

**Exhibit No.:**  
**Issue:** Facility Capacity  
**Witness:** Robert O. Gaebe  
**Sponsoring Party:** Aqua Missouri  
**Type of Exhibit:** Direct Testimony  
**Case No.:** SC-2007-0044, et al.  
**Date Testimony Prepared:** November 29, 2006

**FILED**  
DEC 4 2006  
Missouri Public  
Service Commission

**MISSOURI PUBLIC SERVICE COMMISSION**

**AQUA MISSOURI, INC.**

**DIRECT TESTIMONY  
OF  
ROBERT O. GAEBE**

**BECKER v. AQUA MISSOURI, INC.**

**CASE NO. SC-2007-0044**

**BEFORE THE PUBLIC SERVICE COMMISSION  
OF THE STATE OF MISSOURI**

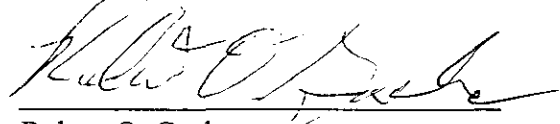
Jason Becker, )  
Becker Development Company, )  
 )  
Complainant, )  
 )  
vs. )  
 )  
Aqua Missouri, Inc., )  
 )  
Respondent. )

Case No. SC-2007-0044

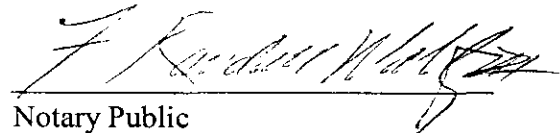
**AFFIDAVIT OF ROBERT O. GAEBE**

STATE OF MISSOURI )  
 )  
COUNTY OF MONTGOMERY )

Robert O. Gaebe, being of lawful age, on his oath states: that he has participated in the preparation of the foregoing Direct Testimony in question and answer form, consisting of 2 pages to be presented in the above case; that the answers in the foregoing Direct Testimony were given by him; that he has knowledge of the matters set forth in such answers; and that such matters are true and correct to the best of his knowledge and belief.

  
Robert O. Gaebe

Before me personally appeared Robert O. Gaebe, who being duly sworn stated that the foregoing is true and correct.

  
Notary Public

My Commission Expires: \_\_\_\_\_



F. RANDALL WALTZ, III  
Cole County  
My Commission Expires  
January 22, 2007

**DIRECT TESTIMONY**  
**OF**  
**ROBERT O. GAEBE**  
**BECKER v. AQUA MISSOURI, INC.**  
**CASE NO. SC-2007-0044**

**Q. State your name and business address.**

A. My name is Robert O. Gaebe. My business address is 108 North Sturgeon, Montgomery City, Missouri, 63361.

**Q. By whom are you employed and in what capacity?**

A. I am the lead civil engineer for the Lewis-Bade Group in its Montgomery City office. I provide design, evaluation, and consulting services regarding site design, storm water management and sanitary sewer systems and treatment.

**Q. Please state your educational background and experience.**

A. My educational program and experience are set forth in Schedule ROG-1 attached to this testimony.

**Q. On whose behalf are you submitting testimony in this proceeding?**

A. I am appearing on behalf of Aqua Missouri, Inc. Aqua Missouri, Inc. is the owner and operator of the Lake Carmel Sewer Treatment Facility which is in question in this matter.

**Q. Please state the basis of your involvement in the incident case.**

A. Aqua Missouri, Inc. received two complaints filed against it by Jason Becker and Becker Development, LLC. The complaints related to the Lake Carmel Sewer Treatment Facility and the complainant's lots held for development within the borders of the area treated by the Lake Carmel

1 Sewer Treatment Facility. Aqua Missouri, Inc. requested that I review the existing treatment facility,  
2 review the complaint and documents relating to the facility, previously provided by the Complainant,  
3 and determine the capacity of the existing treatment facility. Aqua Missouri, Inc. requested that I  
4 submit testimony and testify on its behalf with respect to the complaint filed by Becker.

5 **Q. What is the purpose of your testimony?**

6 A. The purpose of my testimony is to present observations, conclusions and recommendations  
7 relating to the Lake Carmel Sewer Treatment Facility and its capacity. More specifically, I will  
8 address the existing size and capacity of the Lake Carmel Sewer Treatment Facility, the current flows  
9 into and out of that treatment facility and the number of connections which the current treatment  
10 facility may handle. Finally, I will testify as to my professional opinion as to whether the Lake  
11 Carmel Sewer Treatment Facility may handle the extra connections which Mr. Becker seeks to  
12 connect to the Lake Carmel Sewer Treatment Facility.

13 **Q. Please state your conclusions, opinions, and recommendations with regard to the instant**  
14 **proceeding.**

15 A. Based upon my independent review and analysis of the Lake Carmel Sewer Treatment  
16 Facility, along with the information and reports provided by Aqua Missouri, Inc. which had  
17 originally been provided by Becker, I have reached the conclusions and opinions regarding the Lake  
18 Carmel Sewer Treatment Facility, which are contained in Exhibit ROG-2 attached to this testimony.

19 **Q. Does that conclude your direct testimony?**

20 A. Yes.

A responsible and challenging **Professional Engineering** role in an organization that relies heavily on cost control and the on-time completion of its design activities.

**Experience:**

- **Thirty+ years** of professional engineering and construction experience.
- Background which covers engineering, management, and construction.
- Heavy involvement in site development, sewage treatment, and subdivisions.
- In depth involvement with computer applications.
- Accustomed to both positions and demands of responsibility, and comfortable with results accountability.

**Training:** Completed post-baccalaureate studies in Form work Design at North Carolina State University in 1983. Self taught BASIC, LISP, DOS, WINDOWS, as well in depth uses of spreadsheet and CAD program applications.

**Strengths:** Well trained and educated ... very experienced ... management approach ... strong project background ... stable ... engineering professional ... results oriented.

Projects: Hundreds of large to small projects including subdivisions, site plans, sanitary sewage conveyance & treatment, and stormwater detention systems for private and governmental institutions amongst them are:

- Redfield Development – Eugene, MO. A golf course/subdivision with sewage treatment, wells and irrigation integral with stormwater detention.
- Wildwood Crossings – Jefferson City, MO. A shopping center including stormwater detention, sewer and water main extensions.
- Faith Christian Fellowship – Truesdale, MO. A church expansion site plan involving well evaluation, parking, and sewage treatment.
- Governors Mansion – Jefferson City, MO. Sewer evaluation and redesign.

