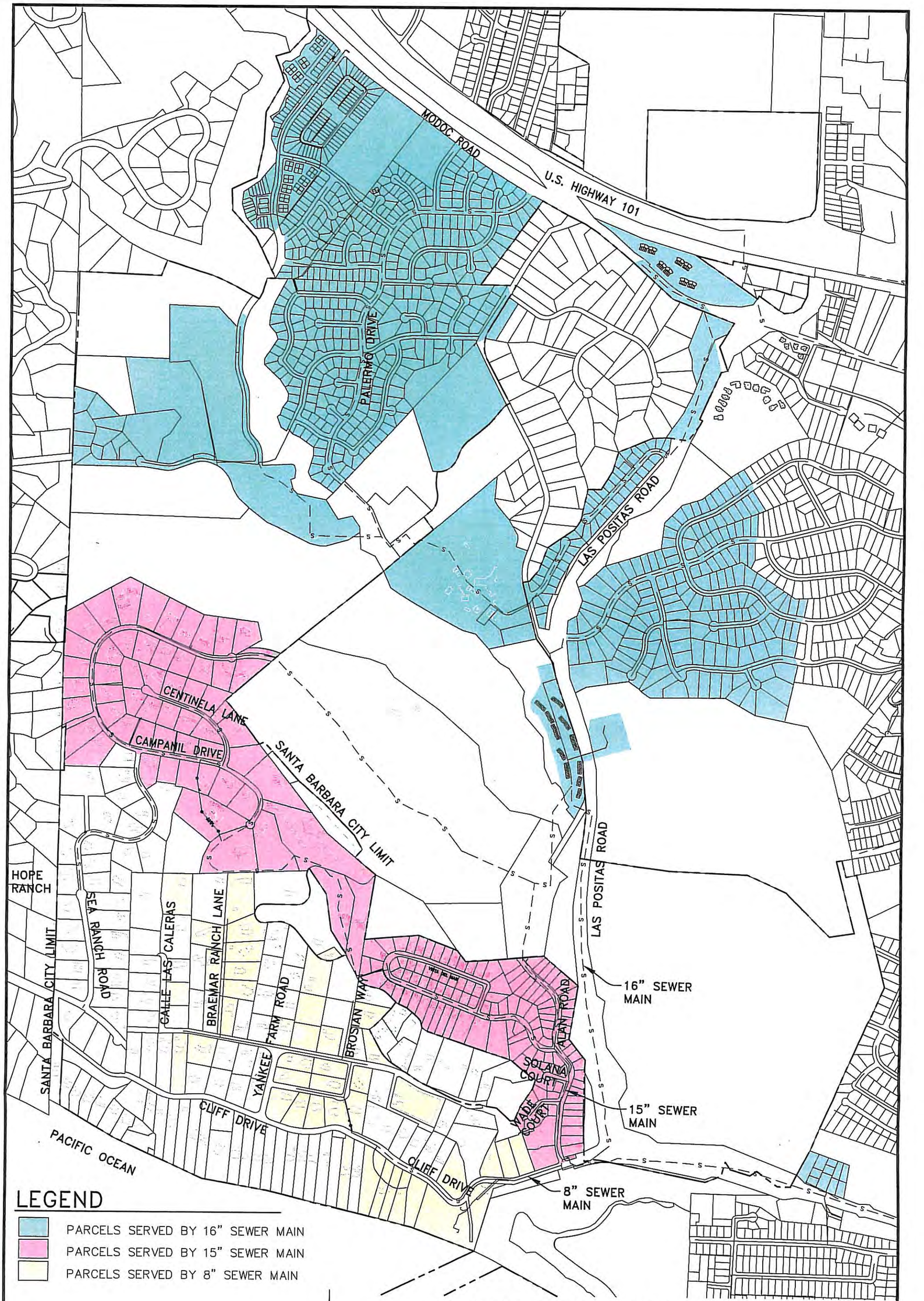
A 15-inch gravity main delivers sewage to the Braemar Lift Station. An 8-inch pipe collects flow from the Braemar/ Campanil areas, a 15-inch pipe collects flow from the Braemar Park and Vista Del Mar areas, and a newer 16-inch pipe that comes from Las Positas Road all deliver flow to the 15-inch pipe that leads to the Braemar Lift Station. The discharge pipe is a 10-inch force main.

Existing Conditions

The existing flows in the 16-inch, 15-inch, and 8-inch pipes were estimated by using a ratio of parcel area to the total pump station flow rate. Approximately 327 acres contribute to the 16-inch pipe, 138 acres contribute to the 15-inch pipe, and 63 acres contribute to the 8-inch pipe for a total of 528 acres. Therefore, approximately 11.8% of the existing collection area flows through the 8-inch pipe. Since the average existing flow to the pump station is 277,700 GPD, approximately 32,888 GPD is collected via the 8-inch pipe. The 528 acres is based on the actual area of the parcels that currently contribute to the lift station, see Exhibit 6 for a map of the existing areas that contribute to each pipe.

Proposed Conditions

The contributing areas increase for the 8-inch sewer, but decrease for the 15-inch sewer. The 15" pipe will have a decrease of 37,824 GPD and the 8-inch pipe will have an increase of 91,023 GPD in addition to the 37,824 GPD due to pipe re-routing. The total increase to the pump station will be 91,023 GPD. See Exhibit 7 for a map of the contributing area for each pipe.



EXISTING PARCELS FLOWING TO LIFT STATION
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SEWER FEASIBILITY
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EXHIBIT 6

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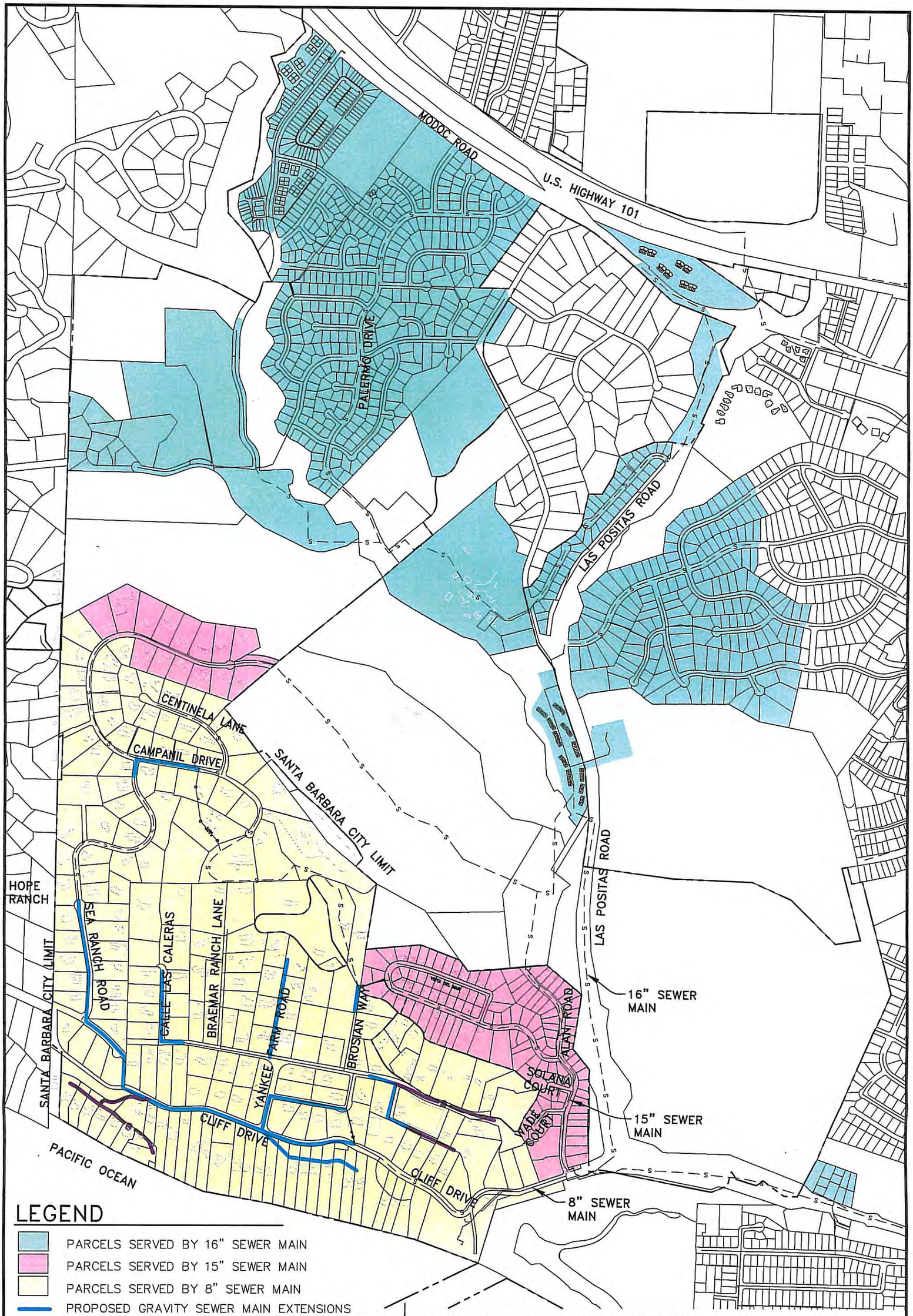

LEGEND

- PARCELS SERVED BY 16" SEWER MAIN
- PARCELS SERVED BY 15" SEWER MAIN
- PARCELS SERVED BY 8" SEWER MAIN
- PROPOSED GRAVITY SEWER MAIN EXTENSIONS
- PROPOSED SEWER FORCE MAIN EXTENSIONS

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PROPOSED PARCELS FLOWING TO LIFT STATION
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EXHIBIT 7

The existing and proposed flow rates, including the rerouting of sewer mains, for the 8-inch pipe near the pump station, are estimated at 161,734 GPD. (The 8-inch flow calculation is before combining and increasing to a 15-inch pipe.) The peak flow rate is 281 GPM. Based on the record drawings of the sewer, the pipe slope is 0.004.The pipe would be flowing about 69% full. See Appendix C, page 8 Pipe Hydraulic Calculations for reference.

Based on the total existing collection area of approximately 528 acres and the existing sewage flow to the pump station, the average daily demand is 525.67 GPD/acre. See Appendix C, page 9 for the demand calculation. This is much lower than the City's original estimated daily demand of 1,200 GPD/acre. A demand factor of 530 GPD/ac was used in the table below.

Including the additional flow from the parcels that would be served by the sewer main extension, the lift station would pump an average of 368,723 GPD which is 33% more than existing. If both pumps can be used to meet the peak flow, the lift station would be at 32% capacity. However, the station capacity would be 64% if only one 1000 gpm pump is required to handle the peak flow. A follow up study of the lift station would need to be performed to determine the impact of future growth. See the table below and in Appendix C, Page 9 for the existing and proposed areas and flows that each pipe collects.

Table 2- Areas and Flows

	Area (AC)	% of Total Area	Average Daily Flow[1] (GPD)	Average Flow (GPM)	Peak Flow[2] (GPM)
Existing Conditions					
Parcels Contributing to 16" Pipe	327.29	62.0%	172,045	119	299
Parcels Contributing to 15" Pipe	138.43	26.2%	72,767	51	126
Parcels Contributing to 8" Pipe	62.56	11.8%	32,888	23	57
Total Existing	**528.28**	**100.0%**	**277,700**	**193**	**482**
Additional Parcels					
Parcels Contributing to 16" Pipe	-	-	-	-	-
Parcels Contributing to 15" Pipe	-	-	-	-	-
Parcels Contributing to 8" Pipe	171.74	100.0%	91,023	61	154
Total Additional Parcels	**171.74**	**100.0%**	**91,023**	**61**	**154**
Pipe Rerouting					
Parcels Contributing to 16" Pipe	-	-	-	-	-
Parcels Contributing to 15" Pipe	**-71.37**	-	**-37,824**	**-26**	**-66**
Parcels Contributing to 8" Pipe	**71.37**	-	**37,824**	**26**	**66**
Total Existing + Proposed	**700.02**	-	**368,723**	**256**	**640**
Total Contributing to 16" Pipe	**327.29**	-	**172,045**	**119**	**299**
Total Contributing to 15" Pipe	**67.06**	-	**34,943**	**24**	**61**
Total Contributing to 8" Pipe	**305.67**	-	**161,734**	**112**	**281**

[1] For Existing Conditions: Average Flow calculated based on known pump station average daily flow; for Proposed Conditions, Average Flow based on 530 GPD/AC.
[2] Peaking Factor = 2.5

RESIDENTIAL CONNECTION ALTERNATIVES

The goal of the private property improvements is to convey the sewage from the existing residence to a collector system in an adjacent access road. A gravity sewer lateral is preferred, but a pumping system can accomplish the goal where conditions do not permit gravity laterals.

One of the primary factors that influence the available options for sewage conveyance from private properties is the elevation difference between the residence and the adjacent sewer main. Another factor is the location of the existing building sewer and

septic tank. In order to avoid major modifications to the existing house plumbing, the new sewer connection would be located upstream of the existing septic tank.

The elevation difference between the residences and adjacent sewers were reviewed. Based on the elevations, it is likely that some of the properties will be able to construct simple gravity laterals. For those homes where gravity conditions exist, the lateral piping would be 4-inch diameter PVC in accordance with City standards and the Uniform Plumbing Code (UPC).

The majority of the parcels proposed to be served by the sewer expansion project can drain by gravity. However, due to topographic conditions, a gravity system is not feasible for all parcels. There are three areas that may require pumping systems in order to be served by the sewer collection system:

- Area F1- East end of Braemar Drive for parcels outside City limits: 11 parcels
- Areas E and F2- Sea Cliff: 8 parcels
- Area G- Sea Ledge Lane: 8 parcels

The alternatives for these areas are divided into the following categories and are discussed below:

- Private Laterals and Private Pump Stations
- Public Pump Stations
- Low Pressure Force Main
- Gravity Flow vs. Pumping

Private Laterals and Private Pump Stations

Pumping systems considered by P&S to be appropriate candidates for this project include the following:

- Individual pumping systems for raw sewage (grinder pumps)
- Private shared pumping systems

An illustration of a typical individual pump system is shown in Appendix D.

A typical individual pump station installation would include construction of a 4-inch diameter pipe upstream of the existing septic tank to a pump basin. Sewage would drain to the basin and be pumped out. The pumped sewage would either discharge into a public main via a 1-1/2-inch or 2-inch diameter force lateral or into a public force main that would connect to the gravity system, as discussed below.

A possible alternative to individual pumps for those properties requiring pumps would include several properties conveying their sewage to a shared pumping facility, either by way of a private gravity collection system or by private force lateral. Minimizing the number of pumping units is desirable from an overall reliability and maintenance perspective. However, shared facilities between private property owners requires use and maintenance agreements, potential easement dedications, provisions to share power costs and overcoming difficulties during emergencies such as power outage or mechanical failure. In addition, it is possible that all property owners may not be motivated or required to abandon their septic tanks and connect to the public system at the same time. Some owners may not recognize the need or desire to participate in constructing a pumping system until the time they proceed with abandonment of their septic system. For these reasons alone, shared private systems are not recommended.

The best alternative for pumping sewage from the individual properties is the use of private individual packaged pump units. The size of the pump basin can be designed to provide one to two days emergency storage volume for events such as a power outage or mechanical problem. Each parcel could have their own individual force lateral to discharge into the public gravity main. The force laterals could be grouped together in one trench or installed individually as connections are necessary.

Public Pump Stations

The operation and maintenance challenges of shared pump units could be reduced if the City assumed the responsibility for such activities. Common concerns associated with sewer pump stations include potential noise, odor emissions and visual impacts. The use of submersible pumps in a packaged pump station would eliminate noise concerns and visual impacts would be addressed by the use of buried facilities and landscaping. Potential odor emission could be addressed by careful design of sewers, access facilities and vent piping. However, some of the parcels within the areas requiring pumping would still require an individual pump station to pump the sewage up to the central pump station wet well.

The public pump station would be owned and operated by the City, and responsibility for the pump station would not be shared by property owners. The property owners would connect to the pump station by gravity or force laterals as needed and no additional coordination between neighbors would be necessary. A disadvantage is that the City would likely have to obtain easements to construct and maintain the pump station. Also, the City would have to maintain the station which would increase the overall operation costs of the City's wastewater system.

Low Pressure Force Main

Another option for parcels needing a pump system to connect to the gravity system is to have a low pressure force main. The laterals connecting to the low pressure force main would have a check valve to prohibit sewage from flowing back to the residence. The

force main would tie into a gravity sewer manhole and then flow via gravity through the collection system.

The main advantage of this type of main is that it resembles a typical sewer layout. There would be only one force main in the street instead of many smaller force laterals. The disadvantage of this type of main is that it may fall under City ownership, requiring City operation and maintenance of the force main.

Choice between Gravity and Force Lateral Options

Six parcels, along Sea Cliff Road, in which the City designated as potentially served by the existing sewer, have the option of either a gravity lateral or a pumping system. The gravity lateral would descend the steep slope at the back of the properties and connect to the existing sewer main on Cliff Drive as the City had proposed. The 4-inch diameter gravity laterals could either be directionally drilled or be placed above ground. A standard trench installation is not feasible due to the steep slope.

One property in that area (APN 047-091-035) currently is connected to the sewer on Cliff Drive via an aboveground gravity pipe. Before construction there was concern about disturbing the greenery or "scarring" the slope causing a visual disturbance. During construction some of the natural vegetation had to be removed to place the pipe but quickly grew back. The area has now recovered and there is no evidence that there is a pipe descending the slope.

