

IN THE TENNESSEE REGULATORY AUTHORITY AT NASHVILLE, TENNESSEE

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DETITION OF TENNESSEE	`

PETITION OF TENNESSEE

WASTEWATER SYSTEMS, INC., FOR
APPROVAL OF CAPITAL

IMPROVEMENT SURCHARGES AND
FINANCING ARRANGEMENTS

)

DOCKET NO. 14-00136

SUPPLEMENT RESPONSE TO STAFF DATA REQUESTS AND TO DISCOVERY REQUESTS FROM THE CONSUMER ADVOCATE

Tennessee Wastewater Systems, Inc. ("TWSI") submits the following supplemental response to TRA Staff Data Requests I-24, I-25, I-44, I-45, I-60, I-61, I-80 and I-81 and to Question 24 of the Discovery Requests from the Consumer Advocate:

RESPONSE:

The most complete compilation of all communications between TWSI and TDEC can be found in the internal files of TDEC. TWSI does not have access to those files but will provide whatever permission may be needed to allow the TRA Staff and the Consumer Advocate to access those files.

In an effort to be responsive to the questions, TDEC has gone through its own files and pulled out all records of communications between TDEC and TWSI concerning the four treatment systems that are the subject of this docket.

All SOP-related filings are publicly available on TDEC's website under "Dataviewers" and "Water Resources Permits Dataviewers." One can access the SOP file for each of the four treatment facilities at issue in this case by entering the name of the

facility or the SOP number. (Maple Green, SOP-01028; Smoky Village, SOP-05033; Summit View, SOP-06035; Cedar Hill, SOP-05039).

Informal communications between TWSI and TDEC are not in those "Dataviewer" files but in the internal files kept by TDEC (the "Water Log"). All of those communications which TWSI has been able to locate are attached as "Supplemental Exhibit 1."

Respectfully submitted,

BRADLEY ARANT BOULT CUMMINGS LLP

By:

Henry Walker (B.P.R. No. 000272) Bradley Arant Boult Cummings, LLP

1600 Division Street, Suite 700 Nashville, TN 37203

Phone: 615-252-2363

Email: hwalker@babc.com

From:

Charles Hyatt [charles.hyatt@adenus.com]

Sent:

Thursday, April 02, 2015 7:41 AM

To:

Walker, Henry

Subject:

FW: Cedar hill Submittal

From: Bob Pickney [mailto:bob.pickney@adenus.com]

Sent: Tuesday, March 31, 2015 10:08 AM

To: charles.hyatt@adenus.com
Subject: FW: Cedar hill Submittal



Bob Pickney, P.E., Esquire

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From: Brad Harris [mailto:Brad.Harris@tn.gov]
Sent: Wednesday, August 07, 2013 6:18 AM

To: Bob Pickney

Subject: RE: Cedar hill Submittal

Yes, we have it and are reviewing it nov.

Brad

From: Bob Pickney [bob.pickney@adenus.com] Sent: Tuesday, August 06, 2013 12:35 PM

To: Brad Harris

Cc: Sandra Dudley; Britton Dotson; Mike Thornton; 'Charles Hyatt'

Subject: Cedar hill Submittal

Brad.

I just wanted to confirm that you received the remediation plan last week – I need to move forward as soon as possible to schedule construction.

Thanks, Bob



Bob Pickney, P.E. Adenus Group

www.adenus.com (615)220-7160 - office (615) 604-4712 - cell (615) 220-7208 - fax

From:

Charles Hyatt [charles.hyatt@adenus.com]

Sent:

Thursday, April 02, 2015 7:40 AM

To:

Walker, Henry

Subject:

FW: Cedar Hill Enmergency Remediation

From: Bob Pickney [mailto:bob.pickney@adenus.com]

Sent: Tuesday, March 31, 2015 10:10 AM

To: charles.hyatt@adenus.com

Subject: FW: Cedar Hill Enmergency Remediation



Bob Pickney, P.E., Esquire

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From: Britton Dotson [mailto:Britton.Dotson@tn.gov]

Sent: Monday, June 03, 2013 7:11 AM

To: Bob Pickney; Sandra Dudley; Brad Harris; Ann Rochelle; Scotty Sorrells

Cc: 'Charles Hyatt'

Subject: RE: Cedar Hill Enmergency Remediation

We containly understand the need to have the system operable as soon as practical. We need to meet at your earliest convenience to discuss the pre-liner work. Tamicipate a degree of over excavation and a well-engineered base that will proceed the liner; however, before we start in that direction TDEC needs to make sure that we consider the man capable of adequately protecting groundwater from future releases.