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**EMPLOYMENT HISTORY**

Feb. 2004 to Present	Lead Civil, Lewis Bade Group, Montgomery City office.
Oct. 2002 to Feb. 2004	Lead Civil, Lewis Bade Group, Fulton office.
1992 to Sep. 2002	<b>Lead Civil</b> , Central Missouri Professional Services, Inc. Projects too numerous to mention either done personally or supervised the efforts of others. Project size has ranged from small office building sites to 100+ acre developments. Specific details available upon request.
May 1988 to 1992	<b>Civil Engineer</b> , MARTELL & ASSOCIATES P.A., Kansas City, Kansas. Responsible for the design and development of the civil plans and specifications for numerous engineering projects
Apr. 1987 to May 1988	<b>Private Practice</b> , Fulton, MO. Various surveying and engineering projects.
Oct. 1975 to Apr. 1987	<b>Construction and Construction Management Positions</b> , DANIEL INTERNATIONAL CORPORATION. Various Locations, with the exception of occasional breaks between projects. Initially part of the survey department but primarily engaged full time as an engineer with this major company in some of its biggest and most prestigious projects, details of which are available upon request.
Mar. 1986 to Apr. 1987	<b>G.E. Lexan Plastic Plant Project</b> , Burkeville, AL.
Oct. 1985 to Mar. 1986	<b>ARCO Lisburne Facilities Project</b> , Portland, OR.
July 1983 to June 1985	<b>Tanajib Marine Facility Project</b> , Tanajib, Saudi Arabia..
Oct. 1982 to July 1983	On break between projects, conducted post baccalaureate studies in Form work Design at North Carolina State University.
July 1981 to Oct. 1982	<b>ARCO CO<sub>2</sub> PROJECT</b> , Walsenburg, CO.
Apr. 1979 to Apr. 1981	<b>Haj Terminal Project</b> , Jeddah, Saudi Arabia \$10 billion airport project.
Oct. 1975 to Apr. 1979	<b>Callaway Nuclear Project</b> , Callaway Co., MO,
May 1972 to Oct. 1975	<b>Southern Mapping &amp; Engineering Co.</b> , Greensboro, NC. Acquired first professional engineering and surveying experience with this company.

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**PERSONAL DATA**

BIRTH DATE  
HEALTH  
MARITAL STATUS

April 6, 1949  
Excellent  
Married

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**REFERENCES**

Numerous references available upon request.

# ***Lewis-Bade Inc.***

108 North. Sturgeon, Montgomery City, Mo 63361

Ph. (573) 564-8108, Fax (573) 564-8108

Corporate Headquarters: 101 E. Walton, Warrenton, MO 63383, Ph. (636) 456-2615

***Registered Land Surveyors & Professional Engineers***

## **Lake Carmel Three Cell Sewage Lagoon**

### **Sewage Capacity Analysis**

**November 2006**

#### **LOCATION**

The Lake Carmel Three Cell Sewage Lagoon is located east of Old Forge R. approximately ½ mile south of the intersection with Old Brazito Rd. To the west is the Lake Carmel Subdivision which the lagoon serves.

#### **CONDITIONS**

This analysis will address four sewage loading conditions. The first condition is based on the Missouri State Operating Permit MO-0088986. The second is based on the existing housing utilizing the lagoon. The third is based on a proposed increase in housing utilizing the lagoon. The fourth is a reverse engineering of flows based on the asbuilt conditions of the lagoon. All conditions will use the upper value (100) of the 75-100 gal/day sewage flow per person per day as given in DNR Chapter 8 – Design Guides 10 CSR 20-8.020 (11) (B) 3. Table I. The 3.7 persons per household from the design guide will also be used. This results in a design assumption of 370 gallons per household per day.

#### **ATTACHMENTS**

Attached to this analysis are several attachments which will be referenced in the course of this document. There are three similar spreadsheet showing the permitted, existing, and proposed sewage flow calculations. Also included is a "Three Cell Lagoon – Asbuilt" drawing showing lagoon measurements and a sheet of corresponding "Volume Calculations". There are eight pages of sewage flow measurements during March and June of 2006. The March measurements were made during a period of normal lake level. At this time there was considerable spring action of groundwater below the dam. The June measurements were made after repairs to some of the manholes. At this time there had been a long dry period. The lake was down and there was little or no spring action of groundwater. Finally attached is a copy of the operating permit.

#### **PERMIT CONDITION**

The operation permit gives a design flow of 12,600 gal./ day and a design population equivalent of 126. The permit reflects the 100 gallons per day per person. 126 persons x 100 gal./ person = 12,600 gallons. 126 persons is the equivalent of 34 single family residences as can be seen on the permit conditions attachment. This shows the operation permit used the 3.7 PE/household & 100 gal/person or 370 gpd/household figures.

#### **EXISTING CONDITION**

There are currently 49 single family residences utilizing the lagoon. The attachment for existing conditions shows this results in a design flow of 18,130 gal./day. An measured average flow of 17,836 gal./day was made over a 10 day period in June 2006. See "Lake Carmel – Sewage Flow Rates" attachment. (Note: this is after a long dry period) These figures also support the 3.7 PE/household & 100 gal/person figures. These flow measurements also show that the design capacity of the existing lagoon (12,000 gpd) is exceeded. There are 13 additional lots that have no homes on them. These results in a potential of 62 homes attached to the system.

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### **PROPOSED CONDITION**

There is a proposal to add another 32 lots to the subdivision which would increase the potential houses contributing sewage to 94. Using the 3.7 PE/household & 100 gal/person figures, this will result in a projected daily flow of 35,520 gallons.

### **ASBUILT CONDITION**

Measurements of the existing lagoon were made in October 2006. Both horizontal layout and numerous effluent depths in each of the cells were measured. The results of these measurements can be seen in the "Three Cell Lagoon - Asbuilt" attachment. Depth contours for each of the three cells are shown. These measurements are used in the "Asbuilt Calculations" attachment which gives the volumes and areas of the lagoon system. The reversed calculated "Daily flow based on 120 day storage" of 5,554 gpd is of interest. If this were a newly designed lagoon this would be the factor that would regulate design flow. Accumulation of sludge is expected in a lagoon and will reduce the effective volume. The "BOD Loading based on 34 lb/acre surface area" results in a population equivalent (PE) of 119. This figure is very close to the permit conditions. The accuracy of these measurements is estimated to result in a possible 20% variation in the calculated quantities.

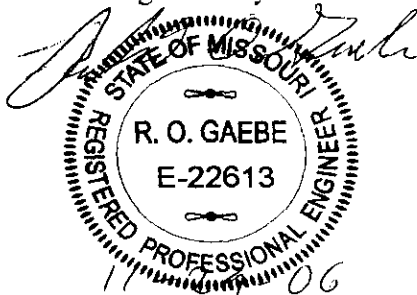
### **CONCLUSION**

The problem is sewage volume not BOD or TSS loading.

The "Existing Condition" design flow (18,130 gpd) and measured sewage flows (17,836 gpd) exceed the capacities of the permitted DNR design parameters (12,600 gpd) by approximately 40%.