The 4-inch diameter aboveground pipe would follow the topographic conditions of the slope which may not allow for a continuous slope. Also, the slope of the pipe would be much greater than the City's standard.

Directional drilling the gravity lateral is less disturbing than the aboveground option. No vegetation would be removed and each lateral would be in place within a few hours. However, similar to the above ground option, the gravity sewer lateral would have a very steep slope.

COST ESTIMATES

This section describes the costs associated with the implementation of this project, including construction costs. It should be recognized that there would be additional costs for work items and tasks that cannot be reasonably estimated at this time. Examples of such items are environmental impact mitigation and obtaining easements from property owners. Costs may be analyzed based on the following categories:

1. Capital costs for the public improvements. These costs would be shared by each benefiting parcel.
2. Costs to the homeowners, per participating parcel, for private facilities and hook-up fees. These costs would be paid at the time a connection is made to the public system.

It is recommended that the City make an initial assessment of project feasibility and possible funding alternatives based on the costs presented herein and an allowance for the items that cannot be quantified. If the project is deemed appropriate and feasible,

subsequent work efforts can be designed to quantify and refine the overall project budget.

Public Sewer System Extension

The costs presented for the public improvements are based on discussions with local contractors and the experience of P&S. A significant contingency is appropriate at this level of design. During the final design and public review phase of the project, unknown conditions and additional work items are typically identified that impact the project cost. In addition, costs for the following items or issues could be significant but cannot be estimated at this time:

- Easements at Private Property for Sewers
- Archaeological, Biological and other Environmental Impact Mitigation

The preliminary cost estimate was prepared for assessing project feasibility and defining subsequent work tasks.

Table 3- Public Sewer Extension

DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST
Mobilization/ Traffic Control	LS	1	$150,000.00	$150,000
8" Dia. HDPE Gravity Sewer Main [1] (≤8' deep)	LF	5,850	$175.00	$1,023,750
8" Dia. HDPE Gravity Sewer Main [1] (>8'≤15' deep)	LF	2,760	$225.00	$621,000
8" Dia. HDPE Gravity Sewer Main [1] (>15' deep)	LF	895	$275.00	$246,125
8" Dia. Sewer Main Rehabilitation (Sea Ranch Road)	LF	1907	$80.00	$152,560
3" Dia. HDPE Force main (3 ft deep)	LF	2,860	$80.00	$228,800
Maintenance Holes (MH)	EA	37	$8,000.00	$296,000
Resolution of Utility Conflicts	LS	1	$10,000.00	$10,000
SUBTOTAL				**$2,728,335**
25% CONTINGENCY				$682,060
20% ENGINEERING/ AGENCY APPROVALS ALLOWANCE [2]				$545,650
15% CONSTRUCTION ADMINISTRATION				$409,235
EASEMENTS/ ENVIRONMENTAL MITIGATION				Not estimated
TOTAL FOR ALL ITEMS				**$4,365,280**

[1] Includes all other work not shown below.
[2] The extent of reviews, annexation process, and bidding support is unknown at this time.

Up to 101 parcels will benefit from extending the sewer collection system. The cost per benefiting parcel for the public portion of the project would be approximately $43,220. The desire to go forward with the gravity only portion because of property owner cooperation, special permitting issues, or annexation issues potentially associated with the pumping areas (F1, F2, and G) would have a budget amount of $3,999,260.

Private Property Improvements

The cost to abandon the existing septic systems and connect to a public sewer would vary substantially depending on the specific circumstances at each property. Each owner must assess the topographic conditions at their site and the extent of existing improvements that would be disturbed by construction. The following cost estimates are

based on "best case" and "worst case" scenarios. It may be possible for the homeowners to utilize this information to estimate the magnitude of costs for improvements at their property. These costs would be paid at the time the homeowner connects to the public system. Also included in each scenario is the share of the public main extension per participating parcel which incorporates the applicable fees and permits.

Work on Private Property - "Best Case"

DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST
Septic Tank Pumping / Abandonment	LS	1	$2,000.00	$2,000
4" Dia. PVC Gravity Sewer Lateral	LF	50	$50.00	$2,500
Piping Connections, Cleanouts, Misc. Plumbing	LS	1	$500.00	$500
City Sewer Buy-in Fee	LS	1	$1,418	$1,418
SUBTOTAL				**$6,418**
25% CONTINGENCY				$1,605
TOTAL PRIVATE PROPERTY COSTS				**$8,023**
Share of the Public Main Extension Costs				$43,220
TOTAL FOR ALL ITEMS				**$51,243**

Work on Private Property - "Worst Case"

DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST
Septic Tank Pumping / Abandonment	LS	1	$2,000.00	$2,000
4" Dia. PVC Gravity Sewer Lateral	LF	20	$80.00	$1,600
Package Pump Station Equipment	LS	1	$4,000.00	$4,000
Pump Installation and Plumbing	LS	1	$1,820.00	$1,820
Electrical Work	LS	1	$1,820.00	$1,820
2" Dia. HDPE Pressure Line	LF	300	$40.00	$12,000
Piping Connections, Cleanouts, Misc. Plumbing	LS	1	$500.00	$500
City Sewer Buy-in Fee	LS	1	$1,418	$1,418
SUBTOTAL				**$25,158**
25% CONTINGENCY				$6,290
TOTAL PRIVATE PROPERTY COSTS				**$31,448**
Share of Public Main Extension Costs				$43,220
Out of Agency Service Agreement				$575
TOTAL FOR ALL ITEMS				**$75,243**

CONCLUSION

This report confirms the feasibility of a conceptual sewer system design that would allow abandonment of existing septic systems by extending the City's sewer system in the Braemar Ranch area. The preliminary engineering and cost information is intended to be utilized by the City and members of the community to assess project feasibility and initiate assessment district information, if the project is deemed feasible. As a part of the process, the City should consider whether to proceed with the complete project, or utilize a phased approach. It is expected that design refinements and additional alternatives may be identified during the project review, public comment, final engineering, and public agency review phases of the project as well. The goal of this phase of work is to reach agreement on the following conclusions:

- There are 120 parcels in the study area are not currently served by City sewer. Up to 27 of these could potentially be served by the existing system. An extension of the sewer system could serve the remaining 93 parcels, and potentially some of the 27 mentioned above.
- The concept proposed herein is generally the best alternative and should serve as a master plan for sewer service in the area.
- The estimated cost for the public portion of the sewer system is approximately $4,365,280, assuming the entire conceptual plan is implemented.
- The cost for private property improvements at each of the parcels to be served by the extended sewer would be between $8,023 and $31,450, with a total estimated cost per parcel between $51,243 and $75,243.
- Budget allowance for easements and environmental mitigation would need to be defined during subsequent work efforts.

Once agreement is reached on these or revised conclusions, assessment district formation, final engineering, public agency coordination and easement negotiations can begin.

APPENDIX A

Braemar Lift Station Pump Readings and Flow Calculations

Braemar Ranch Sewer Main Extension
16743.01

Braemar Ranch Lift Station
Pump Readings 8/1/05 thru 1/23/06 Provided by City of Santa Barbara

Each pump= 1000 gpm
Gallons= (1000 gpm)*(60 min/hr)*(Total (hrs) #1+#2)
GPD= Gallons/Days

8/1/05 thru 8/29/05

	#1	#2		Gallons	Days	GPD
Present	8,057.80	8,051.20				
Previous	8,006.50	7,998.80				
Total (hrs)	51.30	52.40		6,222,000	29	214,552

8/29/05 thru 10/3/05

	#1	#2		Gallons	Days	GPD
Present	8,134.70	8,129.20				
Previous	8,057.80	8,051.20				
Total (hrs)	76.90	78.00		9,294,000	35	265,543

10/3/05 thru 10/31/05

	#1	#2		Gallons	Days	GPD
Present	8,173.40	8,169.20				
Previous	8,134.70	8,129.20				
Total (hrs)	38.70	40.00		4,722,000	28	168,643

10/31/05 thru 11/28/05

	#1	#2		Gallons	Days	GPD
Present	8,238.10	8,234.10				
Previous	8,173.40	8,169.20				
Total (hrs)	64.70	64.90		7,776,000	28	277,714

11/28/05 thru 12/27/05

	#1	#2		Gallons	Days	GPD
Present	8,291.00	8,288.50				
Previous	8,238.10	8,234.10				
Total (hrs)	52.90	54.40		6,438,000	29	222,000

12/27/05 thru 1/23/06

	#1	#2		Gallons	Days	GPD
Present	8,341.10	8,341.10				
Previous	8,302.20	8,299.90				
Total (hrs)	38.90	41.20		4,806,000	27	178,000

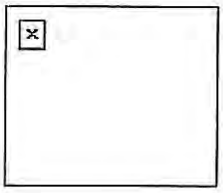
Total = 39,258,000 176
Average (GPD)= 223,057
Average (GPD)= **277,714** (of peak month)

Maximum Capacity of Lift Station = (1000 gpm)*(60 min/hr)*(24 hrs/day)* 2 pumps
= 2,880,000 GPD
= **2.88 MGD**


SBW04 - Symantec pcAnywhere Remote
Remote Control
Braemar - Strip Chart Recorders - RTU #03
62.2 Level 1
62.7 Level 2
2.2 Gas Level
0 GPM
1 HR.
24 HR.
7 DAY
Log On
Map
Main
Spare
Braemar
Spare
Alarm/Event
PL Real Time
Real Trend
Hist Trend
Print

APPENDIX B

Sea Ranch Road Sewer Video Inspection Information



CITY OF SANTA BARBARA

WASTEWATER COLLECTION SECTION

Project Information 1

Surveyor Name	E. ZAMBRANO	**Certificate Number**	U-805-2384
Owner	CITY OF SANTA BARBARA	**Customer**	CITY OF SANTA BARBARA
Drainage Area		**PO Number**	
Pipe Segment Reference		**Date**	4/19/2006 3:48:04 PM
Street	SEA RANCH DR	**City**	SANTA BARBARA
Comments			

Manhole

Upstream MH	003	**Rim to Invert (U)**	5
Grade to Invert (U)	4.4	**Rim to Grade (U)**	6
Downstream MH	002	**Rim to Invert (D)**	
Grade to Invert (D)		**Rim to Grade (D)**	
Sewer Use	Sanitary	**Direction of Survey**	Downstream

Pipe

Height (Diameter)	8	**Width**	
Shape	Circular	**Material**	Vitrified Clay Pipe
Lining Method		**Pipe Joint Length**	
Total Length		**Length Surveyed**	346.9
Year Laid		**Year Renewed**	

Misc

Flow Control	Not Controlled	**Media Label**	37
Purpose	Routine Assessment	**Sewer Category**	
Pre-Cleaning	Jetting	**Date Cleaned**	4/19/2006 3:49:54 PM
Weather	Dry	**Location Code**	
Additional Info	Yes	**Location Details**	

Custom

Atlas	A10B/A10D	**Basin**	29
Personal	DE/EZ/MS/MR	**Vactor**	668
Custom5		**Custom6**	
Custom7		**Custom8**	
Custom9		**Custom10**	

Pacp 6

Reverse Setup ID		**Sheet (Group) Number**	

PO Number:

Date: 4/19/2006 3:48:04 PM

Street: SEA RANCH DR
Total Distance: 346.9
Run Number:

Upstream MH: 003
Downstream MH: 002
Direction of Survey: Downstream

Footage	Fault Observation	Time	Picture
0.0	Water Level Severity: None Value 2nd Dimension: 0 Value Percent: 0	9 00:50:48	
2.2	Crack Circumferential Position: 12 To 2 Severity: None Value 2nd Dimension: 0 Value Percent: 0 Struct Weight: 1	57 00:51:47	
107.8	Tap Factory Position: 3 Severity: None Value 1st Dimension: 4 Value 2nd Dimension: 0 Value Percent: 0 Comments: ROOTS	05:32 00:56:21	
140.1	Tap Factory Position: 9 Severity: None Value 1st Dimension: 4 Value 2nd Dimension: 0 Value Percent: 0	07:05 00:57:54	
280.5	Tap Factory Position: 9 Severity: None Value 1st Dimension: 4 Value 2nd Dimension: 0 Value Percent: 0	13:30 01:04:19	

300.1	Tap Factory Position: 3 Severity: None Value 1st Dimension: 4 Value 2nd Dimension: 0 Value Percent: 0	14:53 01:05:41	
346.9	Manhole Severity: None Value 2nd Dimension: 0 Value Percent: 0 Comments: @ 002	17:18 01:08:05	
346.9	Abandoned Survey Severity: None Value 2nd Dimension: 0 Value Percent: 0 Comments: END OF RUN	17:50 01:08:37	

Grade	Structural	O&M	Overall
5	0	0	0
4	0	0	0
3	0	0	0
2	0	0	0
1	1	0	1
Overall	1	0	1
Number of Defects	1	0	1
Pipe Rating	1100	0000	1100

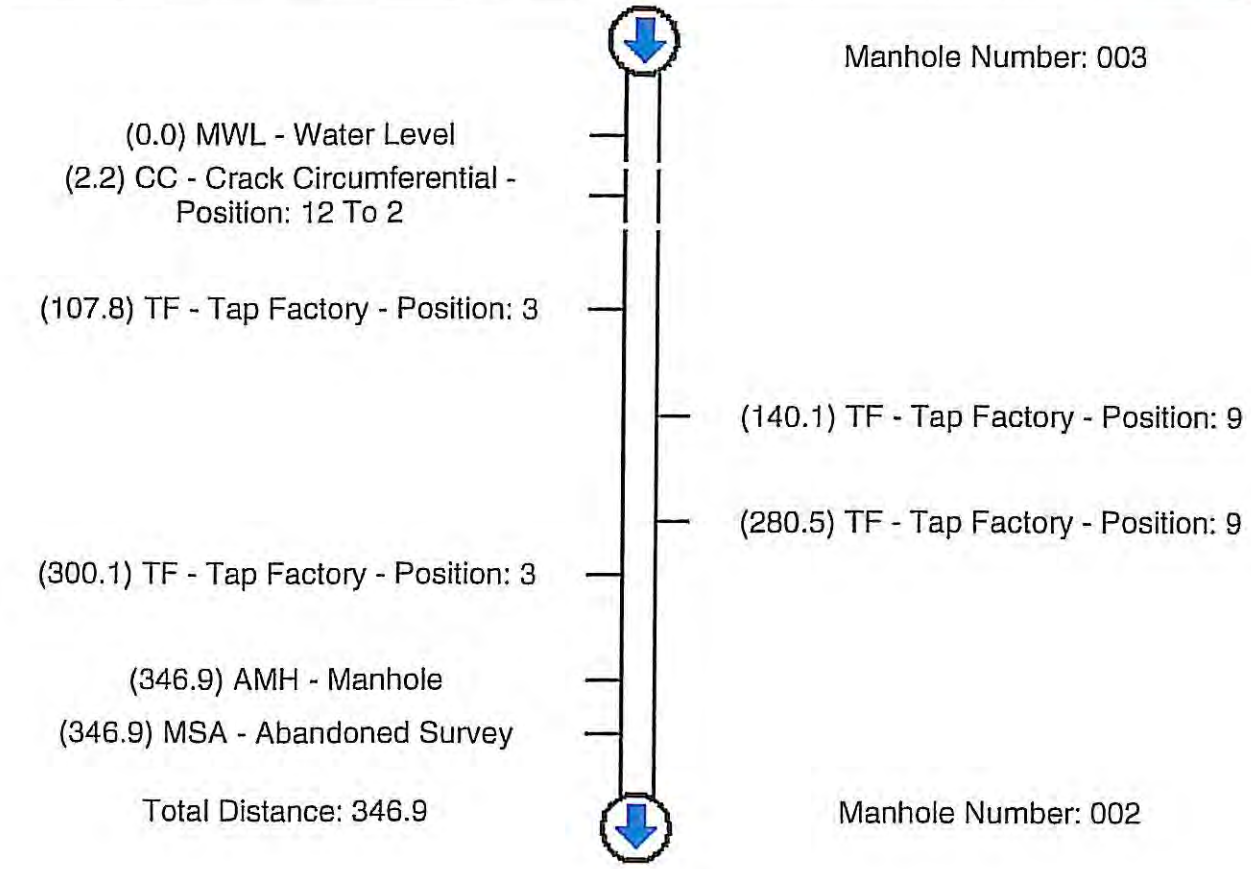
Distance	Video Ref	Code	Cont Defect	Value			Joint	Circumferential Location	
				Dimension		%		At / From	To
				1st	2nd				
0	00:50:48 9	MWL - Water Level			0	0			
2.2	00:51:47 57	CC - Crack Circumferential			0	0		12	2
107.8	00:56:21 332	TF - Tap Factory		4	0	0		3	
		ROOTS							
140.1	00:57:54 425	TF - Tap Factory		4	0	0		9	
280.5	01:04:19 810	TF - Tap Factory		4	0	0		9	
300.1	01:05:41 893	TF - Tap Factory		4	0	0		3	
346.9	01:08:05 1038	AMH - Manhole			0	0			
		@ 002							
346.9	01:08:37 1070	MSA - Abandoned Survey			0	0			
		END OF RUN							

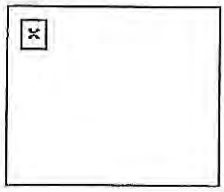
PO Number:

Date: 4/19/2006 3:48:04 PM
Street: SEA RANCH DR
Total Distance: 346.9
Run Number:
Height (Diameter): 8

Pipe Segment Reference:
Upstream MH: 003
Downstream MH: 002
Direction of Survey: Downstream
Material: Vitrified Clay Pipe

Severity
Light
Moderate
Average
Heavy
Severe





CITY OF SANTA BARBARA

WASTEWATER COLLECTION SECTION

Project Information 1

Surveyor Name	E. ZAMBRANO	**Certificate Number**	U-805-2384
Owner	CITY OF SANTA BARBARA	**Customer**	CITY OF SANTA BARBARA
Drainage Area		**PO Number**	
Pipe Segment Reference		**Date**	4/19/2006 3:30:54 PM
Street	SEA RANCH DR	**City**	SANTA BARBARA
Comments			

Manhole

Upstream MH	004	**Rim to Invert (U)**	6
Grade to Invert (U)	5.4	**Rim to Grade (U)**	6
Downstream MH	003	**Rim to Invert (D)**	
Grade to Invert (D)		**Rim to Grade (D)**	
Sewer Use	Sanitary	**Direction of Survey**	Downstream

Pipe

Height (Diameter)	8	**Width**	
Shape	Circular	**Material**	Vitrified Clay Pipe
Lining Method		**Pipe Joint Length**	
Total Length		**Length Surveyed**	351.6
Year Laid		**Year Renewed**	

Misc

Flow Control	Not Controlled	**Media Label**	37
Purpose	Routine Assessment	**Sewer Category**	
Pre-Cleaning	Jetting	**Date Cleaned**	4/19/2006 3:13:16 PM
Weather	Dry	**Location Code**	Light Highway
Additional Info	Yes	**Location Details**	

Custom

Atlas	A10B	**Basin**	29
Personal		**Vactor**	
Custom5		**Custom6**	
Custom7		**Custom8**	
Custom9		**Custom10**	

Pacp 6

Reverse Setup ID		**Sheet (Group) Number**	

PO Number:

Date: 4/19/2006 3:30:54 PM

Street: SEA RANCH DR
Total Distance: 351.6
Run Number:

Upstream MH: 004
Downstream MH: 003
Direction of Survey: Downstream

Footage	Fault Observation	Time	Picture
0.0	Manhole Severity: None Value 2nd Dimension: 0 Value Percent: 0 Comments: @ 004	11 00:36:54	
0.0	Water Level Severity: None Value 2nd Dimension: 0 Value Percent: 0	30 00:37:13	
105.6	Tap Factory Position: 2 Severity: None Value 1st Dimension: 4 Value 2nd Dimension: 0 Value Percent: 0	04:12 00:40:59	
127.3	Tap Factory Position: 3 Severity: None Value 1st Dimension: 4 Value 2nd Dimension: 0 Value Percent: 0	05:07 00:41:53	
225.3	Tap Factory Position: 3 Severity: None Value 1st Dimension: 4 Value 2nd Dimension: 0 Value Percent: 0	08:08 00:44:55	
	Alignment Right Down Severity: None		

314.3	Value 2nd Dimension: 0 Value Percent: 10 Maint Weight: 1	11:43 00:48:28	
345.5	Tap Factory Position: 10 Severity: None Value 1st Dimension: 4 Value 2nd Dimension: 0 Value Percent: 0	12:56 00:49:43	
351.6	Manhole Severity: None Value 2nd Dimension: 0 Value Percent: 0 Comments: @ 003	13:25 00:50:09	
351.6	Abandoned Survey Severity: None Value 2nd Dimension: 0 Value Percent: 0 Comments: END OF RUN	13:50 00:50:35	

Grade	Structural	O&M	Overall
5	0	0	0
4	0	0	0
3	0	0	0
2	0	0	0
1	0	1	1
Overall	0	1	1
Number of Defects	0	1	1
Pipe Rating	0000	1100	1100

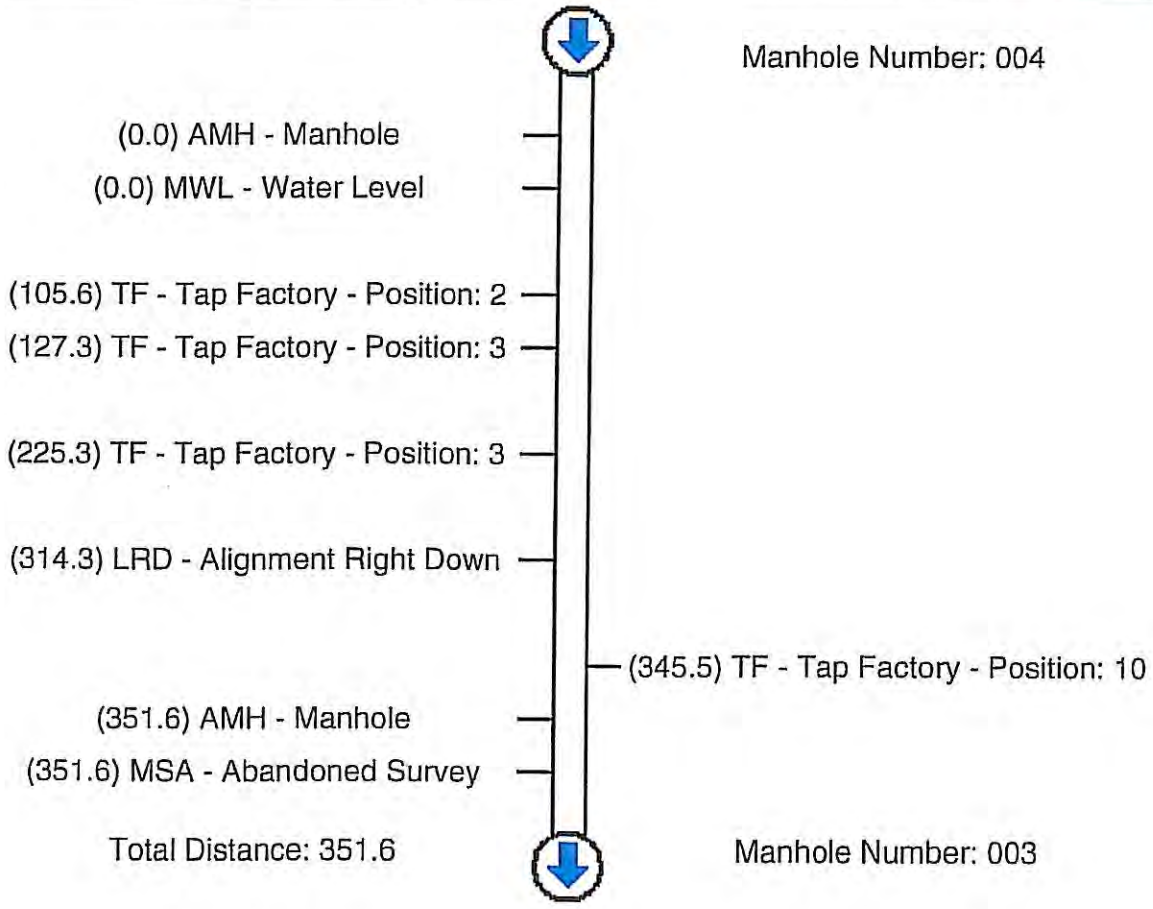
Distance	Video Ref	Code	Cont Defect	Value			Joint	Circumferential Location	
				Dimension		%		At / From	To
				1st	2nd				
0	00:36:54 11	AMH - Manhole			0	0			
		@ 004							
0	00:37:13 30	MWL - Water Level			0	0			
105.6	00:40:59 252	TF - Tap Factory		4	0	0		2	
127.3	00:41:53 307	TF - Tap Factory		4	0	0		3	
225.3	00:44:55 488	TF - Tap Factory		4	0	0		3	
314.3	00:48:28 703	LRD - Alignment Right Down			0	10			
345.5	00:49:43 776	TF - Tap Factory		4	0	0		10	
351.6	00:50:09 805	AMH - Manhole			0	0			
		@ 003							
351.6	00:50:35 830	MSA - Abandoned Survey			0	0			
		END OF RUN							

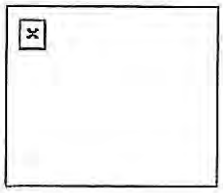
PO Number:

Date: 4/19/2006 3:30:54 PM
Street: SEA RANCH DR
Total Distance: 351.6
Run Number:
Height (Diameter): 8

Pipe Segment Reference:
Upstream MH: 004
Downstream MH: 003
Direction of Survey: Downstream
Material: Vitrified Clay Pipe

Severity
Light
Moderate
Heavy
Severe





CITY OF SANTA BARBARA

WASTEWATER COLLECTION SECTION

Project Information 1

Surveyor Name	E. ZAMBRANO	**Certificate Number**	U-805-2384
Owner	CITY OF SANTA BARBARA	**Customer**	CITY OF SANTA BARBARA
Drainage Area		**PO Number**	
Pipe Segment Reference		**Date**	4/19/2006 2:46:49 PM
Street	SEA RANCH DR	**City**	SANTA BARBARA
Comments			

Manhole

Upstream MH	005	**Rim to Invert (U)**	16
Grade to Invert (U)	15.2	**Rim to Grade (U)**	6
Downstream MH	004	**Rim to Invert (D)**	
Grade to Invert (D)		**Rim to Grade (D)**	
Sewer Use	Sanitary	**Direction of Survey**	Downstream

Pipe

Height (Diameter)	8	**Width**	
Shape	Circular	**Material**	Vitrified Clay Pipe
Lining Method		**Pipe Joint Length**	
Total Length		**Length Surveyed**	193.4
Year Laid		**Year Renewed**	

Misc

Flow Control	Not Controlled	**Media Label**	37
Purpose	Routine Assessment	**Sewer Category**	
Pre-Cleaning	Jetting	**Date Cleaned**	4/19/2006 2:48:41 PM
Weather	Dry	**Location Code**	Light Highway
Additional Info	Yes	**Location Details**	

Custom

Atlas	A10B	**Basin**	29
Personal		**Vactor**	
Custom5		**Custom6**	
Custom7		**Custom8**	
Custom9		**Custom10**	

Pacp 6

Reverse Setup ID		**Sheet (Group) Number**	

PO Number:

Date: 4/19/2006 2:46:49 PM

Street: SEA RANCH DR
Total Distance: 193.4
Run Number:

Upstream MH: 005
Downstream MH: 004
Direction of Survey: Downstream

Footage	Fault Observation	Time	Picture
0.0	Manhole Severity: None Value 2nd Dimension: 0 Value Percent: 0 Comments: @ 005	3 00:29:57	
0.0	Water Level Severity: None Value 2nd Dimension: 0 Value Percent: 0	16 00:30:10	
94.3	Tap Factory Position: 9 Severity: None Value 1st Dimension: 4 Value 2nd Dimension: 0 Value Percent: 0	03:29 00:33:25	
193.4	Manhole Severity: None Value 2nd Dimension: 0 Value Percent: 0 Comments: @ 004	06:13 00:36:08	
193.4	Abandoned Survey Severity: None Value 2nd Dimension: 0 Value Percent: 0 Comments: END OF RUN	06:35 00:36:31	

Grade	Structural	O&M	Overall
5	0	0	0
4	0	0	0
3	0	0	0
2	0	0	0
1	0	0	0
Overall	0	0	0
Number of Defects	0	0	0
Pipe Rating	0000	0000	0000

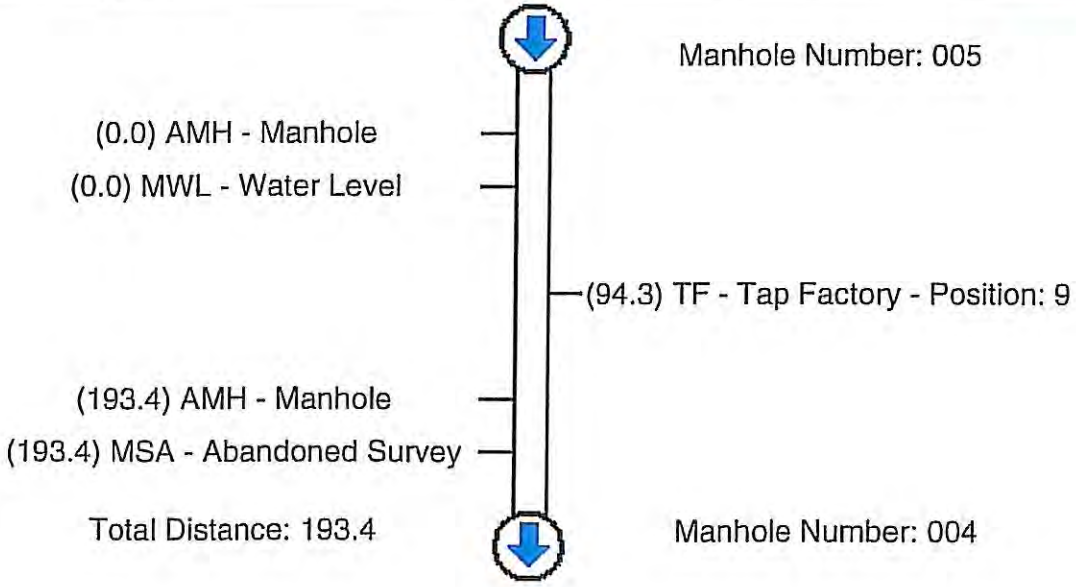
Distance	Video Ref	Code	Cont Defect	Value			Joint	Circumferential Location	
				Dimension		%		At / From	To
				1st	2nd				
0	00:29:57 3	AMH - Manhole			0	0			
		@ 005							
0	00:30:10 16	MWL - Water Level			0	0			
94.3	00:33:25 209	TF - Tap Factory		4	0	0		9	
193.4	00:36:08 373	AMH - Manhole			0	0			
		@ 004							
193.4	00:36:31 395	MSA - Abandoned Survey			0	0			
		END OF RUN							

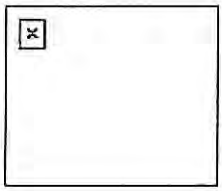
PO Number:

Date: 4/19/2006 2:46:49 PM
Street: SEA RANCH DR
Total Distance: 193.4
Run Number:
Height (Diameter): 8

Pipe Segment Reference:
Upstream MH: 005
Downstream MH: 004
Direction of Survey: Downstream
Material: Vitrified Clay Pipe

Severity
Light
Moderate
Average
Heavy
Severe





CITY OF SANTA BARBARA

WASTEWATER COLLECTION SECTION

Project Information 1

Surveyor Name	E. ZAMBRANO	**Certificate Number**	U-805-2384
Owner	CITY OF SANTA BARBARA	**Customer**	CITY OF SANTA BARBARA
Drainage Area		**PO Number**	
Pipe Segment Reference		**Date**	4/19/2006 2:17:59 PM
Street	SEA RANCH DR	**City**	SANTA BARBARA
Comments			

Manhole

Upstream MH	006	**Rim to Invert (U)**	13.3
Grade to Invert (U)	12.8	**Rim to Grade (U)**	6
Downstream MH	005	**Rim to Invert (D)**	
Grade to Invert (D)		**Rim to Grade (D)**	
Sewer Use	Sanitary	**Direction of Survey**	Downstream

Pipe

Height (Diameter)	8	**Width**	
Shape	Circular	**Material**	Vitrified Clay Pipe
Lining Method		**Pipe Joint Length**	
Total Length		**Length Surveyed**	350.3
Year Laid		**Year Renewed**	

Misc

Flow Control	Not Controlled	**Media Label**	37
Purpose	Routine Assessment	**Sewer Category**	
Pre-Cleaning	Jetting	**Date Cleaned**	4/19/2006 2:18:53 PM
Weather	Dry	**Location Code**	Light Highway
Additional Info	Yes	**Location Details**	

Custom

Atlas	A10B	**Basin**	29
Personal	EZ/DE/VG/JS/MR/MS	**Vactor**	668/669/633
Custom5		**Custom6**	
Custom7		**Custom8**	
Custom9		**Custom10**	

Pacp 6

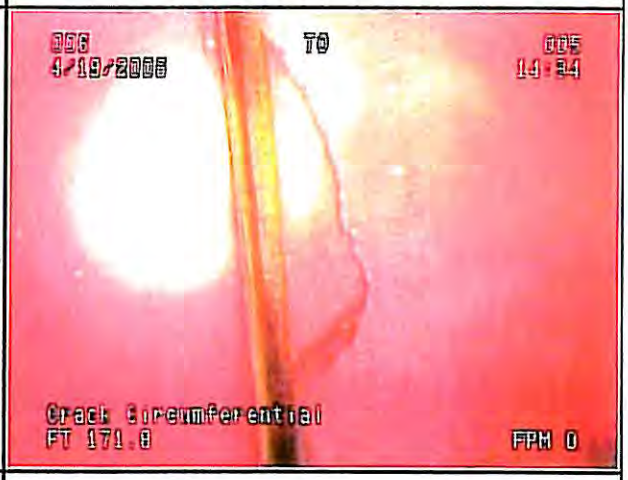
Reverse Setup ID		**Sheet (Group) Number**	

PO Number:

Date: 4/19/2006 2:17:59 PM

Street: SEA RANCH DR
Total Distance: 350.3
Run Number:

Upstream MH: 006
Downstream MH: 005
Direction of Survey: Downstream

Footage	Fault Observation	Time	Picture
0.0	Manhole Severity: None Value 2nd Dimension: 0 Value Percent: 0 Comments: @ 006	4 00:13:55	
0.0	Water Level Severity: None Value 2nd Dimension: 0 Value Percent: 0	19 00:14:12	
105.9	Tap Factory Position: 12 Severity: None Value 1st Dimension: 4 Value 2nd Dimension: 0 Value Percent: 0	04:03 00:17:58	
171.8	Crack Circumferential Position: 8 To 9 Severity: None Value 2nd Dimension: 0 Value Percent: 0 Struct Weight: 1	06:35 00:20:36	
	Crack Multiple		

245.7	Position: 8 To 11 Severity: None Value 2nd Dimension: 0 Value Percent: 0 Struct Weight: 3	10:02 00:23:59	
247.0	Tap Factory Position: 9 Severity: None Value 1st Dimension: 4 Value 2nd Dimension: 0 Value Percent: 0	10:46 00:24:40	
298.5	Crack Spiral Position: 4 To 7 Severity: None Value 2nd Dimension: 0 Value Percent: 0 Struct Weight: 2	13:00 00:26:56	
313.3	Crack Circumferential Position: 1 To 3 Severity: None Value 2nd Dimension: 0 Value Percent: 0 Struct Weight: 1	13:50 00:27:46	
350.3	Manhole Severity: None Value 2nd Dimension: 0 Value Percent: 0 Comments: @ 005	15:23 00:29:15	
350.3	Abandoned Survey Severity: None Value 2nd Dimension: 0 Value Percent: 0 Comments: END OF RUN	15:43 00:29:36	

Grade	Structural	O&M	Overall
5	0	0	0
4	0	0	0
3	3	0	3
2	2	0	2
1	2	0	2
Overall	7	0	7
Number of Defects	4	0	4
Pipe Rating	3121	0000	3121

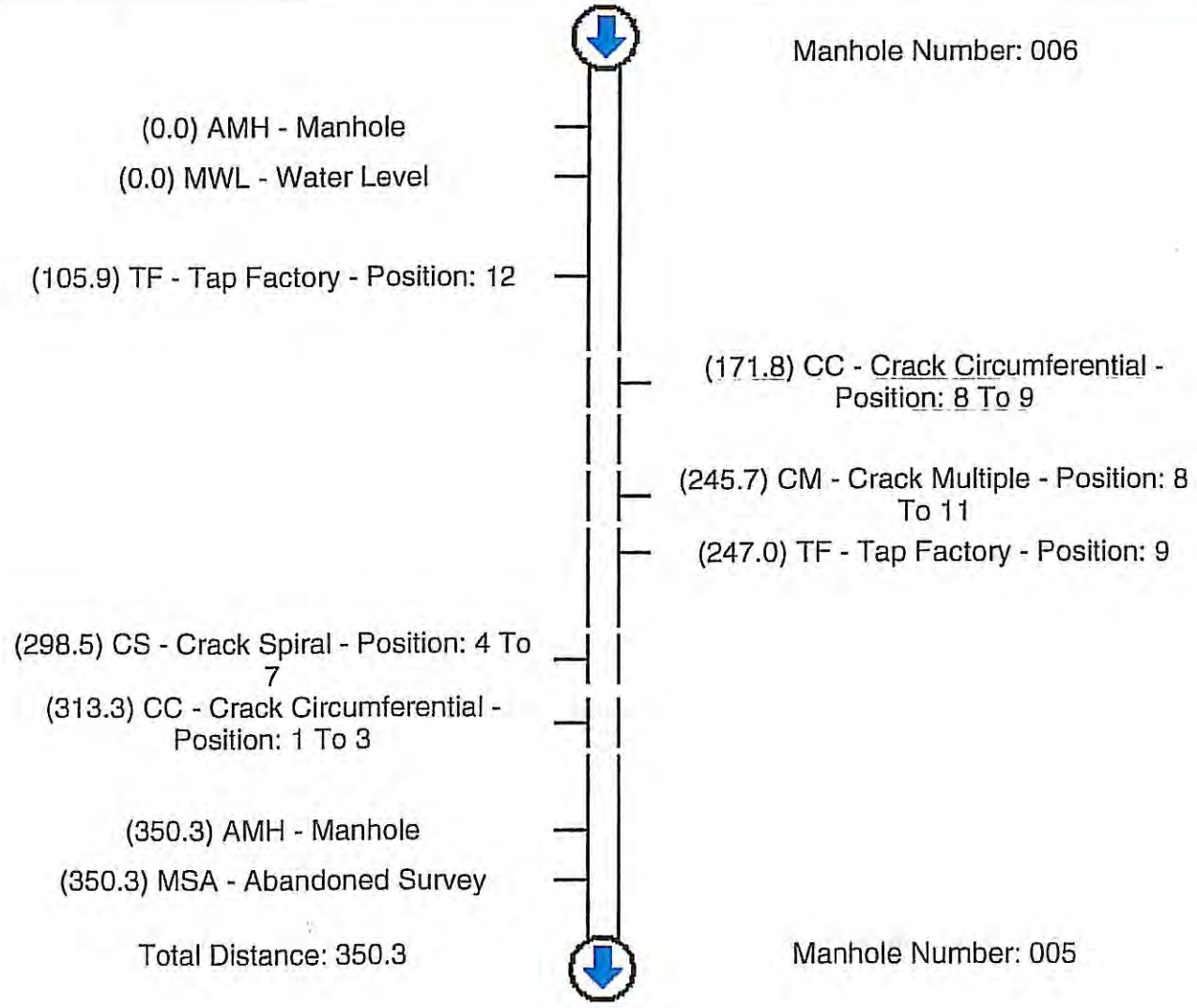
Distance	Video Ref	Code	Cont Defect	Value			Joint	Circumferential Location	
				Dimension		%		At / From	To
				1st	2nd				
0	00:13:55 4	AMH - Manhole			0	0			
		@ 006							
0	00:14:12 19	MWL - Water Level			0	0			
105.9	00:17:58 243	TF - Tap Factory		4	0	0		12	
171.8	00:20:36 395	CC - Crack Circumferential			0	0		8	9
245.7	00:23:59 602	CM - Crack Multiple			0	0		8	11
247	00:24:40 646	TF - Tap Factory		4	0	0		9	
298.5	00:26:56 780	CS - Crack Spiral			0	0		4	7
313.3	00:27:46 830	CC - Crack Circumferential			0	0		1	3
350.3	00:29:15 923	AMH - Manhole			0	0			
		@ 005							
350.3	00:29:36 943	MSA - Abandoned Survey			0	0			
		END OF RUN							

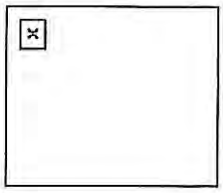
PO Number:

Date: 4/19/2006 2:17:59 PM
Street: SEA RANCH DR
Total Distance: 350.3
Run Number:
Height (Diameter): 8

Pipe Segment Reference:
Upstream MH: 006
Downstream MH: 005
Direction of Survey: Downstream
Material: Vitrified Clay Pipe

Severity
Light
Moderate
Average
Heavy
Severe





CITY OF SANTA BARBARA

WASTEWATER COLLECTION SECTION

Project Information 1

Surveyor Name	E. ZAMBRANO	**Certificate Number**	U-805-2384
Owner	CITY OF SANTA BARBARA	**Customer**	CITY OF SANTA BARBARA
Drainage Area		**PO Number**	
Pipe Segment Reference		**Date**	4/19/2006 10:43:21 AM
Street	SEA RANCH DR.	**City**	SANTA BARBARA
Comments			

Manhole

Upstream MH	07	**Rim to Invert (U)**	5
Grade to Invert (U)	5.6	**Rim to Grade (U)**	6
Downstream MH	06	**Rim to Invert (D)**	
Grade to Invert (D)		**Rim to Grade (D)**	
Sewer Use	Sanitary	**Direction of Survey**	Downstream

Pipe

Height (Diameter)	8	**Width**	
Shape	Circular	**Material**	Vitrified Clay Pipe
Lining Method		**Pipe Joint Length**	
Total Length		**Length Surveyed**	350.9
Year Laid		**Year Renewed**	

Misc

Flow Control	Not Controlled	**Media Label**	37
Purpose	Routine Assessment	**Sewer Category**	
Pre-Cleaning	No Pre-Cleaning	**Date Cleaned**	
Weather	Dry	**Location Code**	Light Highway
Additional Info	Yes	**Location Details**	

Custom

Atlas	A10B	**Basin**	29
Personal	EZ/JS/DE	**Vactor**	668
Custom5		**Custom6**	
Custom7		**Custom8**	
Custom9		**Custom10**	

Pacp 6

Reverse Setup ID		**Sheet (Group) Number**	

PO Number:

Date: 4/19/2006 10:43:21 AM

Street: SEA RANCH DR.
Total Distance: 350.9
Run Number:

Upstream MH: 07
Downstream MH: 06
Direction of Survey: Downstream

Footage	Fault Observation	Time	Picture
0.0	Manhole Severity: None Value 2nd Dimension: 0 Value Percent: 0 Comments: @ 07	19 00:00:37	
0.0	Water Level Severity: None Value 2nd Dimension: 0 Value Percent: 0	01:07 00:01:15	
45.0	Roots Ball Barrel Position: 7 To 5 Severity: None Value 2nd Dimension: 0 Value Percent: 55 Comments: ROOTS FIND FOR THE LAST 10' Maint Weight: 5	04:02 00:04:13	
	Tap Factory Position: 3 Severity: None	08:14	

45.3	Value 1st Dimension: 4 Value 2nd Dimension: 0 Value Percent: 0	00:01:21	
46.3	Roots Ball Barrel Position: 7 To 5 Severity: None Value 2nd Dimension: 0 Value Percent: 95 Comments: ROOT BALL IN NON ACTIVE MAIN Maint Weight: 5	05:29 00:05:44	
269.0	Tap Factory Position: 3 Severity: None Value 1st Dimension: 4 Value 2nd Dimension: 0 Value Percent: 0	15:16 00:08:23	
296.7	Tap Factory Position: 9 Severity: None Value 1st Dimension: 4 Value 2nd Dimension: 0 Value Percent: 0	16:27 00:09:34	
350.9	Manhole Severity: None Value 2nd Dimension: 0 Value Percent: 0 Comments: @ 07	23:04 00:13:43	
350.9	Abandoned Survey Severity: None Value 2nd Dimension: 0 Value Percent: 0 Comments: END OF RUN	23:24 00:13:43	

Grade	Structural	O&M	Overall
5	0	10	10
4	0	0	0
3	0	0	0
2	0	0	0
1	0	0	0
Overall	0	10	10
Number of Defects	0	2	2
Pipe Rating	0000	5200	5200

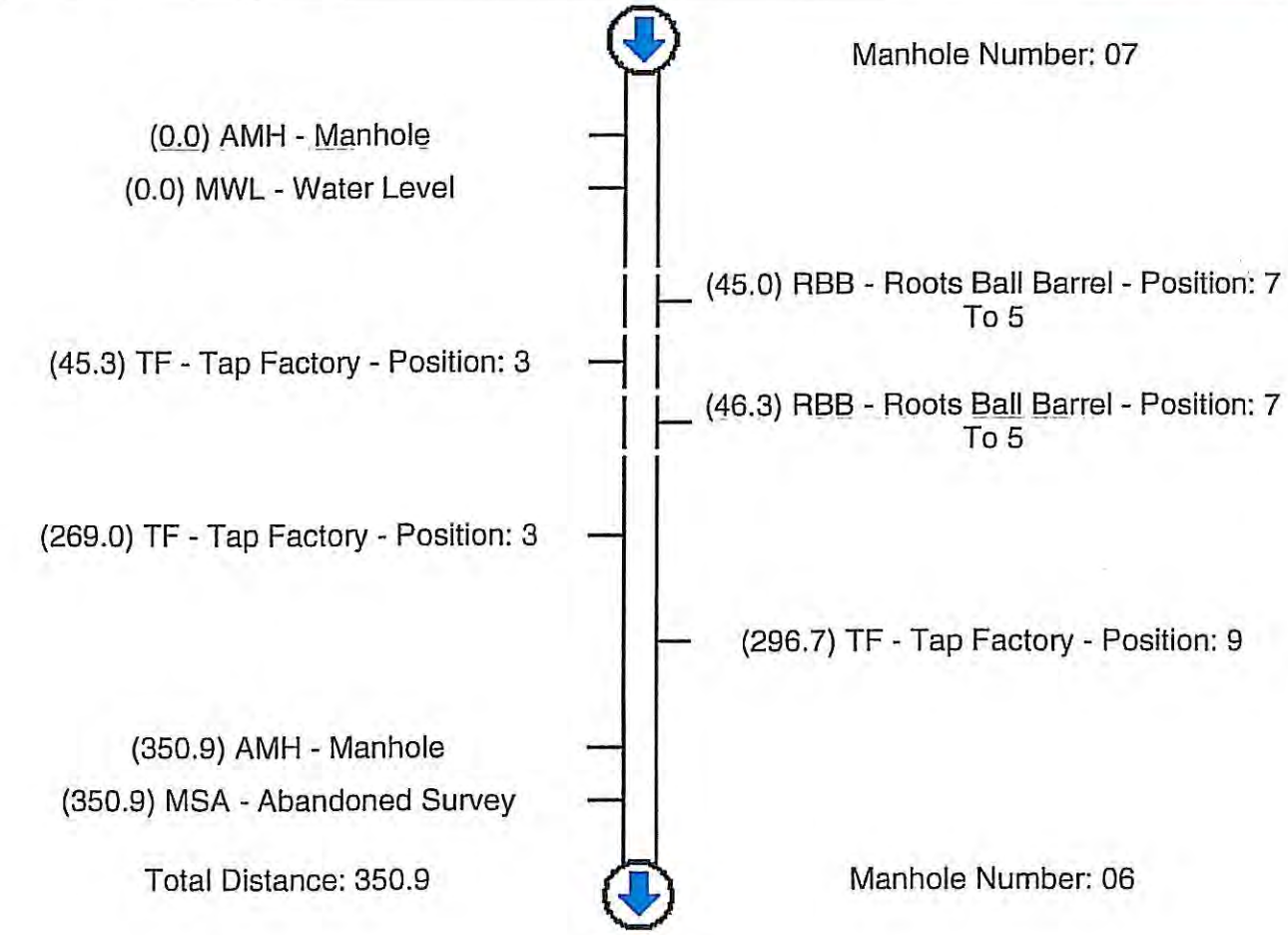
Distance	Video Ref	Code	Cont Defect	Value			Joint	Circumferential Location	
				Dimension		%		At / From	To
				1st	2nd				
0	00:00:37 19	AMH - Manhole			0	0			
		@ 07							
0	00:01:15 67	MWL - Water Level			0	0			
45	00:04:13 242	RBB - Roots Ball Barrel			0	55		7	5
		ROOTS FIND FOR THE LAST 10'							
45.3	00:01:21 494	TF - Tap Factory		4	0	0		3	
46.3	00:05:44 329	RBB - Roots Ball Barrel			0	95		7	5
		ROOT BALL IN NON ACTIVE MAIN							
269	00:08:23 916	TF - Tap Factory		4	0	0		3	
296.7	00:09:34 987	TF - Tap Factory		4	0	0		9	
350.9	00:13:43 1384	AMH - Manhole			0	0			
		@ 07							
350.9	00:13:43 1404	MSA - Abandoned Survey			0	0			
		END OF RUN							

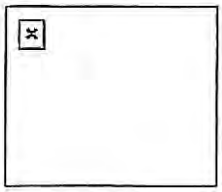
PO Number:

Date: 4/19/2006 10:43:21 AM
Street: SEA RANCH DR.
Total Distance: 350.9
Run Number:
Height (Diameter): 8

Pipe Segment Reference:
Upstream MH: 07
Downstream MH: 06
Direction of Survey: Downstream
Material: Vitrified Clay Pipe

Severity
Light
Moderate
Average
Heavy
Severe





CITY OF SANTA BARBARA

WASTEWATER COLLECTION SECTION

Project Information 1

Surveyor Name	E. ZAMBRANO	**Certificate Number**	U-805-2384
Owner	CITY OF SANTA BARBARA	**Customer**	CITY OF SANTA BARBARA
Drainage Area		**PO Number**	
Pipe Segment Reference		**Date**	4/19/2006 2:46:49 PM
Street	SEA RANCH DR	**City**	SANTA BARBARA
Comments			

Manhole

Upstream MH	005	**Rim to Invert (U)**	16
Grade to Invert (U)	15.2	**Rim to Grade (U)**	6
Downstream MH	004	**Rim to Invert (D)**	
Grade to Invert (D)		**Rim to Grade (D)**	
Sewer Use	Sanitary	**Direction of Survey**	Downstream

Pipe

Height (Diameter)	8	**Width**	
Shape	Circular	**Material**	Vitrified Clay Pipe
Lining Method		**Pipe Joint Length**	
Total Length		**Length Surveyed**	193.4
Year Laid		**Year Renewed**	

Misc

Flow Control	Not Controlled	**Media Label**	37
Purpose	Routine Assessment	**Sewer Category**	
Pre-Cleaning	Jetting	**Date Cleaned**	4/19/2006 2:48:41 PM
Weather	Dry	**Location Code**	Light Highway
Additional Info	Yes	**Location Details**	