Batton Deison

Exepuly Director, Water Quality Branch

Division of Water Resources

britton.dotson@tn.gov

(615) 532 0762

From: Bob Pickney [mailto:bob.pickney@adenus.com]

Sent: Sunday, June 02, 2013 3:34 PM **To:** Britton Dotson; Sandra Dudley

Cc: 'Charles Hyatt'

Subject: Cedar Hill Enmergency Remediation

Britton/Sandra,

I have equipment and personnel on the ground at the Cedar Hill Project. I need to fast track the coordination in order to have the system operable by the time schools re-open later this summer. If at all possible I would like to have someone to coordinate with during the planning and construction Phase that can help make decisions on the repair quickly. My initial thought is to convert the pond to two cells — only using one cell for the near future since the systems is grossly over sized for current needs and the foreseeable future growth. Then install a synthetic liner in the cell to be used. The big question in my mind is how much subsurface exploration we need to do prior to prepping for the liner. Assistance from anyone on your staff with this expertise in this area would be greatly appreciated.

Thanks,

Bob

Bob Pickney, P.E. Adenus Group

www.adenus.com (615)220-7160 - office (615) 604-4712 - cell (615) 220-7208 - fax

From:

Charles Hyatt [charles.hyatt@adenus.com]

Sent:

Thursday, April 02, 2015 7:41 AM

To: Subject: Walker, Henry FW: Cedar Hill

From: Bob Pickney [mailto:bob.pickney@adenus.com]

Sent: Tuesday, March 31, 2015 10:09 AM

To: charles.hyatt@adenus.com

Subject: FW: Cedar Hill



Bob Pickney, P.E., Esquire

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From: Brad Harris [mailto:Brad.Harris@tn.gov]

Sent: Thursday, July 11, 2013 1:17 PM

To: Bob Pickney
Cc: Britton Dotson
Subject: RE: Cedar Hill

Thanks for the update.

Brad

From: Bob Pickney [bob.pickney@adenus.com]

Sent: Thursday, July 11, 2013 1:16 PM

To: Brad Harris

Cc: 'Charles. Hyatt'; 'Brian Carter'

Subject: Cedar Hill

Brad,

Just an update, the dye study is in process, and it is expected to be completed by the middle of August. The seimic study by TTL is in progress, and a final report should be ready in a few weeks. After these items are complete, I should be in a position to submit a final CAP. The dividing berm is also complete.

Bob



Bob Pickney, P.E. Adenus Group

www.adenus.com (615)220-7160 - office (615) 604-4712 - cell (615) 220-7208 - fax

From: Charles Hyatt [charles.hyatt@adenus.com]

Sent: Thursday, April 02, 2015 7:41 AM

To: Walker, Henry Subject: FW: Cedar Hill

Attachments: SOP-05039.CAP.LTR_signed.pdf

From: Bob Pickney [mailto:bob.pickney@adenus.com]

Sent: Tuesday, March 31, 2015 10:08 AM

To: charles.hyatt@adenus.com

Subject: FW: Cedar Hill



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From: Brad Harris [mailto:Brad.Harris@cn.gov]
Sent: Wednesday, October 16, 2013 12:34 PM

To: bob.pickney@adenus.com

Cc: Britton Dotson Subject: Cedar Hill

What is the status of the revised CAP and dye trace results for Cedar Hill?