The test results of the effluent discharge of this existing condition are within the required limits. This is in part due to the large infiltration of groundwater (INI) to the collection system "thinning" the effluent. The field measurements of June 2006 sewage flow of 17,836 gpd for 49 homes result in 364 gpd/household. The 170gpd/person by THHinc based on water records indicate that  $(364 - 170 = 194)$  approximately 194 gallons of flow per household or a total of 9,600 gallons is from infiltration. This is almost 4 times the infiltration estimated by THHinc using 30% of design flow or 51 gpd per house or 221gpd total. This could result in as much as 60% reduction in test results  $(221/364 = 60.7\%)$ .

I recommend that further investigation be made to locate and remove sources of ground water infiltrating into the sewage system prior to further development. If the actual flows can be lowered to below the design limits then testing of the effluent would indicate the advisability of adding additional loading to the system.



Robert O. Gaebe P.E.





# Project: Lake Carmel

## PERMIT CONDITIONS

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Ref Handbook of Applied Hyd. - Davis - 2nd Edition - McGraw-Hill - p892  
Hazen-Williams - Circular pipe formulas  
 $h=kQ^{1.85}$  h=head loss in feet k=constant Q=quantity gpm  
 $k=(3.55/C)^{1.85} * (L/d^{4.87})$  L=pipe length in feet d=pipe dia. In inches

## QUANTITY ESTIMATE CALCULATOR

### Residential

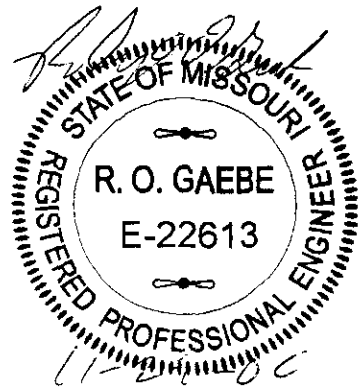
Single family dwellings

SOURCE	Units	People /Unit	Gal./ Person	Total gpd	BOD/ Person	BOD lb	BOD mg/l	max gpd	TSS .2LB/PE
	34	3.7	100	12580	0.17	21.39	203.706	100	25.16
TOTALS =				12,580		21.39	203.706		

## ESTIMATED QUANTITIES TO BE USED

(If other method is used for ADF & BOD, insert values below)

ADF gpd	BOD lb.	POP. EQUAV, by BOD by ADF		Dry Sludge ton/year		-65%	Flow
					BOD mg/l	BOD mg/l	Peak Factor
12,580	21.39	126	126	1.887	204	71	4.21



# Project: Lake Carmel

EXISTING CONDITIONS FEB 2006

2/7/2006 <Start date  
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Ref Handbook of Applied Hyd. - Davis - 2nd Edition - McGraw-Hill - p892  
Hazen-Williams - Circular pipe formulas  
 $h=kQ^{1.85}$   $h$ =head loss in feet  $k$ =constant  $Q$ =quantity gpm  
 $k=(3.55/C)^{1.85} * (L/d^{4.87})$   $L$ =pipe length in feet  $d$ =pipe dia. In inches

## QUANTITY ESTIMATE CALCULATOR

	Units	People /Unit	Gal./ Person	Total gpd	BOD/ Person	BOD lb	BOD mg/l	max gpd	TSS .2LB/PE
<b>SOURCE</b>									
<b>Residential</b>									
Single family dwellings	49	3.7	100	18130	0.17	30.82	203.706	100	36.26
<b>TOTALS =</b>				18,130		30.82	203.706		

## ESTIMATED QUANTITIES TO BE USED

(If other method is used for ADF & BOD, insert values below)

ADF gpd	BOD lb.	POP. EQUAV, by BOD by ADF		Dry Sludge ton/year		-65%	Flow
					BOD mg/l	BOD mg/l	Peak Factor
18,130	30.82	181	181	2.720	204	71	4.16



# Project: Lake Carmel

## PROPOSED CONDITIONS

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Ref Handbook of Applied Hyd. - Davis - 2nd Edition - McGraw-Hill - p892  
Hazen-Williams - Circular pipe formulas  
 $h=kQ^{1.85}$   $h$ =head loss in feet  $k$ =constant  $Q$ =quantity gpm  
 $k=(3.55 / C)^{1.85} * (L/d^{4.87})$   $L$ =pipe length in feet  $d$ =pipe dia. In inches

## QUANTITY ESTIMATE CALCULATOR

### Residential

Single family dwellings

SOURCE	Units	People /Unit	Gal./ Person	Total gpd	BOD/ Person	BOD lb	BOD mg/l	max gpd	TSS .2LB/PE
	96	3.7	100	35520	0.17	60.38	203.706	100	71.04
TOTALS =				35,520		60.38	203.706		

## ESTIMATED QUANTITIES TO BE USED

(If other method is used for ADF & BOD, insert values below)

ADF gpd	BOD lb.	POP. EQUAV, by BOD	by ADF	Dry Sludge ton/year		Flow
					BOD mg/l	Peak Factor
35,520	60.38	355	355	5.328	204	4.05

# LAKE CARMEL THREE CELL SEWAGE LAGOON - ASBUILT CALCULATIONS

## PRISMATIC EQUATION - VOLUME CALCULATIONS OCT, 2006

$$Q=h/6*(A1+A2+(A1^{.5}+A2^{.5})^2)$$

$$Q=h/3*(A1+A2+(A1*A2)^{.5})$$

### PRIMARY CELL

SECTION ELEV.	SECTION AREA	SECTION VOLUME	SUB TOTAL VOLUME		
			CF		GAL
-3.50	2683.00			Measured	
-3.00	9574.00	2,888	2,888	Cal	21599
-3.00	9574.00	0	2,888	Measured	21599
-2.50	13014.89	5,625	8,513	Cal	63676
-2.00	16983.00	7,478	15,990	Measured	119607
-1.50	19020.20	8,996	24,986	Cal	186897
0.00	25824.00	33,503	58,490	Measured	437503
	Volume % of total=		66%		
	Area % of total =		56%		

### 2 ND CELL

SECTION ELEV.	SECTION AREA	SECTION VOLUME	SUB TOTAL VOLUME		
			CF		GAL
-2.50	3718.00			Measured	
-2.00	6013.41	2,410	2,410	Cal	18027
-1.50	8858.00	3,695	6,105	Measured	45665
-1.00	10847.88	4,918	11,023	Cal	82452
0.00	15432.00	13,073	24,096	Measured	180237
	Volume % of total=		27%		
	Area % of total =		34%		

### 3 RD CELL

SECTION ELEV.	SECTION AREA	SECTION VOLUME	SUB TOTAL VOLUME		
			CF		GAL
-2.50	203.00			Measured	
-2.00	1638.00	403	403	Cal	3014
-2.00	1638.00	0	403	Measured	3014
-1.50	2263.74	971	1,374	Cal	10279
0.00	4747.00	5,144	6,519	Measured	48759
	Volume % of total=		7%		
	Area % of total =		10%		