Custom

Atlas	A10B	**Basin**	29
Personal		**Vactor**	
Custom5		**Custom6**	
Custom7		**Custom8**	
Custom9		**Custom10**	

Pacp 6

Reverse Setup ID		**Sheet (Group) Number**	

PO Number:

Date: 4/19/2006 2:46:49 PM

Street: SEA RANCH DR
Total Distance: 193.4
Run Number:

Upstream MH: 005
Downstream MH: 004
Direction of Survey: Downstream

Footage	Fault Observation	Time	Picture
0.0	Manhole Severity: None Value 2nd Dimension: 0 Value Percent: 0 Comments: @ 005	3 00:29:57	
0.0	Water Level Severity: None Value 2nd Dimension: 0 Value Percent: 0	16 00:30:10	
94.3	Tap Factory Position: 9 Severity: None Value 1st Dimension: 4 Value 2nd Dimension: 0 Value Percent: 0	03:29 00:33:25	
193.4	Manhole Severity: None Value 2nd Dimension: 0 Value Percent: 0 Comments: @ 004	06:13 00:36:08	
193.4	Abandoned Survey Severity: None Value 2nd Dimension: 0 Value Percent: 0 Comments: END OF RUN	06:35 00:36:31	

Grade	Structural	O&M	Overall
5	0	0	0
4	0	0	0
3	0	0	0
2	0	0	0
1	0	0	0
Overall	0	0	0
Number of Defects	0	0	0
Pipe Rating	0000	0000	0000

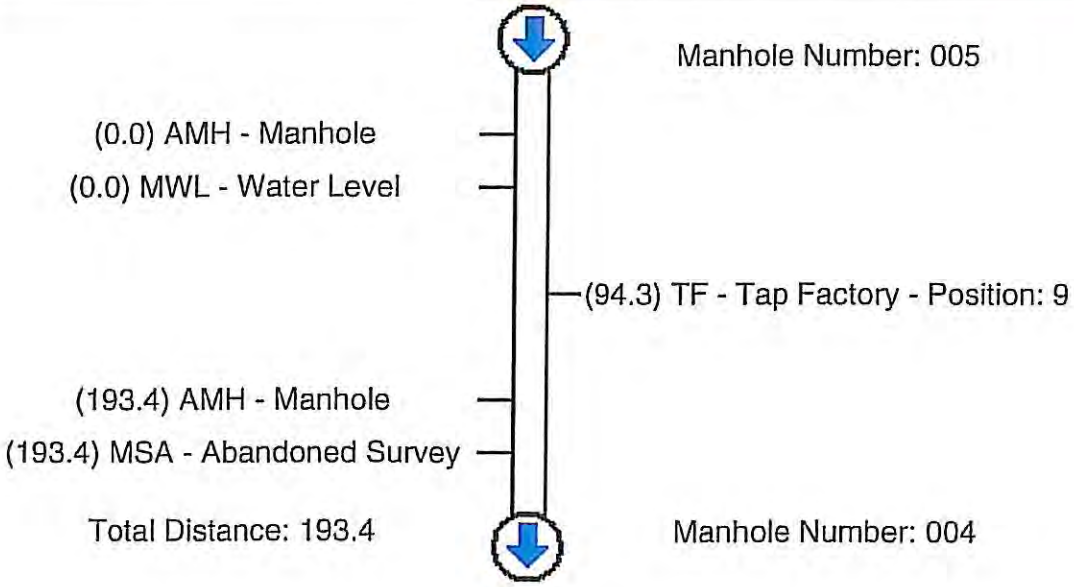
Distance	Video Ref	Code	Cont Defect	Value			Joint	Circumferential Location	
				Dimension		%		At / From	To
				1st	2nd				
0	00:29:57 3	AMH - Manhole			0	0			
		@ 005							
0	00:30:10 16	MWL - Water Level			0	0			
94.3	00:33:25 209	TF - Tap Factory		4	0	0		9	
193.4	00:36:08 373	AMH - Manhole			0	0			
		@ 004							
193.4	00:36:31 395	MSA - Abandoned Survey			0	0			
		END OF RUN							

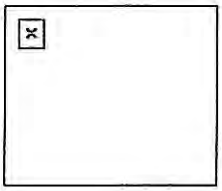
PO Number:

Date: 4/19/2006 2:46:49 PM
Street: SEA RANCH DR
Total Distance: 193.4
Run Number:
Height (Diameter): 8

Pipe Segment Reference:
Upstream MH: 005
Downstream MH: 004
Direction of Survey: Downstream
Material: Vitrified Clay Pipe

Severity
Light
Moderate
Average
Heavy
Severe





CITY OF SANTA BARBARA

WASTEWATER COLLECTION SECTION

Project Information 1

Surveyor Name	E. ZAMBRANO	**Certificate Number**	U-805-2384
Owner	CITY OF SANTA BARBARA	**Customer**	CITY OF SANTA BARBARA
Drainage Area		**PO Number**	
Pipe Segment Reference		**Date**	4/19/2006 2:17:59 PM
Street	SEA RANCH DR	**City**	SANTA BARBARA
Comments			

Manhole

Upstream MH	006	**Rim to Invert (U)**	13.3
Grade to Invert (U)	12.8	**Rim to Grade (U)**	6
Downstream MH	005	**Rim to Invert (D)**	
Grade to Invert (D)		**Rim to Grade (D)**	
Sewer Use	Sanitary	**Direction of Survey**	Downstream

Pipe

Height (Diameter)	8	**Width**	
Shape	Circular	**Material**	Vitrified Clay Pipe
Lining Method		**Pipe Joint Length**	
Total Length		**Length Surveyed**	350.3
Year Laid		**Year Renewed**	

Misc

Flow Control	Not Controlled	**Media Label**	37
Purpose	Routine Assessment	**Sewer Category**	
Pre-Cleaning	Jetting	**Date Cleaned**	4/19/2006 2:18:53 PM
Weather	Dry	**Location Code**	Light Highway
Additional Info	Yes	**Location Details**	

Custom

Atlas	A10B	**Basin**	29
Personal	EZ/DE/VG/JS/MR/MS	**Vactor**	668/669/633
Custom5		**Custom6**	
Custom7		**Custom8**	
Custom9		**Custom10**	

Pacp 6

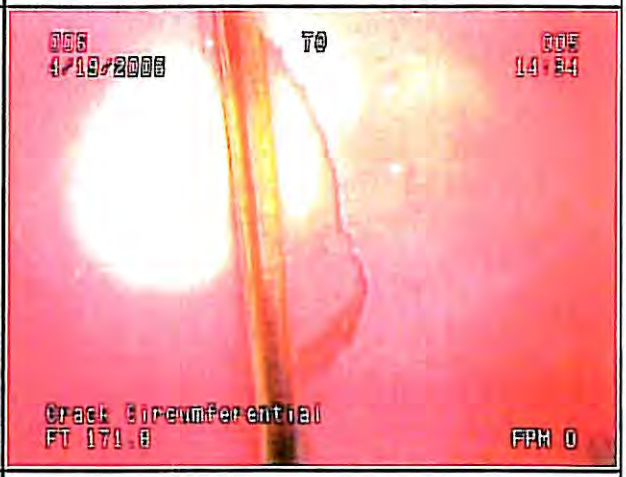
Reverse Setup ID		**Sheet (Group) Number**	

PO Number:

Date: 4/19/2006 2:17:59 PM

Street: SEA RANCH DR
Total Distance: 350.3
Run Number:

Upstream MH: 006
Downstream MH: 005
Direction of Survey: Downstream

Footage	Fault Observation	Time	Picture
0.0	Manhole Severity: None Value 2nd Dimension: 0 Value Percent: 0 Comments: @ 006	4 00:13:55	
0.0	Water Level Severity: None Value 2nd Dimension: 0 Value Percent: 0	19 00:14:12	
105.9	Tap Factory Position: 12 Severity: None Value 1st Dimension: 4 Value 2nd Dimension: 0 Value Percent: 0	04:03 00:17:58	
171.8	Crack Circumferential Position: 8 To 9 Severity: None Value 2nd Dimension: 0 Value Percent: 0 Struct Weight: 1	06:35 00:20:36	
	Crack Multiple		

245.7	Position: 8 To 11 Severity: None Value 2nd Dimension: 0 Value Percent: 0 Struct Weight: 3	10:02 00:23:59	
247.0	Tap Factory Position: 9 Severity: None Value 1st Dimension: 4 Value 2nd Dimension: 0 Value Percent: 0	10:46 00:24:40	
298.5	Crack Spiral Position: 4 To 7 Severity: None Value 2nd Dimension: 0 Value Percent: 0 Struct Weight: 2	13:00 00:26:56	
313.3	Crack Circumferential Position: 1 To 3 Severity: None Value 2nd Dimension: 0 Value Percent: 0 Struct Weight: 1	13:50 00:27:46	
350.3	Manhole Severity: None Value 2nd Dimension: 0 Value Percent: 0 Comments: @ 005	15:23 00:29:15	
350.3	Abandoned Survey Severity: None Value 2nd Dimension: 0 Value Percent: 0 Comments: END OF RUN	15:43 00:29:36	

Grade	Structural	O&M	Overall
5	0	0	0
4	0	0	0
3	3	0	3
2	2	0	2
1	2	0	2
Overall	7	0	7
Number of Defects	4	0	4
Pipe Rating	3121	0000	3121

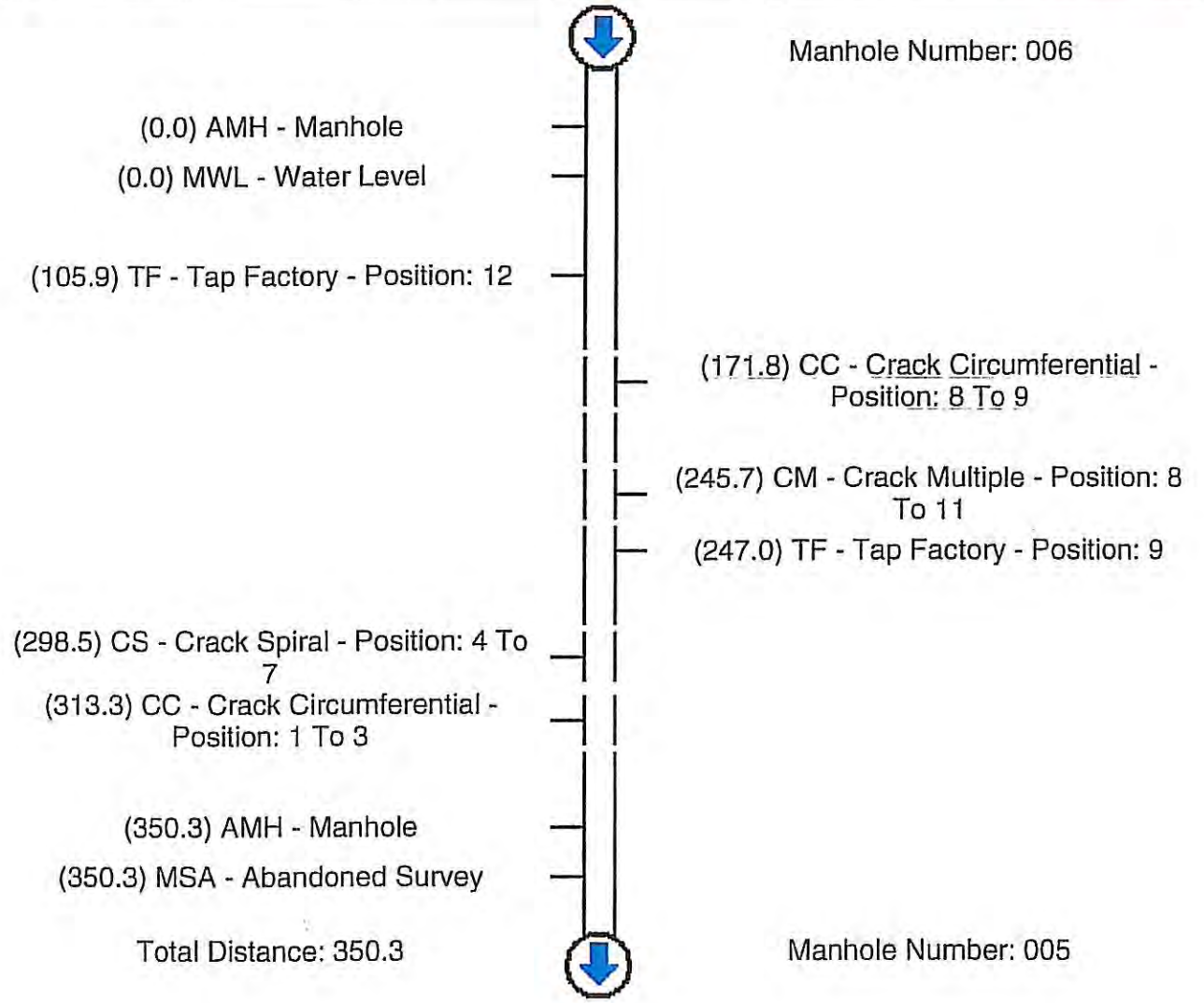
Distance	Video Ref	Code	Cont Defect	Value			Joint	Circumferential Location	
				Dimension		%		At / From	To
				1st	2nd				
0	00:13:55 4	AMH - Manhole			0	0			
		@ 006							
0	00:14:12 19	MWL - Water Level			0	0			
105.9	00:17:58 243	TF - Tap Factory		4	0	0		12	
171.8	00:20:36 395	CC - Crack Circumferential			0	0		8	9
245.7	00:23:59 602	CM - Crack Multiple			0	0		8	11
247	00:24:40 646	TF - Tap Factory		4	0	0		9	
298.5	00:26:56 780	CS - Crack Spiral			0	0		4	7
313.3	00:27:46 830	CC - Crack Circumferential			0	0		1	3
350.3	00:29:15 923	AMH - Manhole			0	0			
		@ 005							
350.3	00:29:36 943	MSA - Abandoned Survey			0	0			
		END OF RUN							

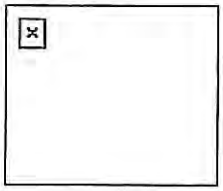
PO Number:

Date: 4/19/2006 2:17:59 PM
Street: SEA RANCH DR
Total Distance: 350.3
Run Number:
Height (Diameter): 8

Pipe Segment Reference:
Upstream MH: 006
Downstream MH: 005
Direction of Survey: Downstream
Material: Vitrified Clay Pipe

Severity
Light
Moderate
Average
Heavy
Severe





CITY OF SANTA BARBARA

WASTEWATER COLLECTION SECTION

Project Information 1

Surveyor Name	E. ZAMBRANO	**Certificate Number**	U-805-2384
Owner	CITY OF SANTA BARBARA	**Customer**	CITY OF SANTA BARBARA
Drainage Area		**PO Number**	
Pipe Segment Reference		**Date**	4/19/2006 10:43:21 AM
Street	SEA RANCH DR.	**City**	SANTA BARBARA
Comments			

Manhole

Upstream MH	07	**Rim to Invert (U)**	5
Grade to Invert (U)	5.6	**Rim to Grade (U)**	6
Downstream MH	06	**Rim to Invert (D)**	
Grade to Invert (D)		**Rim to Grade (D)**	
Sewer Use	Sanitary	**Direction of Survey**	Downstream

Pipe

Height (Diameter)	8	**Width**	
Shape	Circular	**Material**	Vitrified Clay Pipe
Lining Method		**Pipe Joint Length**	
Total Length		**Length Surveyed**	350.9
Year Laid		**Year Renewed**	

Misc

Flow Control	Not Controlled	**Media Label**	37
Purpose	Routine Assessment	**Sewer Category**	
Pre-Cleaning	No Pre-Cleaning	**Date Cleaned**	
Weather	Dry	**Location Code**	Light Highway
Additional Info	Yes	**Location Details**	

Custom

Atlas	A10B	**Basin**	29
Personal	EZ/JS/DE	**Vactor**	668
Custom5		**Custom6**	
Custom7		**Custom8**	
Custom9		**Custom10**	

Pacp 6

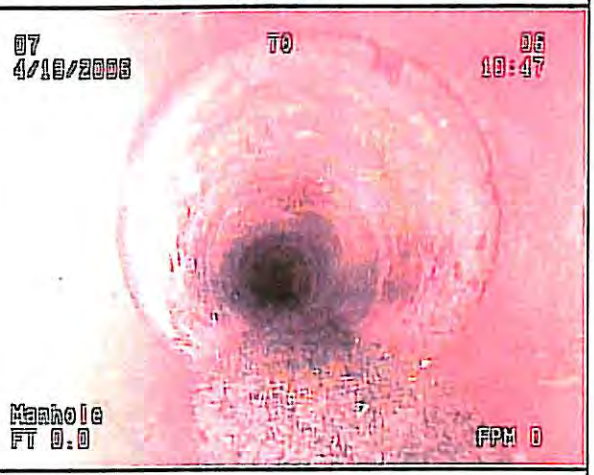
Reverse Setup ID		**Sheet (Group) Number**	

PO Number:

Date: 4/19/2006 10:43:21 AM

Street: SEA RANCH DR.
Total Distance: 350.9
Run Number:

Upstream MH: 07
Downstream MH: 06
Direction of Survey: Downstream

Footage	Fault Observation	Time	Picture
0.0	Manhole Severity: None Value 2nd Dimension: 0 Value Percent: 0 Comments: @ 07	19 00:00:37	
0.0	Water Level Severity: None Value 2nd Dimension: 0 Value Percent: 0	01:07 00:01:15	
45.0	Roots Ball Barrel Position: 7 To 5 Severity: None Value 2nd Dimension: 0 Value Percent: 55 Comments: ROOTS FIND FOR THE LAST 10' Maint Weight: 5	04:02 00:04:13	
	Tap Factory Position: 3 Severity: None	08:14	

45.3	Value 1st Dimension: 4 Value 2nd Dimension: 0 Value Percent: 0	00:01:21	
46.3	Roots Ball Barrel Position: 7 To 5 Severity: None Value 2nd Dimension: 0 Value Percent: 95 Comments: ROOT BALL IN NON ACTIVE MAIN Maint Weight: 5	05:29 00:05:44	
269.0	Tap Factory Position: 3 Severity: None Value 1st Dimension: 4 Value 2nd Dimension: 0 Value Percent: 0	15:16 00:08:23	
296.7	Tap Factory Position: 9 Severity: None Value 1st Dimension: 4 Value 2nd Dimension: 0 Value Percent: 0	16:27 00:09:34	
350.9	Manhole Severity: None Value 2nd Dimension: 0 Value Percent: 0 Comments: @ 07	23:04 00:13:43	
350.9	Abandoned Survey Severity: None Value 2nd Dimension: 0 Value Percent: 0 Comments: END OF RUN	23:24 00:13:43	

Grade	Structural	O&M	Overall
5	0	10	10
4	0	0	0
3	0	0	0
2	0	0	0
1	0	0	0
Overall	0	10	10
Number of Defects	0	2	2
Pipe Rating	0000	5200	5200

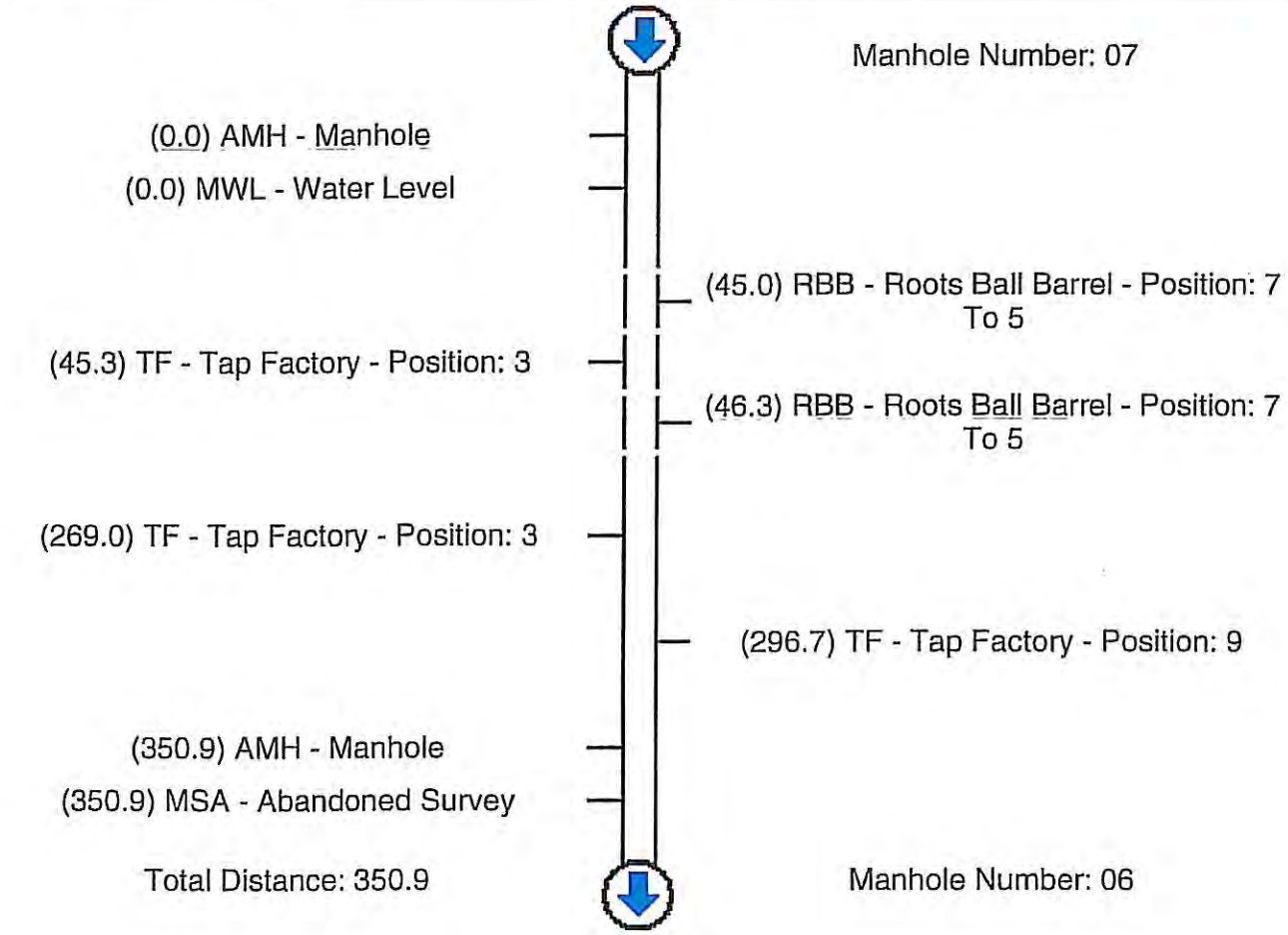
Distance	Video Ref	Code	Cont Defect	Value			Joint	Circumferential Location	
				Dimension		%		At / From	To
				1st	2nd				
0	00:00:37 19	AMH - Manhole			0	0			
		@ 07							
0	00:01:15 67	MWL - Water Level			0	0			
45	00:04:13 242	RBB - Roots Ball Barrel			0	55		7	5
		ROOTS FIND FOR THE LAST 10'							
45.3	00:01:21 494	TF - Tap Factory		4	0	0		3	
46.3	00:05:44 329	RBB - Roots Ball Barrel			0	95		7	5
		ROOT BALL IN NON ACTIVE MAIN							
269	00:08:23 916	TF - Tap Factory		4	0	0		3	
296.7	00:09:34 987	TF - Tap Factory		4	0	0		9	
350.9	00:13:43 1384	AMH - Manhole			0	0			
		@ 07							
350.9	00:13:43 1404	MSA - Abandoned Survey			0	0			
		END OF RUN							

PO Number:

Date: 4/19/2006 10:43:21 AM
Street: SEA RANCH DR.
Total Distance: 350.9
Run Number:
Height (Diameter): 8

Pipe Segment Reference:
Upstream MH: 07
Downstream MH: 06
Direction of Survey: Downstream
Material: Vitrified Clay Pipe

Severity
Light
Moderate
Average
Heavy
Severe



APPENDIX C
Sewer Main Capacity Calculations

APPENDIX C
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Braemar Ranch
Sewer Main Extension
16743.01

Pipe Lengths by Area

Area	Pipe No.	Horizizontal Length (ft)	Vertical Difference (ft)	Actual Length (ft)	Subtotal (ft)	Approximate Depth (ft)	Description
A1	1	292.18	13.40	292.49		7	
	2	300.26	9.00	300.39		10	
	3	260.36	2.60	260.37	853.25	6	Gravity- Cliff Dr
	1	296.52	4.45	296.55		7	
	2	339.45	5.09	339.49		11	
	3	342.28	9.36	342.41	978.45	9	Gravity- Private Dr
A2	1	280.87	9.60	281.03		7	
	2	264.77	12.20	265.05		7	
	3	289.25	4.50	289.29		9	
	4	300	3.00	300.01		9	
	5	184.45	1.90	184.46	1319.84	8	Gravity
B	1	350	34.05	351.65		7	
	2	300	20.60	300.71		8	
	3	250	18.70	250.70	903.06	8	Gravity
C	1	201.03	0.81	201.03		8	
	2	300	28.81	301.38		7	
	3	328.47	27.00	329.58	831.99	7	Gravity
D	1	342.45	19.8	343.02		8	
	2	350	33	351.55		8	
	3	300	28.6	301.36		8	
	4	108.37	8.7	108.72	1104.65	10	Gravity
D1	1	285.44	1.14	285.44		7	
	2	154.49	0.62	154.49		4	
	3	293.54	6.2	293.61	733.54	6	Gravity
D2	1	354.26	15.65	354.61		9	
	2	350	3.52	350.02		7	
	3	225.68	1.13	225.68	930.31	7	Gravity
D3*	1	293.54	6.2	293.61		7	
	2	170	5.4	170.09		6	
	3	280.09	4.7	280.13	743.82	7	Gravity
D4	1	307.53	3.08	307.55		11	
	2	310.97	10.49	311.15		10	
	3	168.21	1.68	168.22		8	
	4	350	3.52	350.02		7	
	5	225.68	1.13	225.68	1362.61	7	Gravity
E	1	251.04	0.84	251.04		7	
	2	314.87	1.6	314.87		6	
	3	210.89	0.85	210.89	776.81	5	Gravity
F1	1	949.83	53.9	951.36	951.36	3	Force Main
F2	1	460.14	0.2	460.14	460.14	3	Force Main
G	1	1445.47	82	1447.79	1447.79	3	Force Main
H	1	201.18	28.51	203.19		9	
	2	346.8	55.36	351.19		12	

Braemar Ranch
Sewer Main Extension
16743.01

Pipe Lengths by Area

Area	Pipe No.	Horizizontal Length (ft)	Vertical Difference (ft)	Actual Length (ft)	Subtotal (ft)	Approximate Depth (ft)	Description
	3	350.28	48.44	353.61		16	
H	4	194.22	12.7	194.63		14	
	5	340.45	40.97	342.91		11	
	6	350.53	40.97	352.92		10	
	7	108.37	8.7	108.72	1907.17	10	Gravity- Rehab
J	1	6	0.07	6.00		18	
	2	240.27	0.96	240.27		16	
	3	206.04	0.83	206.04		15	
	4	115.69	0.46	115.69		14	
	5	15.65	0.63	15.66		8	
	6	155.27	9.25	155.55	739.21	11	Gravity- Rerouting
K	1	6	0	6.00		22	
	2	220.29	0.88	220.29		20	
	3	217.03	0.87	217.03		17	
	4	255.79	1.28	255.79		14	
	5	322.9	17.27	323.36	1022.48	9	Gravity- Rerouting
L	1	231.26		231.26	231.26	12	Gravity- Rerouting

* Preferred Option. Areas D1, D2, and D4 not included in totals.

Total Rehabilitation=	1907.17 feet
Total Force Mains=	2859.29 feet
Total Gravity Mains (≤ 8')=	5847.23 feet
Total Gravity Mains (> 8' ≤ 15')=	2761.96 feet
Total Gravity Mains (>15')=	895.64 feet
Total Gravity Mains	9504.83 feet

Capacity Calculations for Sea Ranch Road Existing Sewer

- Total acres for existing sewerflow = 40.15 AC (Appendix C, pg. 4) (after rerouting)
- Total acres of proposed flow = 23.24 AC (Appendix C, pg. 5)
  Total = 63.39 AC

* assume 530 GPD/AC (Appendix C, pg. 9)

530 GPD/AC (63.39 AC) = 33,597 GPD

$$Q = 33{,}597 \frac{gal}{day}\left(\frac{1\,day}{24\,hr}\right)\left(\frac{1\,hr}{60\,min}\right)\left(\frac{1\,min}{60\,sec}\right)\left(\frac{1\,ft^3}{7.48\,gal}\right) = 0.052\ cfs$$

8" dia VCP = n = 0.013
Slope = 11.84% = 0.1184

Q 8-hr day = 0.156 cfs

$$Q_{full} = \frac{1.486}{n} A R^{2/3} S^{1/2} \qquad R = \frac{A}{P} = \frac{\pi/4\,(8/12)^2}{\pi\,(8/12)} = 0.167$$

$$Q_{full} = \frac{1.486}{0.013}\left[\pi/4\,(8/12)^2\right](0.167)^{2/3}(0.1184)^{1/2}$$

$Q_{full} = 4.16$ cfs

24-hr $\frac{Q}{Q_{full}} = \frac{0.052}{4.16} = 0.0125$ 1.25% full ∴ OK

8-hr $\frac{Q}{Q_{full}} = \frac{0.156}{4.16} = 0.0375$ 3.75% full ∴ OK

Braemar Ranch
Sewer Main Extension
16743.01

Existing Properties Flowing to Sea Ranch Road Intersection after Rerouting

Area		APN	Acres (AC)	
Centinela Lane				
	1	047-102-017	0.49	
	2	047-102-018	1.15	
	3	047-102-019	1.01	
	4	047-102-020	1.01	
	5	047-102-021	1.01	
	6	047-102-022	1.10	
	7	047-102-023	0.89	
	8	047-102-024	0.89	
	9	047-102-025	0.90	
	10	047-102-026	0.89	
	11	047-102-027	0.88	
	12	047-102-028	0.88	
	13	047-110-010	1.56	
	14	047-110-011	1.57	
		Subtotal of Centinela Lane	14.22	
Camanil Drive between Centinela Lane and Sea Ranch Road				
	1	047-102-001	1.00	
	2	047-102-002	1.02	
	3	047-102-029	0.89	
	4	047-104-008	1.11	
	5	047-104-011	0.93	
	6	047-110-001	2.04	
	7	047-110-002	1.48	
		Subtotal of Campanil Dr between Centinela & Sea Ranch	8.46	
Campanil Drive from Cleanout to Intersection				
	1	047-101-008	1.74	
	2	047-101-009	1.81	
	3	047-101-010	1.23	
	4	047-101-011	1.02	
	5	047-101-012	1.01	
	6	047-101-013	1.22	
	7	047-102-003	1.02	
	8	047-102-004	1.02	
	9	047-102-005	1.01	
	10	047-102-006	1.00	
	11	047-102-007	0.99	
	12	047-102-008	0.99	
	13	047-103-001	1.56	
	14	047-103-002	1.85	
		Subtotal of Campanil Drive from Cleanout to Intersection	17.47	
		Total	**40.15**	**AC**
		Total Number of Parcels	**35**	

Braemar Ranch
Sewer Main Extension
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Proposed Properties Flowing to Sea Ranch Road

Area		APN	Acres (AC)	
H+J- Sea Ranch Road				
	1	047-103-003	1.09	
	2	047-103-004	1.32	
	3	047-103-005	1.09	
	4	047-103-006	0.97	
	5	047-103-007	1.06	
	6	047-103-008	1.83	
	7	047-103-009	2.58	
	8	047-103-010	1.81	
	9	047-103-011	1.03	
	10	047-103-012	1.14	
	11	047-104-001	0.99	
	12	047-104-002	1.10	
	13	047-104-003	1.02	
	14	047-104-004	1.03	
	15	047-104-005	1.34	
	16	047-104-006	1.72	
	17	047-104-010	2.12	
		Total	**23.24**	**AC**
		Total Number of Parcels	**17**	

Peaking Factor for a Peak Sewage Flow Rate
(Factor to be applied to the average daily peak month flow)

Peak month = 277,714 $\frac{gal}{day}$ (average)

110 $\frac{cycles}{day}$ (Braemar Lift Station Chart, Appendix A)

$277{,}741 \frac{gal}{day}\left(\frac{day}{110\ cycles}\right) = 2525 \frac{gal}{cycle}$

$2525 \frac{gal}{cycle} \times 5 \frac{cycles}{30\ min} = 420.83\ gpm$

$277{,}714 \frac{gal}{day} \Rightarrow 192.85\ gpm$

Peaking Factor = 420.83 gpm / 192.85 gpm = 2.18

∴ use Peaking Factor of 2.5

Braemar Ranch
Sewer Main Extension
16743.01

Additional Properties to be Served by the Braemar Lift Station

	Area	Description	Total Acres (AC)	No. of Parcels
1	A1	Cliff Drive from Exist. MH to Yankee Farm Road Inters. MH (APN 047-092-012 to 047-082-022)	12.62	9
2	A2	Cliff Drive from Yankee Farm Road Inters. to MH (APN 047-082-021 to 047-082-008)	25.83	19
3	D	Cliff Drive MH to Marina Drive and Sea Ranch Road Inters. (APN 047-022-001 to 047-021-011)	5.80	5
4	D	Marina Drive and Sea Ranch Road Inters. To Exist. MH-A10-002	13.95	11
5	H+ J	Exist. MH-A10-002 to New S. MH on Sea Ranch Road (APN 047-104-001 to 047-103-003)	23.24	17
6	*	Braemar Drive and Yankee Farm Road Inters. to Braemar Ranch Lane Inters. (APN 047-081-007 to 047-030-046)	4.41	4
7	B+1	Yankee Farm Road from Braemar Drive to City Limit (APN 047-030-024 to 047-030-026)	8.43	7
8	E	Braemar Drive along Sea Cliff (APN 047-091-001 to 047-091-010)	4.84	3
9	C	Braemar Drive from Exit. MH up Calle Las Caleras (APN 047-081-003 to 047-021-026)	13.62	9
10	*	Braemar Drive and Braemar Ranch Lane MH-B11-002 to Exist. MH (APN 047-030-016 to 047-030-020)	2.29	2
11	*	Braemar Ranch Lane	1.39	1
12	*	Brosian Way (APN 047-030-009 to 047-030-030)	7.26	5
13	*	Campanil Drive Exist. Extension on Private Property (APN 047-110-013 to 047-041-003)	15.39	4
14	F	Braemar Drive Dirt Road and Sea Cliff Pumped Areas (APN 047-091-010 to 047-042-020)	25.34	16
15	G	Sea Ledge Lane- Braemar Terrace Pumped Areas (APN 047-082-002 to 047-082-010)	7.32	8
		Total	**171.74**	**120**

* Parcels to be served by the existing sewer system.