Thanks, Brad

Bob,

Brad C Harris P.E. Division of Water Resources William R. Snodgrass Tennessee Tower 312 Rosa L. Parks Avenue, 11th Floor Nashville, Tennessee 37243 (615) 532-5367



DEPARTMENT OF ENVIRONMENT AND CONSERVATION DIVISION OF WATER RESOURCES

William R. Snodgrass - Tennessee Tower 312 Rosa L. Parks Avenue. 11th Floor Nashville. Tennessee 37243-1102

September 19, 2013

Mr. Bob Pickney, P.E. Adenus Group, LLC e-copy: <u>bob.pickney@adenus.com</u> 849 Aviation Parkway Smyrna, TN 37167

Subject:

Corrective Action Plan Review, SOP-05039

TN Wastewater Systems - Cedar Hill Treatment Facility

Cedar Hill, Robertson County, Tennessee

Mr. Pickney,

The DWR has reviewed the proposed remediation plan you submitted. While DWR largely agrees with the plan of action and the results from the TTL geophysical investigation the following points should be specifically addressed in a revised corrective action plan.

- 1. The information provided by the seismic refraction study has identified areas that warrant additional investigation. A representative from TTL should be present during the investigation to observe the test pits and interpret the results. The revised correction action plan should include a summary of both the observations and the result interpretations.
- A report from TTL describing the results of the test pit excavations and recommendations for repair must be submitted to the DWR for consideration. If approved a representative from TTL must be present during the repair and must submit a report documenting the repairs.
- A corrective action plan must include flow metering and recording sufficient to monitor the flow into the lagoon continuously to ensure accurate accounting of the wastewater entering the lagoon.
- d. The CAP should also include the proposed liner specifications and requirements for geologic support describing the base material, thickness, geotechnical properties and installation process, liner manufacturer (EP). Inc.) warranties and installation specifications. Installation must be certified by manufacturer or a qualified independent third party.

- The CAP must also describe the capabilities of the existing water level monitoring system. A monitoring plan must be designed and established to evaluate the integrity of the lagoon. If the existing water level monitoring system is not sufficient to evaluate lagoon integrity, then the corrective action plan must include a system capable to meet this objective.
- 6. IN Wastewater must demonstrate in the CAP that sufficient suitable soil area exists (by ownership or easement) for the permitted flow.
- 7. The CAP must propose a timeline to have an amended engineering report reflecting the modification of the lagoon and available suitable soils area submitted. The timeline must also speak to the submission of plans for the disposal area and expected installation of the disposal system.

We appreciate your attention to these points.

If you have questions, please contact the division at your local Field Office at 1-888-891-TDEC; or, at this office, please contact Brad Harris at (615) 532-0762 or by E-mail at Brad.Harris@tn.gov.

Sincerely,

Britton Dotson Deputy Director

CBD/bch

From: Sent:

Charles Hyatt [charles.hyatt@adenus.com]

Thursday, April 02, 2015 7:41 AM

To: Subject: Walker, Henry FW: Cedar Hill

----Original Message----

From: Bob Pickney [mailto:bob.pickney@adenus.com]

Sent: Tuesday, March 31, 2015 10:08 AM

To: charles.hyatt@adenus.com Subject: FW: Cedar Hill

Bob Pickney, P.E., Esquire

Adenus Group, LLC | 849 Aviation Pkwy, Smyrna, TN 37167

Direct: +1 615.220.7160 | Toll Free: +1 888.4.ADENUS Ext: 160 | Mobile:

615.604.4712 | Fax: 615.220.7207

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attachments) is not intended or written to be used, and cannot be used, for the purpose of avoiding penalties under the Internal Revenue Code.

----Original Message----

From: Britton Dotson [mailto:Britton.Dotson@tn.gov]

Sent: Thursday, October 17, 2013 9:04 AM

To: Bob Pickney

Subject: Re: Cedar Hill

Can you send us a copy of the dye trace report?

Thanks

Sent from my iPhone

On Oct 17, 2013, at 8:59 AM, "Bob Pickney"

bob.pickney@adenus.com> wrote:

> Brad,

> We are working on the response for the revised CAP. The dve trace

> study has been completed, and we are analyzing the results.