TOTAL SURFACE= 46,003 SF

TOTAL VOLUME = 89,104 cf

Daily flow based on 120 day storage =

5,554 gpd

PE Home

56 15.0

BOD Loading based on 34lb/acre surface area =

20.2 lb

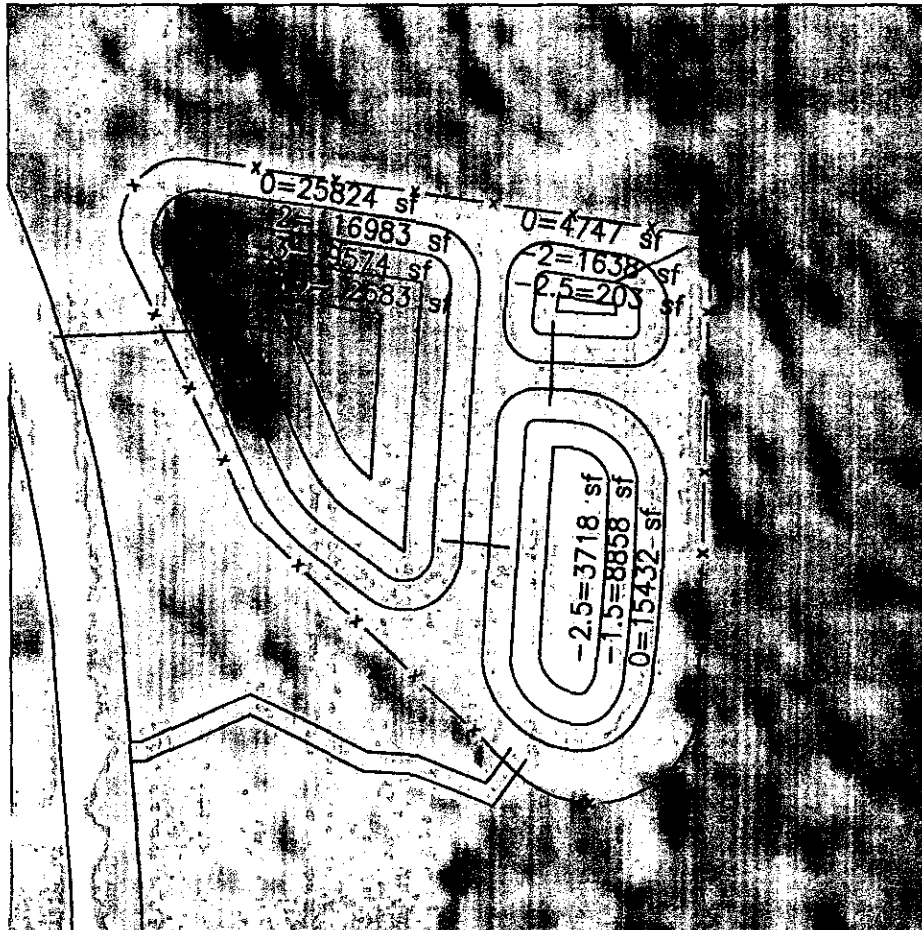
119 32.0

10 CSR 20-8.020 (13) (A)

# Three Cell Lagoon — Asbuilt

Lake Carmel Treatment Facility

Prepared by Lewis-Bade Inc. — October, 2006



Lake Carmel – Sewage Flow Rates

Page 1 of 8

Measured at lagoon discharge point		3/23/2006	27,987	3/23/2006	17,952
		3/23/2006	25,721	3/23/2006	19,418
		3/23/2006	27,058	3/23/2006	19,418
Date of	(gpd)	3/23/2006	33,284	3/23/2006	18,324
Flow		3/23/2006	35,627	3/23/2006	10,198
3/22/2006	22,170	3/23/2006	33,284	3/23/2006	17,983
3/22/2006	21,436	3/23/2006	34,737	3/23/2006	17,983
3/22/2006	28,454	3/23/2006	32,452	3/23/2006	17,016
3/22/2006	22,850	3/23/2006	29,786	3/23/2006	13,503
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3/22/2006	24,675	3/23/2006	29,632	3/23/2006	15,788
3/22/2006	25,120	3/23/2006	29,632	3/23/2006	15,788
3/22/2006	20,677	3/23/2006	24,392	3/23/2006	20,743
3/22/2006	28,469	3/23/2006	22,037	3/23/2006	20,864
3/22/2006	22,668	3/23/2006	22,037	3/23/2006	23,767
3/22/2006	23,639	3/23/2006	23,339	3/23/2006	27,626
3/22/2006	25,041	3/23/2006	27,367	3/23/2006	20,132
3/22/2006	26,902	3/23/2006	25,993	3/23/2006	21,419
3/22/2006	28,335	3/23/2006	27,584	3/23/2006	22,716
3/22/2006	22,207	3/23/2006	28,203	3/23/2006	26,244
3/22/2006	27,542	3/23/2006	26,206	3/23/2006	27,996
3/22/2006	27,055	3/23/2006	23,475	3/23/2006	20,530
3/22/2006	29,801	3/23/2006	25,206	3/23/2006	21,922
3/22/2006	29,801	3/23/2006	29,021	3/23/2006	21,569
3/22/2006	22,548	3/23/2006	29,021	3/23/2006	22,963
3/22/2006	22,270	3/23/2006	31,958	3/23/2006	28,720
3/22/2006	25,848	3/23/2006	27,728	3/23/2006	20,306
3/22/2006	27,307	3/23/2006	26,602	3/23/2006	20,114
3/22/2006	29,138	3/23/2006	22,829	3/23/2006	24,238
3/22/2006	27,885	3/23/2006	20,156	3/23/2006	23,804
3/22/2006	30,604	3/23/2006	28,831	3/23/2006	24,238
3/22/2006	27,885	3/23/2006	26,183	3/23/2006	26,448
3/22/2006	26,390	3/23/2006	26,183	3/23/2006	27,122
3/22/2006	26,390	3/23/2006	26,183	3/23/2006	27,122
3/22/2006	27,789	3/23/2006	20,581	3/23/2006	27,379
3/22/2006	27,789	3/23/2006	21,109	3/23/2006	28,117
3/22/2006	24,806	3/23/2006	19,757	3/23/2006	29,839
3/22/2006	24,806	3/23/2006	19,757	3/23/2006	32,229
3/22/2006	24,410	3/23/2006	15,898	3/23/2006	32,229
3/22/2006	24,806	3/23/2006	16,702	3/23/2006	29,019
3/22/2006	24,806	3/23/2006	12,311	3/23/2006	28,715
3/22/2006	26,784	3/23/2006	11,900	3/23/2006	27,837
3/22/2006	26,784	3/23/2006	19,574	3/23/2006	27,837
Daily Average	25,756	3/23/2006	11,791	3/23/2006	27,094
		3/23/2006	15,615	3/23/2006	27,094
3/23/2006	26,784	3/23/2006	14,490	Daily Average 23,847	
3/23/2006	28,172	3/23/2006	12,269		
3/23/2006	27,987	3/23/2006	17,952	3/24/2006	22,181