Additional Flow to Braemar Pump Station

Average Daily Demand:	530	GPD/AC
Additional Flow To Pump Station:	91,023	GPD
Average Flow Per Parcel:	759	GPD
Average Flow Rate to Pump Station in 24-hour period:	63	GPM
Average Flow Rate to Pump Station in 8-hour period:	190	GPM
Peak Flow in 24-hour Period (using 2.5 peaking factor):	158	GPM

PIPE HYDRAULIC CALCULATOR

(Based on Manning's Equation, Open channel flow)

PROJECT: Braemar Ranch Sewer Feasibility St
LOCATION: City of Santa Barbara
CLIENT: City of Santa Barbara
W.O. #: 16743.01

PENFIELD & SMITH, INC.
111 E. VICTORIA ST.
SANTA BARBARA, CA 93102
PHONE : 805-963-9532

CALCULATED BY: LOR DATE: 09-Jun-06
CHECKED BY: CEC DATE: 18-Dec-06
DIRECTORY: W:\work\16000-16999\16743\Report- Final 12-18-06

Flow is calulcated in gpm
Slope (decimal form) = 0.004
Pipe Diameter (in) = 8
Mannings "n" = 0.013

Capacity (d/D)	Flow (gpm)	V (fps)
50%	171.502	2.189
67%	270.739	2.427
75%	312.777	2.482
90%	365.572	2.462

Flow (gpm)										
d/D	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090
0.00	0.000	0.052	0.231	0.551	1.022	1.647	2.430	3.371	4.474	5.737
0.10	7.161	8.746	10.491	12.394	14.456	16.673	19.045	21.569	24.244	27.068
0.20	30.037	33.150	36.404	39.797	43.325	46.985	50.775	54.692	58.733	62.893
0.30	67.171	71.562	76.063	80.670	85.380	90.189	95.094	100.090	105.174	110.341
0.40	115.588	120.910	126.304	131.765	137.289	142.871	148.507	154.193	159.924	165.695
0.50	171.502	177.339	183.203	189.088	194.989	200.901	206.819	212.737	218.651	224.555
0.60	230.443	236.310	242.151	247.958	253.727	259.451	265.123	270.739	276.291	**281.772**
0.70	287.175	292.494	297.722	302.850	307.871	312.777	317.560	322.210	326.719	331.077
0.80	335.274	339.300	343.142	346.789	350.228	353.444	356.422	359.145	361.592	363.743
0.90	365.572	367.049	368.138	368.794	368.961	368.562	367.485	365.554	362.449	357.396
1.00	343.003									

281

Velocity "V" (fps)										
d/D	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090
0.00	0.000	0.195	0.308	0.403	0.486	0.562	0.633	0.699	0.762	0.821
0.10	0.878	0.933	0.985	1.036	1.084	1.131	1.177	1.221	1.264	1.306
0.20	1.347	1.386	1.425	1.462	1.499	1.534	1.569	1.603	1.636	1.668
0.30	1.699	1.730	1.760	1.789	1.818	1.846	1.873	1.899	1.925	1.951
0.40	1.975	1.999	2.023	2.046	2.068	2.090	2.111	2.131	2.151	2.171
0.50	2.189	2.208	2.226	2.243	2.259	2.276	2.291	2.306	2.321	2.335
0.60	2.348	2.361	2.373	2.385	2.396	2.407	2.417	2.427	2.436	2.444
0.70	2.452	2.459	2.466	2.472	2.477	2.482	2.486	2.489	2.492	2.494
0.80	2.495	2.496	2.496	2.495	2.493	2.490	2.487	2.482	2.476	2.470
0.90	2.462	2.452	2.441	2.429	2.414	2.397	2.378	2.354	2.325	2.285
1.00	2.189									

Braemar Ranch
Sewer Main Extention
16743.01

Existing and Proposed Flow to the Braemar Lift Station Summary Table

	Area (AC)	% of Total Area	Average Daily Flow[1] (GPD)	Average Flow (GPM)	Peak Flow[2] (GPM)
Existing Conditions					
Parcels Contributing to 16" Pipe	327.29	62.0%	172,045	119	299
Parcels Contributing to 15" Pipe	138.43	26.2%	72,767	51	126
Parcels Contributing to 8" Pipe	62.56	11.8%	32,888	23	57
Total Existing	**528.28**	**100.0%**	**277,700**	**193**	**482**
Additional Parcels					
Parcels Contributing to 16" Pipe	-	-	-	-	-
Parcels Contributing to 15" Pipe	-	-	-	-	-
Parcels Contributing to 8" Pipe	171.74	100.0%	91,023	63	158
Total Additional Parcels	**171.74**	**100.0%**	**91,023**	**63**	**158**
Pipe Rerouting					
Parcels Contributing to 16" Pipe	-	-	-	-	-
Parcels Contributing to 15" Pipe	-71.37	-	-37,824	-26	-66
Parcels Contributing to 8" Pipe	71.37	-	37,824	26	66
Total Existing + Proposed	**700.02**	**-**	**368,723**	**256**	**640**
Total Contributing to 16" Pipe	**327.29**	**-**	**172,045**	**119**	**299**
Total Contributing to 15" Pipe	**67.06**	**-**	**34,943**	**24**	**61**
Total Contributing to 8" Pipe	**305.67**	**-**	**161,734**	**112**	**281**

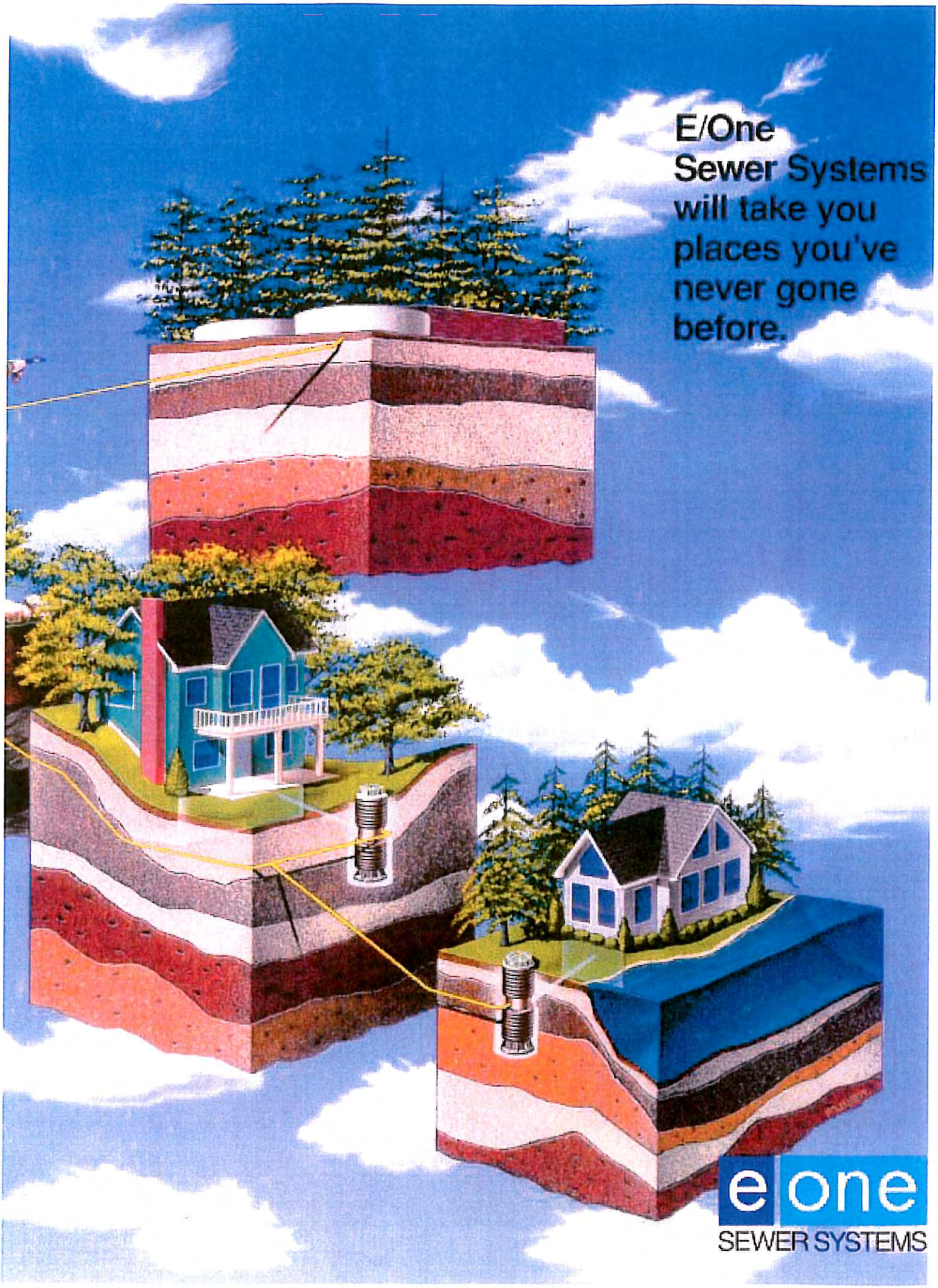
[1] For Existing Conditions: Average Flow calculated based on known pump station average daily flow; for Proposed Condiotions, Average Flow based on 530 GPD/AC.

[2] Peaking Factor = 2.5

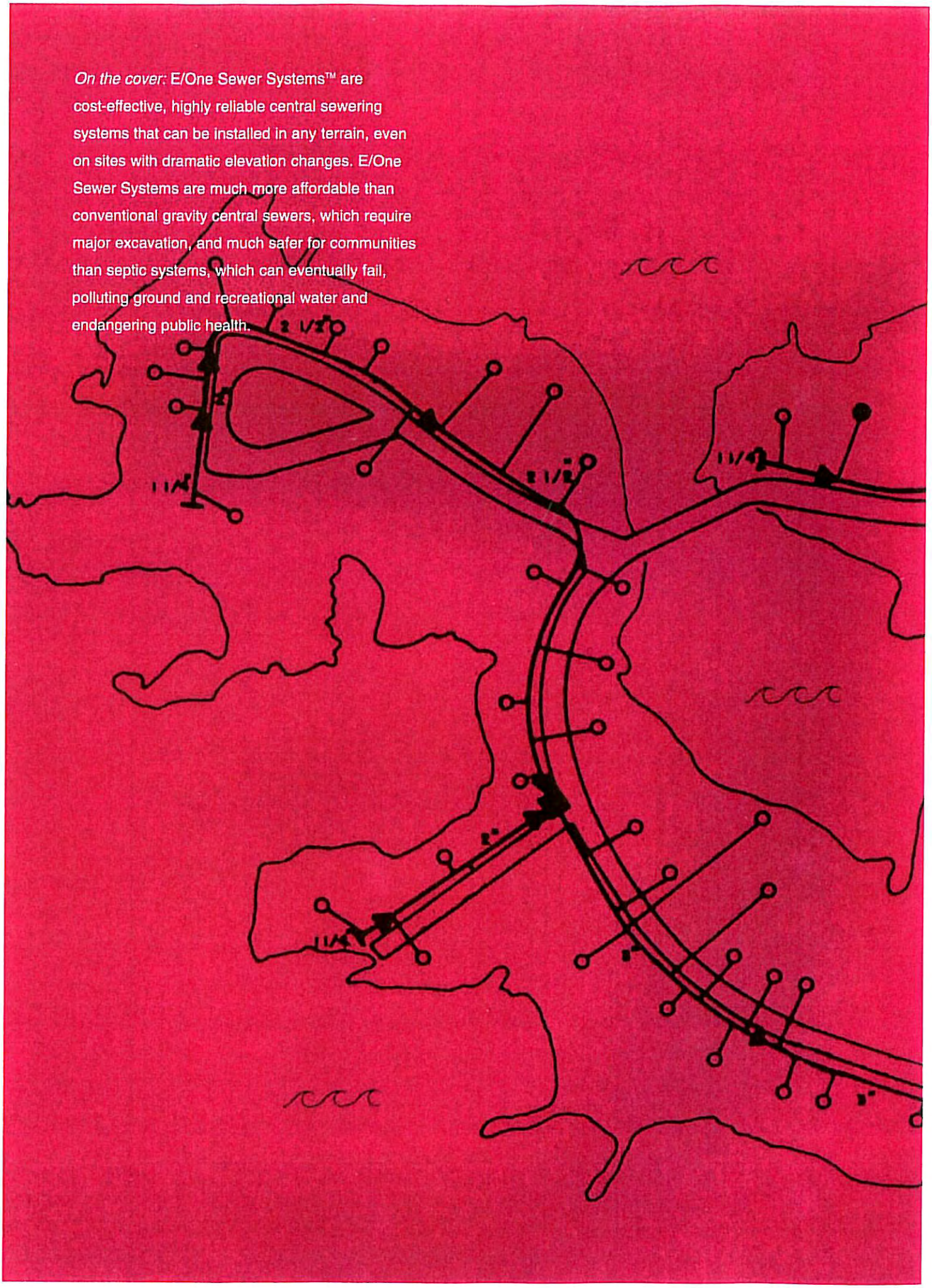
Calculated Average Daily Demand per Acre for Existing Conditions:

= Average Daily Flow Rate (GPD) / Total Exisitng Contributing Area (AC)
= 277,700 GPD / 528.28 AC
= **525.67 GPD/AC**

APPENDIX D
Individual Pump System Information


E/One
Sewer Systems
will take you
places you've
never gone
before.
e one
SEWER SYSTEMS

On the cover: E/One Sewer Systems™ are cost-effective, highly reliable central sewering systems that can be installed in any terrain, even on sites with dramatic elevation changes. E/One Sewer Systems are much more affordable than conventional gravity central sewers, which require major excavation, and much safer for communities than septic systems, which can eventually fail, polluting ground and recreational water and endangering public health.



E/One Sewer Systems™ give you the freedom to sewer anywhere–at up to half the cost of gravity sewers.

Rugged hills. Isolated flatlands. Coastal areas. Or sites with high water tables. With E/One behind you, you can sewer where no one has sewered before.

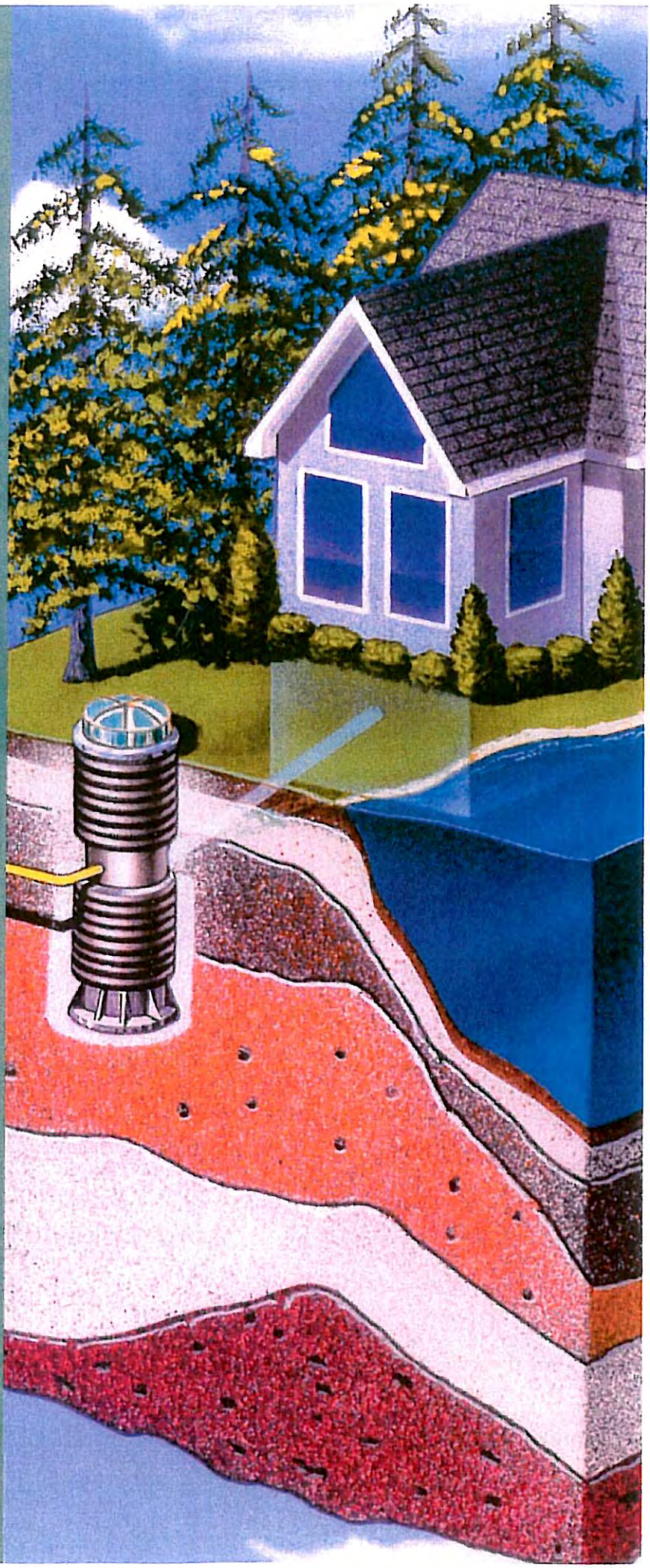
That's because E/One Sewer Systems™ follow the contour of the land. So they can go anywhere. Without destroying the landscape.