# Lake Carmel – Sewage Flow Rates

Page 2 of 8

3/24/2006	20,553	3/24/2006	25,669		
3/24/2006	29,357	3/24/2006	22,452	3/25/2006	23,881
3/24/2006	29,357	3/24/2006	23,701	3/25/2006	27,562
3/24/2006	27,227	3/24/2006	23,701	3/25/2006	28,459
3/24/2006	29,480	3/24/2006	24,421	3/25/2006	21,648
3/24/2006	29,480	3/24/2006	24,421	3/25/2006	28,887
3/24/2006	29,480	3/24/2006	24,421	3/25/2006	28,887
3/24/2006	29,480	3/24/2006	21,903	3/25/2006	27,078
3/24/2006	26,863	3/24/2006	26,312	3/25/2006	23,419
3/24/2006	30,419	3/24/2006	26,517	3/25/2006	22,131
3/24/2006	30,419	3/24/2006	27,865	3/25/2006	23,608
3/24/2006	30,718	3/24/2006	28,153	3/25/2006	22,317
3/24/2006	29,349	3/24/2006	27,865	3/25/2006	24,485
3/24/2006	28,272	3/24/2006	26,769	3/25/2006	28,792
3/24/2006	29,349	3/24/2006	23,263	3/25/2006	28,792
3/24/2006	22,511	3/24/2006	23,027	3/25/2006	28,792
3/24/2006	24,239	3/24/2006	22,269	3/25/2006	27,708
3/24/2006	23,176	3/24/2006	23,514	3/25/2006	23,703
3/24/2006	23,176	3/24/2006	23,754	3/25/2006	23,703
3/24/2006	31,113	3/24/2006	23,754	3/25/2006	23,277
3/24/2006	31,766	3/24/2006	26,700	3/25/2006	22,409
3/24/2006	30,917	3/24/2006	27,999	3/25/2006	22,409
3/24/2006	30,851	3/24/2006	28,942	3/25/2006	23,277
3/24/2006	30,851	3/24/2006	25,969	3/25/2006	20,550
3/24/2006	34,084	3/24/2006	22,947	3/25/2006	20,550
3/24/2006	33,888	3/24/2006	26,139	3/25/2006	23,091
3/24/2006	32,450	3/24/2006	29,396	3/25/2006	25,694
3/24/2006	32,450	3/24/2006	29,396	3/25/2006	23,091
3/24/2006	33,268	3/24/2006	29,396	3/25/2006	27,961
3/24/2006	32,549	3/24/2006	29,807	3/25/2006	20,721
3/24/2006	33,408	3/24/2006	21,100	3/25/2006	21,282
3/24/2006	33,973	3/24/2006	21,100	3/25/2006	32,668
3/24/2006	33,408	3/24/2006	23,432	3/25/2006	34,061
3/24/2006	26,399	3/24/2006	23,432	3/25/2006	30,832
3/24/2006	25,104	3/24/2006	28,201	3/25/2006	27,225
3/24/2006	25,104	3/24/2006	23,671	3/25/2006	27,225
3/24/2006	21,263	3/24/2006	24,239	3/25/2006	25,945
3/24/2006	27,989	3/24/2006	23,671	3/25/2006	23,990
3/24/2006	24,345	3/24/2006	22,615	3/25/2006	23,990
3/24/2006	27,913	3/24/2006	24,228	3/25/2006	20,071
3/24/2006	26,616	3/24/2006	22,615	3/25/2006	18,044
3/24/2006	26,616	3/24/2006	22,158	3/25/2006	15,832
3/24/2006	29,156	3/24/2006	22,615	3/25/2006	15,224
3/24/2006	21,303	3/24/2006	28,658	3/25/2006	13,176
3/24/2006	26,729	3/24/2006	29,900	3/25/2006	17,038
3/24/2006	29,235	3/24/2006	29,900	3/25/2006	10,523
3/24/2006	22,383	3/24/2006	23,881	3/25/2006	16,375
3/24/2006	23,700	Daily Average	26,769	3/25/2006	12,128

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3/25/2006	12,376	3/25/2006	37,354	3/26/2006	19,694
3/25/2006	16,979	Daily Average	23,843	3/26/2006	19,694
3/25/2006	14,972			3/26/2006	10,304
3/25/2006	11,063	3/26/2006	39,813	3/26/2006	17,849
3/25/2006	15,442	3/26/2006	31,893	3/26/2006	17,256
3/25/2006	16,212	3/26/2006	36,285	3/26/2006	15,269
3/25/2006	16,212	3/26/2006	37,772	3/26/2006	14,290
3/25/2006	17,148	3/26/2006	37,772	3/26/2006	16,368
3/25/2006	16,228	3/26/2006	37,772	3/26/2006	15,340
3/25/2006	17,144	3/26/2006	37,733	3/26/2006	19,204
3/25/2006	18,071	3/26/2006	37,030	3/26/2006	10,484
3/25/2006	12,281	3/26/2006	31,100	3/26/2006	14,051
3/25/2006	14,738	3/26/2006	31,100	3/26/2006	12,688
3/25/2006	14,177	3/26/2006	31,100	3/26/2006	18,506
3/25/2006	15,971	3/26/2006	30,605	3/26/2006	12,403
3/25/2006	19,489	3/26/2006	31,100	3/26/2006	11,448
3/25/2006	10,749	3/26/2006	34,884	3/26/2006	13,900
3/25/2006	13,474	3/26/2006	36,367	3/26/2006	16,392
3/25/2006	17,254	3/26/2006	34,884	3/26/2006	15,891
3/25/2006	23,750	3/26/2006	34,884	3/26/2006	15,891
3/25/2006	28,493	3/26/2006	32,827	3/26/2006	18,854
3/25/2006	27,761	3/26/2006	32,827	3/26/2006	24,022
3/25/2006	23,562	3/26/2006	36,987	3/26/2006	23,415
3/25/2006	22,093	3/26/2006	34,260	3/26/2006	25,338
3/25/2006	23,446	3/26/2006	38,330	3/26/2006	26,849
3/25/2006	27,126	3/26/2006	38,330	3/26/2006	28,610
3/25/2006	20,054	3/26/2006	37,433	3/26/2006	29,930
3/25/2006	20,054	3/26/2006	37,433	3/26/2006	22,595
3/25/2006	21,337	3/26/2006	33,648	3/26/2006	25,141
3/25/2006	23,924	3/26/2006	29,942	3/26/2006	25,141
3/25/2006	26,998	3/26/2006	29,903	3/26/2006	26,499
3/25/2006	26,998	3/26/2006	31,123	3/26/2006	21,666
3/25/2006	30,145	3/26/2006	31,123	3/26/2006	24,234
3/25/2006	32,254	3/26/2006	39,708	3/26/2006	30,134
3/25/2006	32,822	3/26/2006	39,708	3/26/2006	29,019
3/25/2006	32,822	3/26/2006	31,050	3/26/2006	30,134
3/25/2006	34,633	3/26/2006	34,029	3/26/2006	38,073
3/25/2006	38,934	3/26/2006	32,361	3/26/2006	38,073
3/25/2006	30,367	3/26/2006	32,361	3/26/2006	31,992
3/25/2006	30,367	3/26/2006	30,100	3/26/2006	33,374
3/25/2006	31,808	3/26/2006	34,211	3/26/2006	33,305
3/25/2006	33,747	3/26/2006	35,636	3/26/2006	33,305
3/25/2006	32,764	3/26/2006	34,233	3/26/2006	34,763
3/25/2006	35,210	3/26/2006	23,884	3/26/2006	37,801
3/25/2006	35,210	3/26/2006	14,572	3/26/2006	38,290
3/25/2006	32,764	3/26/2006	10,107	3/26/2006	39,780
3/25/2006	39,813	3/26/2006	11,575	3/26/2006	31,243
3/25/2006	39,813	3/26/2006	12,063	3/26/2006	31,207



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3/26/2006	30,305	3/27/2006	45,887	3/27/2006	47,594
3/26/2006	38,321	3/27/2006	47,934	3/27/2006	48,228
3/26/2006	36,905	3/27/2006	35,101	3/27/2006	49,110
Daily Average	28,095	3/27/2006	33,542	3/27/2006	48,397
		3/27/2006	30,158	3/27/2006	41,541
3/27/2006	35,007	3/27/2006	34,508	Daily Average	37,763
3/27/2006	31,935	3/27/2006	29,524		
3/27/2006	35,007	3/27/2006	27,499	3/28/2006	40,950
3/27/2006	36,585	3/27/2006	25,867	3/28/2006	48,096
3/27/2006	36,585	3/27/2006	20,050	3/28/2006	42,627
3/27/2006	36,585	3/27/2006	28,621	3/28/2006	40,950
3/27/2006	36,585	3/27/2006	29,999	3/28/2006	43,644
3/27/2006	29,166	3/27/2006	29,999	3/28/2006	43,921
3/27/2006	29,166	3/27/2006	25,528	3/28/2006	43,644
3/27/2006	29,166	3/27/2006	34,490	3/28/2006	43,644
3/27/2006	32,458	3/27/2006	34,527	3/28/2006	45,484
3/27/2006	33,052	3/27/2006	37,892	3/28/2006	45,048
3/27/2006	32,618	3/27/2006	34,910	3/28/2006	42,988
3/27/2006	32,858	3/27/2006	34,910	3/28/2006	38,279
3/27/2006	34,164	3/27/2006	31,867	3/28/2006	36,785
3/27/2006	34,164	3/27/2006	32,253	3/28/2006	36,785
3/27/2006	30,073	3/27/2006	32,253	3/28/2006	39,321
3/27/2006	31,573	3/27/2006	35,388	3/28/2006	39,321
3/27/2006	31,294	3/27/2006	31,679	3/28/2006	38,098
3/27/2006	38,116	3/27/2006	39,976	3/28/2006	38,098
3/27/2006	35,830	3/27/2006	36,255	3/28/2006	40,262
3/27/2006	38,892	3/27/2006	31,051	3/28/2006	40,262
3/27/2006	44,469	3/27/2006	34,237	3/28/2006	40,262
3/27/2006	49,999	3/27/2006	35,638	3/28/2006	38,586
3/27/2006	49,999	3/27/2006	35,638	3/28/2006	38,586
3/27/2006	44,075	3/27/2006	37,458	3/28/2006	38,586
3/27/2006	43,332	3/27/2006	39,187	3/28/2006	38,586
3/27/2006	44,182	3/27/2006	38,833	3/28/2006	38,586
3/27/2006	49,537	3/27/2006	42,464	3/28/2006	39,182
3/27/2006	41,159	3/27/2006	42,464	3/28/2006	33,483
3/27/2006	41,159	3/27/2006	40,263	3/28/2006	34,974
3/27/2006	42,788	3/27/2006	37,981	3/28/2006	36,078
3/27/2006	44,175	3/27/2006	40,263	3/28/2006	37,629
3/27/2006	49,848	3/27/2006	39,577	3/28/2006	37,629
3/27/2006	42,873	3/27/2006	36,655	3/28/2006	37,629
3/27/2006	42,873	3/27/2006	37,347	3/28/2006	36,222
3/27/2006	43,455	3/27/2006	32,187	3/28/2006	34,679
3/27/2006	43,455	3/27/2006	33,512	3/28/2006	34,679
3/27/2006	41,783	3/27/2006	38,754	3/28/2006	36,561
3/27/2006	40,858	3/27/2006	44,262	3/28/2006	37,662
3/27/2006	40,858	3/27/2006	44,262	3/28/2006	38,904
3/27/2006	44,718	3/27/2006	47,413	3/28/2006	40,515
3/27/2006	44,718	3/27/2006	49,107	3/28/2006	37,662

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3/28/2006	36,568	3/28/2006	44,365	3/29/2006	34,518
3/28/2006	36,568	3/28/2006	42,909	3/29/2006	23,289
3/28/2006	36,568	3/28/2006	46,038	3/29/2006	21,144
3/28/2006	33,748	3/28/2006	46,038	3/29/2006	29,929
3/28/2006	33,748	3/28/2006	47,641	3/29/2006	20,311
3/28/2006	30,650	3/28/2006	48,639	3/29/2006	28,895
3/28/2006	38,258	3/28/2006	48,639	3/29/2006	22,818
3/28/2006	33,973	Daily Average 37,240		3/29/2006	29,234
3/28/2006	37,926			3/29/2006	26,459
3/28/2006	37,926	3/29/2006	48,598	3/29/2006	19,359
3/28/2006	36,435	3/29/2006	48,218	3/29/2006	17,147
3/28/2006	34,953	3/29/2006	46,520	3/29/2006	11,438
3/28/2006	34,953	3/29/2006	45,071	3/29/2006	14,221
3/28/2006	37,136	3/29/2006	43,375	3/29/2006	10,940
3/28/2006	32,627	3/29/2006	43,375	3/29/2006	13,746
3/28/2006	30,132	3/29/2006	43,375	3/29/2006	12,553
3/28/2006	28,692	3/29/2006	43,375	3/29/2006	12,553
3/28/2006	25,838	3/29/2006	46,485	3/29/2006	18,842
3/28/2006	24,424	3/29/2006	47,997	3/29/2006	18,842
3/28/2006	24,848	3/29/2006	46,485	3/29/2006	10,077
3/28/2006	24,848	3/29/2006	47,997	3/29/2006	13,847
3/28/2006	29,615	3/29/2006	47,997	3/29/2006	20,341
3/28/2006	29,615	3/29/2006	44,257	Daily Average 35,525	
3/28/2006	32,502	3/29/2006	37,282	SUMMATION	
3/28/2006	31,968	3/29/2006	37,282		
3/28/2006	31,968	3/29/2006	37,282	3/22/06	25,756
3/28/2006	28,823	3/29/2006	35,325	3/23/06	23,847
3/28/2006	31,968	3/29/2006	42,402	3/24/06	26,769
3/28/2006	33,807	3/29/2006	49,607	3/25/06	23,843
3/28/2006	33,807	3/29/2006	49,607	3/26/06	28,095
3/28/2006	35,235	3/29/2006	49,607	3/27/06	37,763
3/28/2006	36,672	3/29/2006	40,267	3/28/06	37,240
3/28/2006	36,672	3/29/2006	40,267	3/29/06	35,525
3/28/2006	38,939	3/29/2006	48,376	Total Average 29,904	
3/28/2006	38,939	3/29/2006	45,485		
3/28/2006	30,805	3/29/2006	48,584	Maximum	49,999
3/28/2006	33,808	3/29/2006	48,584	Minimum	10,077
3/28/2006	35,415	3/29/2006	47,646		
3/28/2006	37,056	3/29/2006	43,123		
3/28/2006	38,656	3/29/2006	44,619		
3/28/2006	37,910	3/29/2006	49,053		
3/28/2006	38,656	3/29/2006	43,123		
3/28/2006	39,505	3/29/2006	41,633		
3/28/2006	34,715	3/29/2006	45,609		
3/28/2006	36,511	3/29/2006	45,609		
3/28/2006	37,809	3/29/2006	44,068		
3/28/2006	35,316	3/29/2006	41,008		
3/28/2006	38,363	3/29/2006	37,976		