They're easier to install than conventional gravity sewers, so they greatly reduce the high cost of sewering. And they're highly reliable. So they lower operating costs.

They're also safer than septic systems, which are environmental time bombs threatening ground and recreational water.

Cost-efficient. Reliable. Goes anywhere. And safer for the whole community.

Isn't that the direction you want to go?



The E/One Sewer System.

In the world of sewer system technology, less is more. The E/One Sewer System requires only a shallow trench and small 2- to 4-inch diameter piping. So, unlike conventional gravity central sewers, which use a 24-inch pipe and require deep excavation, the E/One Sewer System is not destructive to the landscape's natural or built features. It also costs significantly less to install and operate than a gravity system. It requires less maintenance. But it guarantees big results.

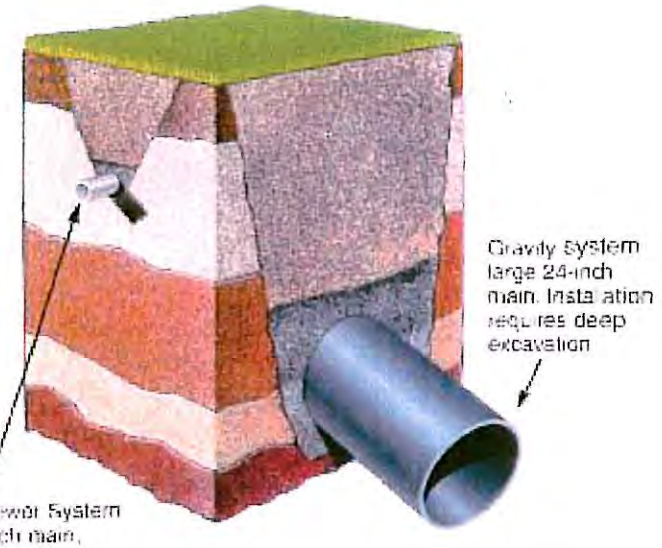
Here's the idea behind the E/One Sewer System. Both the gravity sewer system and the E/One Sewer System are known as central sewer systems. (Septic systems fall into a whole other category of waste disposal—see "The High Cost of Septic Systems" on the following page.) Most cities and many villages use central sewering, which simply means that waste is transferred, usually by a pipe or main, to a central treatment plant.

Gravity sewers are the "original" central sewers, with origins in the Roman aqueducts. Unfortunately, the technology behind gravity sewers is also centuries-old: they're bulky systems using a large main and can require major excavation to install. They must be accurately placed and bedded along a continuous downward grade. Plus they're expensive and not entirely efficient in transporting waste because they can tend to leak.

The more advanced E/One Sewer System employs highly sophisticated technology and has become known for its reliability, minimal maintenance, low upfront costs, reduced operating expenses, and ability to be installed at any site, regardless of the challenges of topography. And only the E/One Sewer System with its GP 2000 grinder pump overcomes the challenges of low-pressure systems performing dependably day in and day out.

Small Is Beautiful.

Conventional gravity sewers use a 24-inch large-diameter pipe, or main, which requires major excavation and severely disrupts the landscape and any built structures such as lawns, driveways and plantings. The E/One Sewer System uses an unobtrusive small-diameter 2- to 4-inch main installed right below the frostline, following the natural topography of the land.



Gravity system large 24-inch main. Installation requires deep excavation.

E/One Sewer System 2- to 4-inch main, installed to follow the contour of the land.

engineered to do one job perfectly.™

The GP 2000 grinder pump, the heart of the E/One Sewer System, provides wastewater storage, grinding, and pumping in a single unit. Translation: it lowers operating costs, the cost of waste collection and reduces maintenance.

The E/One Sewer System grinder pump is engineered to do one thing perfectly and in the process will help communities manage their growth and maintain quality of life.

What it is. How it works. Why it's

Defy Gravity with E/One.

The beauty of the E/One Sewer System is that, unlike conventional central sewers, it defies gravity. Because installation follows the natural contour of the land, it is ideal for all terrain, including land that is flat, wet, rocky, or hilly. It gives the freedom to sewer anywhere including sites where old septic systems have contaminated water and posed severe public health issues.

How Does It Look From Where You Are?

Aesthetics are a major consideration for homeowners. The E/One Sewer System is virtually out of sight—the only visible part is a low-profile cover that blends seamlessly into the environment but provides easy access for servicing operations.

A Sense of Site.

Multi-branch E/One Sewer Systems serve the entire community and give engineers, developers, community planners, and homeowners the freedom to sewer anywhere, on any kind of site.

better.

The Price Is Right.

E/One can solve sewering problems and replace failing septic systems at aproximately half the cost of conventional gravity sewers. E/One Sewer Systems sharply reduce both front-end costs and ongoing maintenance costs.

The Advantages of the E/One Sewer System.

Homeowners

- Safe—protects water quality and enhances quality of life
- Reduces costs of housing—both initial and ongoing
- Visually benign—only evidence is a low-profile cover that is easily camouflaged
- Does not disrupt the beauty of the landscape or damage built structures
- Virtually no preventive maintenance required of homeowner
- Central sewer increases value of home

Municipalities/Developers

- Permits freedom to sewer anywhere in any kind of terrain
- Low initial costs make central sewers economically feasible
- Low initial costs make development economically feasible
- Central sewer increases value of development units
- High reliability—maintenance is minimal
- Reduces operating costs
- Protective of public health
- Permits regulatory compliance

Engineers/Operators

- Proven engineering and design
- Ideal for every terrain and building environment
- Cost-effective central sewering solution for new construction or retrofits
- Engineering and technical support during design, construction, installation, and operation
- Reliable performance means reduced O&M costs
- When needed, E/One pumps are easy and safe to access and service
- Designed to keep maintenance to absolute minimum

Contractors/Construction Managers

- Installation follows contour of the land—does not require major excavation
- Needs only shallow trenches—increases ease and safety of installation procedures
- Labor and material costs are much less than gravity sewer systems

The High Cost of Septic Systems.

While septic systems may be a common way of disposing of residential sanitary waste, they are, at best, a temporary solution and come at a high cost to public health. All over America, septic systems have degraded ground and recreational water, creating serious safety problems. Because of failing septic systems, water is not safe to drink. Children are not free to play near contaminated lakes and streams. Outbreaks of waterborne disease become common. Quality of life is eroded. In addition, failing septic systems decrease real estate values. E/One Sewer Systems can go wherever septic systems were initially used, reclaiming water quality and quality of life while providing an efficient, cost effective solution to wastewater disposal and treatment. In fact, communities retrofitting with E/One Sewer Systems have reported dramatic improvements in coliform levels in as little as 30 days after installation.

E/One Sewer Systems are at home in communities all over the country.

Many communities have been made possible because of the E/One Sewer System idea and hundreds more have been made safe once again after failing septic systems created serious public health problems by contaminating ground and recreational water.

The E/One Sewer System delivers safe, cost-effective, reliable performance and enables controlled growth, permitting communities to maintain their quality of life at a cost they can afford.

Representative Projects

Weatherby Lake, an established municipality in Missouri, installation start date 1977.

Pierce County, a community in the Lakes Area of Washington state, installation start date 1983.

Fairfield Glade, a lakefront and golf course community in the Cumberland Mountains of Tennessee, installation start date 1975.

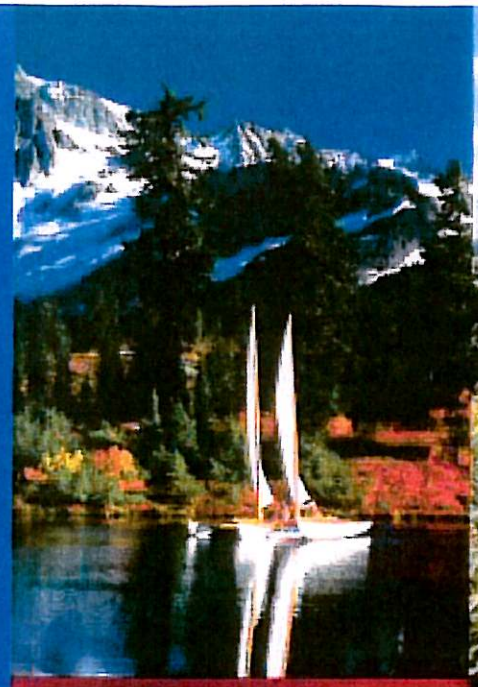
Riverview Landing, 160-acre wooded site overlooking the historic Mohawk River, Albany, New York, installation start date 1987.

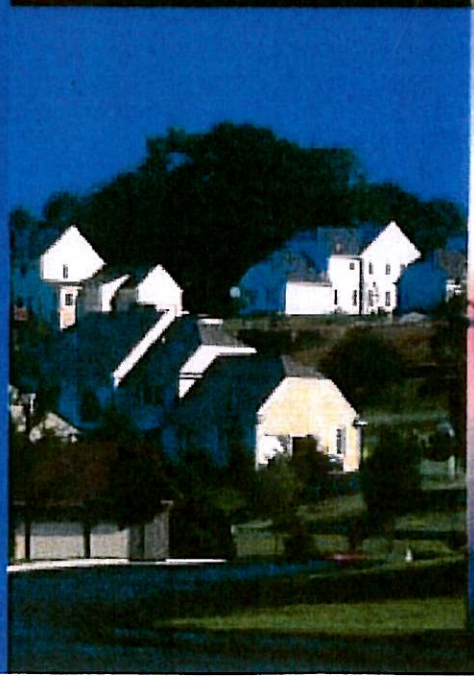
Quaker Lake, a small lakefront community in Pennsylvania, installation start date 1976.

Catawba Island, a resort community in Ohio, installation start date 1989.

Suwannee, a coastal community in Florida, installation start date 1996.

Forest Highlands, a golf course community in Flagstaff, Arizona, installation start date 1987.





There's no limit to where you can go with E/One Sewer Systems behind you.

We hope this brochure has served as a useful introduction to how the E/One Sewer System works and why it is a cost-effective, reliable central sewering solution.

Of course, there's more to E/One than our highly engineered product. The people behind the product are here to answer your questions, keep you informed, and work with you on your project every step of the way from concept through design and construction.

For more information, call, fax, or visit us at:

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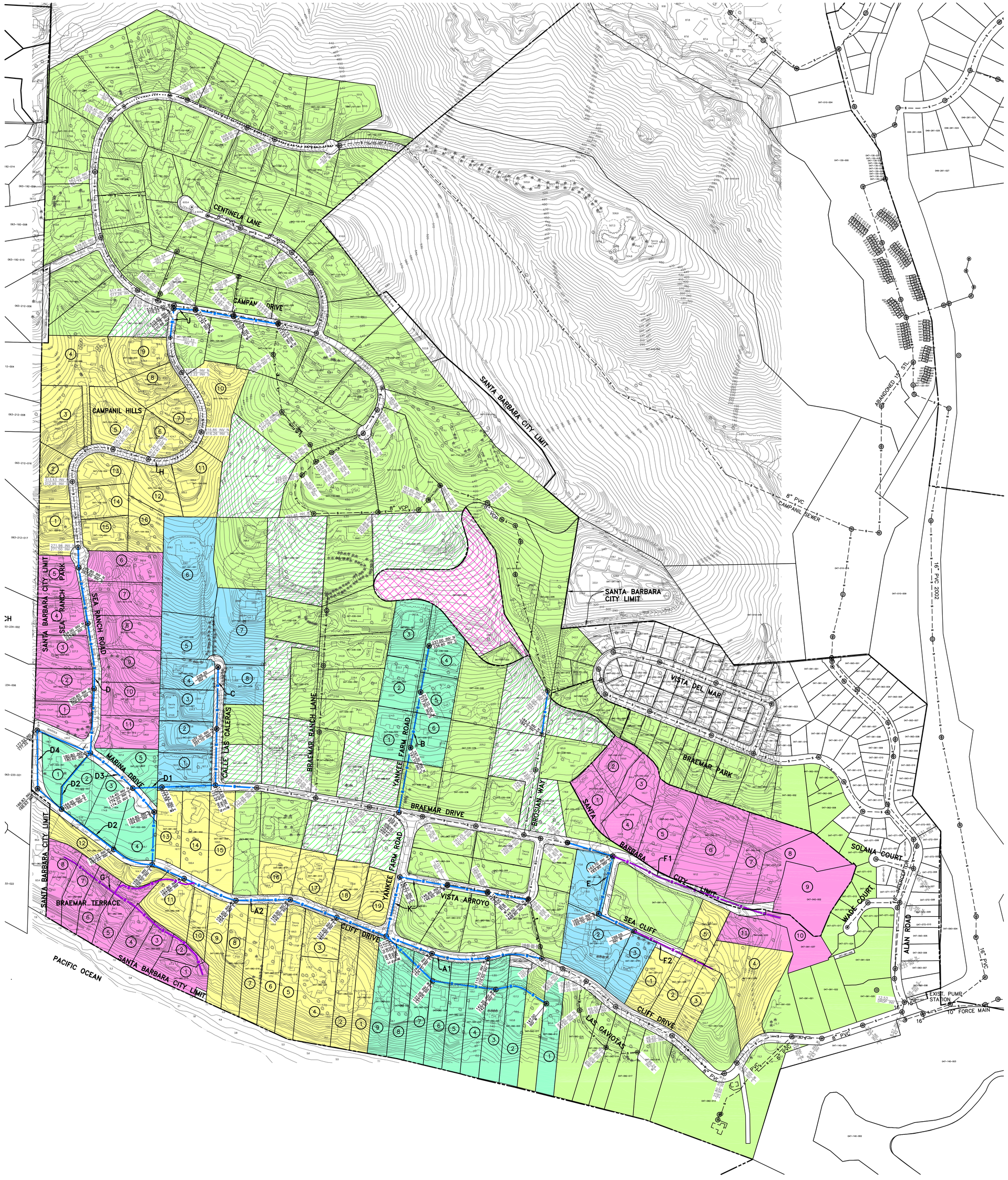
www.eone.com

We'll help you get wherever you want to go.



LEGEND

- PARCELS CURRENTLY SERVED BY CITY SEWER
- AREA A1– PARCELS TO BE SERVED BY CITY SEWER MAIN EXTENSION
- AREA A2– PARCELS TO BE SERVED BY CITY SEWER MAIN EXTENSION
- AREA B– PARCELS TO BE SERVED BY CITY SEWER MAIN EXTENSION
- AREA C– PARCELS TO BE SERVED BY CITY SEWER MAIN EXTENSION
- AREA D– PARCELS TO BE SERVED BY CITY SEWER MAIN EXTENSION
- AREA D#– PARCELS TO BE SERVED BY CITY SEWER MAIN EXTENSION
- AREA E– PARCELS TO BE SERVED BY CITY SEWER MAIN EXTENSION
- AREA F1– PARCELS TO BE SERVED BY CITY SEWER MAIN EXTENSION
- AREA F2– PARCELS TO BE SERVED BY CITY SEWER MAIN EXTENSION
- AREA G– PARCELS TO BE SERVED BY CITY SEWER MAIN EXTENSION
- AREA H– PARCELS TO BE SERVED BY CITY SEWER MAIN EXTENSION
- PARCELS WHICH COULD BE SERVED BY EXISTING CITY SEWER
- OUT–OF–CITY PARCELS POTENTIALLY SERVED BY EXISTING CITY SEWER
- PROPOSED SEWER MAIN EXTENSION– GRAVITY MAIN
- PROPOSED SEWER MAIN EXTENSION– GRAVITY MAIN ALTERNATIVE
- PROPOSED SEWER MAIN EXTENSION– FORCEMAIN
- EXISTING CITY SEWER MAIN
- EXISTING CITY SEWER MAIN TO BE ABANDONED
- +130.50 INV W / +130.30 INV E — PROPOSED SEWER MAIN EXTENSION INVERTS
- +130.50 INV W / +130.30 INV E — EXISTING CITY SEWER MAIN INVERTS
- PROPOSED SEWER MANHOLE
- EXISTING SEWER MANHOLE

N

SCALE: 1"=200'
0 200 400 600

NO.	DATE	REVISIONS	APPD.

Penfield&Smith
ENGINEERS • SURVEYORS • PLANNERS
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Mailing Address: P.O. Box 98, Santa Barbara, CA 93102
Phone: (805) 963-9532 Fax: (805) 966-9801

DESIGN CEC CHECKED
CARRIE E. COLLINS DATE:
PROJECT ENGINEER
R.C.E. 70345 (EXP. 09-30-08)

CITY OF SANTA BARBARA
REVIEWED BY:
SIGNATURE DATE

EXHIBIT 1
EXISTING AND PROPOSED SEWER MAINS
BRAEMAR RANCH SEWER EXTENSION PLAN
SANTA BARBARA, CALIFORNIA

P&S PROJECT NO. 16743.01
SHEET 1 OF 1
PLAN DATE

48-ENG SAVE DATE:1/5/2007 1:59:28 PM PLOT BY:Carrie Collins PLOT DATE:1/9/2007 2:19:01 PM PLOT SCALE:1:1

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