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Measured at lagoon discharge point		06/09/06	11,493	06/10/06	10,982
		06/09/06	11,493	06/10/06	11,199
		06/09/06	10,873	06/10/06	10,096
Date of	(gpd)	06/09/06	11,493	Day avg.	10,857
Flow		06/09/06	10,537		
		06/09/06	12,280	06/11/06	12,165
06/08/06	11,202	06/09/06	11,108	06/11/06	12,330
06/08/06	11,331	06/09/06	12,280	06/11/06	16,852
06/08/06	12,015	06/09/06	12,594	06/11/06	18,793
06/08/06	12,015	06/09/06	12,594	06/11/06	26,501
06/08/06	12,644	06/09/06	12,594	06/11/06	32,915
06/08/06	13,376	06/09/06	12,594	06/11/06	35,989
06/08/06	13,617	06/09/06	12,545	06/11/06	35,989
06/08/06	13,617	06/09/06	12,545	06/11/06	36,534
06/08/06	14,502	06/09/06	12,545	06/11/06	37,418
06/08/06	14,307	06/09/06	12,328	06/11/06	39,113
06/08/06	13,773	06/09/06	11,485	06/11/06	37,987
06/08/06	13,773	06/09/06	10,895	06/11/06	35,483
06/08/06	14,428	06/09/06	10,142	06/11/06	31,951
06/08/06	14,011	Day avg.	11,763	06/11/06	31,951
06/08/06	14,428			06/11/06	30,959
06/08/06	14,428	06/10/06	10,153	06/11/06	31,719
06/08/06	14,011	06/10/06	10,722	06/11/06	32,998
06/08/06	14,011	06/10/06	10,834	06/11/06	32,430
06/08/06	14,428	06/10/06	11,420	06/11/06	34,281
06/08/06	13,690	06/10/06	11,420	06/11/06	30,788
06/08/06	14,428	06/10/06	12,298	06/11/06	31,381
06/08/06	14,428	06/10/06	11,666	06/11/06	29,771
06/08/06	14,086	06/10/06	11,666	06/11/06	29,152
06/08/06	14,086	06/10/06	11,504	06/11/06	24,359
06/08/06	14,086	06/10/06	11,504	06/11/06	22,046
06/08/06	14,086	06/10/06	10,725	06/11/06	19,604
06/08/06	14,086	06/10/06	11,002	06/11/06	20,968
06/08/06	14,790	06/10/06	11,002	06/11/06	21,883
06/08/06	13,981	06/10/06	11,002	06/11/06	24,048
Day avg.	13,713	06/10/06	11,002	Day avg.	28,612
		06/10/06	11,002		
06/09/06	11,476	06/10/06	10,748	06/12/06	27,684
06/09/06	11,896	06/10/06	10,660	06/12/06	28,182
06/09/06	11,896	06/10/06	10,660	06/12/06	28,182
06/09/06	11,485	06/10/06	10,112	06/12/06	24,778
06/09/06	10,713	06/10/06	10,023	06/12/06	24,778
06/09/06	11,485	06/10/06	10,112	06/12/06	25,774
06/09/06	11,485	06/10/06	9,941	06/12/06	25,377
06/09/06	11,897	06/10/06	10,112	06/12/06	26,483
06/09/06	11,897	06/10/06	10,206	06/12/06	26,483
06/09/06	12,115	06/10/06	10,945	06/12/06	25,208
06/09/06	12,115	06/10/06	10,982	06/12/06	24,575

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06/12/06	25,699	06/13/06	20,529	06/15/06	16,622
06/12/06	24,793	06/13/06	18,866	06/15/06	15,976
06/12/06	23,590	06/13/06	18,126	06/15/06	16,623
06/12/06	24,187	Day avg.	22,939	06/15/06	16,604
06/12/06	24,267			06/15/06	16,623
06/12/06	23,372	06/14/06	17,051	06/15/06	15,060
06/12/06	22,029	06/14/06	14,542	06/15/06	14,648
06/12/06	23,506	06/14/06	15,128	06/15/06	15,209
06/12/06	21,197	06/14/06	15,722	06/15/06	14,648
06/12/06	19,465	06/14/06	14,993	06/15/06	15,209
06/12/06	20,351	06/14/06	16,623	06/15/06	13,746
06/12/06	18,869	06/14/06	16,958	06/15/06	15,448
06/12/06	19,108	06/14/06	14,868	06/15/06	15,996
06/12/06	20,348	06/14/06	13,114	06/15/06	15,405
06/12/06	21,114	06/14/06	15,438	06/15/06	15,948
06/12/06	21,943	06/14/06	14,126	06/15/06	15,284
06/12/06	25,780	06/14/06	20,714	06/15/06	14,325
06/12/06	24,287	06/14/06	18,638	06/15/06	13,818
06/12/06	25,174	06/14/06	18,143	06/15/06	14,325
Day avg.	23,886	06/14/06	18,143	Day avg.	15,255
		06/14/06	18,089		
06/13/06	22,728	06/14/06	17,735	06/16/06	13,196
06/13/06	24,971	06/14/06	18,099	06/16/06	13,235
06/13/06	23,301	06/14/06	19,362	06/16/06	14,399
06/13/06	24,971	06/14/06	19,972	06/16/06	14,399
06/13/06	26,426	06/14/06	19,362	06/16/06	13,620
06/13/06	23,301	06/14/06	20,054	06/16/06	13,620
06/13/06	23,751	06/14/06	19,308	06/16/06	13,620
06/13/06	26,426	06/14/06	19,239	06/16/06	13,921
06/13/06	25,495	06/14/06	17,116	06/16/06	14,063
06/13/06	24,500	06/14/06	18,590	06/16/06	14,063
06/13/06	20,026	06/14/06	18,174	06/16/06	14,482
06/13/06	19,994	06/14/06	18,752	06/16/06	14,482
06/13/06	20,741	06/14/06	18,091	06/16/06	13,891
06/13/06	21,473	06/14/06	17,429	06/16/06	14,437
06/13/06	25,796	Day avg.	17,452	06/16/06	13,735
06/13/06	23,546			06/16/06	15,242
06/13/06	25,619	06/15/06	13,924	06/16/06	14,715
06/13/06	24,368	06/15/06	14,531	06/16/06	15,242
06/13/06	22,914	06/15/06	13,763	06/16/06	14,715
06/13/06	24,264	06/15/06	14,348	06/16/06	15,865
06/13/06	23,989	06/15/06	15,293	06/16/06	14,715
06/13/06	23,748	06/15/06	15,925	06/16/06	13,559
06/13/06	22,193	06/15/06	15,304	06/16/06	13,034
06/13/06	21,384	06/15/06	15,145	06/16/06	13,034
06/13/06	22,193	06/15/06	15,755	06/16/06	12,517
06/13/06	21,284	06/15/06	15,757	06/16/06	12,318
06/13/06	21,262	06/15/06	16,391	06/16/06	12,555

Lake Carmel – Sewage Flow Rates

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06/16/06	12,669	06/18/06	21,379	Period 6/08/06-6/19/06	
06/16/06	11,850	06/18/06	19,742	All avg.	17,836
06/16/06	12,374	06/18/06	22,188	Max	39,113
Day avg.	13,786	06/18/06	22,452	Min.	9,941
		06/18/06	21,694	Daily Averages	
06/17/06	11,542	06/18/06	21,650		
06/17/06	11,828	06/18/06	20,929		
06/17/06	11,828	06/18/06	20,419	06/08/06	13,713
06/17/06	11,449	06/18/06	20,419	06/09/06	11,763
06/17/06	11,820	06/18/06	20,841	06/10/06	10,857
06/17/06	12,889	06/18/06	20,419	06/11/06	28,612
06/17/06	13,437	06/18/06	20,841	06/12/06	23,886
06/17/06	13,437	06/18/06	19,981	06/13/06	22,939
06/17/06	13,471	06/18/06	21,488	06/14/06	17,452
06/17/06	13,530	06/18/06	21,602	06/15/06	15,255
06/17/06	13,471	06/18/06	19,698	06/16/06	13,786
06/17/06	12,671	06/18/06	21,561	06/17/06	14,383
06/17/06	14,090	06/18/06	18,550	06/18/06	21,820
06/17/06	14,090	06/18/06	18,928	06/19/06	19,905
06/17/06	12,502	Day avg.	21,820		
06/17/06	12,502				
06/17/06	14,473	06/19/06	19,072		
06/17/06	14,473	06/19/06	19,723	Period 3/22/06-3/29/06	
06/17/06	14,980	06/19/06	20,668	Total Average	29,904
06/17/06	14,482	06/19/06	20,443	Maximum	49,999
06/17/06	14,473	06/19/06	20,058	Minimum	10,077
06/17/06	14,150	06/19/06	19,909		
06/17/06	14,307	06/19/06	19,533		
06/17/06	14,054	06/19/06	18,635		
06/17/06	15,866	06/19/06	16,650		
06/17/06	16,460	06/19/06	17,232		
06/17/06	18,069	06/19/06	19,389		
06/17/06	19,311	06/19/06	21,901		
06/17/06	20,348	06/19/06	20,788		
06/17/06	21,500	06/19/06	19,351		
Day avg.	14,383	06/19/06	20,395		
		06/19/06	20,616		
06/18/06	23,754	06/19/06	20,395		
06/18/06	24,020	06/19/06	20,616		
06/18/06	23,001	06/19/06	21,391		
06/18/06	23,259	06/19/06	21,391		
06/18/06	22,791	06/19/06	20,205		
06/18/06	22,624	06/19/06	20,205		
06/18/06	23,163	06/19/06	19,251		
06/18/06	24,346	Day avg.	19,905		
06/18/06	24,346				
06/18/06	24,251				
06/18/06	24,251				

STATE OF MISSOURI

DEPARTMENT OF NATURAL RESOURCES

MISSOURI CLEAN WATER COMMISSION



MISSOURI STATE OPERATING PERMIT

In compliance with the Missouri Clean Water Law, (Chapter 644 R.S. Mo. as amended, hereinafter, the Law), and the Federal Water Pollution Control Act (Public Law 92-500, 92<sup>nd</sup> Congress) as amended,

Permit No. MO-0088986

Owner: AquaSource Services LP (ASSLP)  
Address: PO Box 7017, Jefferson City, MO 65102

Continuing Authority: Same as above  
Address: Same as above

Facility Name: ASSLP, Lake Carmel Wastewater Treatment Facility  
Address: West Brazito Road, Jefferson City, MO 65102

Legal Description: NE ¼, NW ¼, NE ¼, Sec. 33, T43N, R13W, Cole County

Receiving Stream: Unnamed tributary to Clark Fork (U)  
First Classified Stream and ID: Clark Fork (C) (01000)  
USGS Basin & Sub-watershed No.: (10300102-210003)

is authorized to discharge from the facility described herein, in accordance with the effluent limitations and monitoring requirements as set forth herein:

**FACILITY DESCRIPTION**

Outfall #001 - Subdivision - SIC #4952

Three-cell lagoon/sludge is retained in lagoon.  
Design population equivalent is 126.  
Design flow is 12,600 gallons per day.  
Actual flow is 10,400 gallons per day.  
Design sludge production is 1.9 dry tons/year.

This permit authorizes only wastewater discharges under the Missouri Clean Water Law and the National Pollutant Discharge Elimination System; it does not apply to other regulated areas. This permit may be appealed in accordance with Section 644.051.6 of the Law.

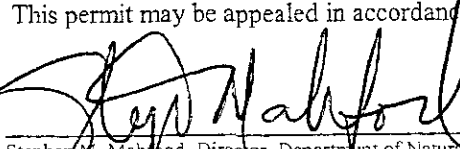
December 12, 2003


Effective Date

December 11, 2008

Expiration Date

MO 780-0041 (10-93)

  
Stephen M. Mahood, Director, Department of Natural Resources  
Executive Secretary, Clean Water Commission

  
G. Irene Crawford, Director, Northeast Regional Office