> Thanks,

> Bob

>

> ----Original Message----

```
> From: Brad Harris [mailto:Brad.Harris@tn.gov]
> Sent: Wednesday, October 16, 2013 12:34 PM
> To: bob.pickney@adenus.com
> Cc: Britton Dotson
> Subject: Cedar Hill
> Bob,
>
>
> What is the status of the revised CAP and dye trace results for Cedar
>
>
> Thanks,
>
> Brad
>
>
>
>
>
> Brad C Harris P.E.
> Division of Water Resources
> William R. Snodgrass Tennessee Tower
>
> 312 Rosa L. Parks Avenue, 11th Floor
>
> Nashville, Tennessee 37243
> (615) 532-5367
>
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From:

Charles Hyatt [charles.hyatt@adenus.com]

Sent:

Thursday, April 02, 2015 7:41 AM

To: Subject: Walker, Henry FW: Smokey Village

From: Bob Pickney [mailto:bob.pickney@adenus.com]

Sent: Tuesday, March 31, 2015 10:03 AM

To: charles.hyatt@adenus.com
Subject: FW: Smokey Village



Bob Pickney, P.E., Esquire

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From: John West [mailto:John.West@tn.gov]

Sent: Friday, July 13, 2012 10:28 AM

To: bob.pickney@adenus.com Subject: Smokey Village

Bob,

It was good talking to you today. Thank you for your frank discussion. Lets meet on the site next Thursday around 11 AM. I look forward to meeting Scott as well.

John West 865-594-5522

From: Charles Hyatt [charles.hyatt@adenus.com]

Sent: Thursday, April 02, 2015 7:41 AM

To: Walker, Henry Subject: FW: Smokey Village

From: Bob Pickney [mailto:bob.pickney@adenus.com]

Sent: Tuesday, March 31, 2015 10:03 AM

To: charles.hyatt@adenus.com
Subject: FW: Smokey Village



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From: Woody Smith [mailto:Woody.Smith@tn.gov]

Sent: Tuesday, January 15, 2013 2:53 PM

To: Bob Pickney

Cc: John West; Charles. Hyatt; Charles Pickney; Brian Carter

Subject: RE: Smokey Village

Agreed

From: Bob Pickney [mailto:bob.pickney@adenus.com]

Sent: Tuesday, January 15, 2013 3:42 PM

To: Woody Smith

Cc: John West; Charles. Hyatt; Charles Pickney; Brian Carter

Subject: Smokey Village

Woody,

I am close to completing the deal for the additional land at Smokey Village, I should have a signed contract in the next week or two. With your permission, I want to delay my response to you request until I get the signed contract for the land.

Thanks, Bob

Sent:

From:

Charles Hyatt [charles.hyatt@adenus.com]

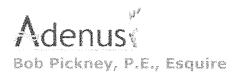
Thursday, April 02, 2015 7:41 AM

To: Walker, Henry Subject: FW: Smokey Village

From: Bob Pickney [mailto:bob.pickney@adenus.com]

Sent: Tuesday, March 31, 2015 10:03 AM

To: charles.hyatt@adenus.com
Subject: FW: Smokey Village



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From: Woody Smith [mailto:Woody.Smith@tn.gov]

Sent: Tuesday, March 19, 2013 8:39 AM

To: 'Bob Pickney' Cc: Jason Mann

Subject: RE: Smokey Village

Thanks for the update on Smokey Village. That sounds good.

We have of course been wondering how your facility at Black Bear resorts is faring in the fire, thope they got as much rain as we got yesterday to help put it out. Let us know what you find out. Nobody can do anything I guess until the library lighters give the all clear.

From: Bob Pickney [mailto:bob.pickney@adenus.com]

Sent: Tuesday, March 19, 2013 8:38 AM

To: Woody Smith

Cc: 'Charles Hyatt'; 'Brian Carter'; 'Scottie Miller'

Subject: Smokey Village

Woody,

Just an update, we have closed on the land and the pits for the soil map have been completed – all indications are the soil is actually much better than I had expected. Kevin Davis should complete the soil map in the next week or two, and I will be I a position to move forward with the design. I have also met with the neighbors, and getting the easements should not be a problem.

FYI – we have no definite information on Black Bear at this time – we know there is damage, but we don't think our treatment systems have been imp[acted based on aerial views of the fire. If we have issues, we will let you know. Thanks,

Bob

Bob Pickney, P.E. Adenus Group

www.adenus.com (615)220-7160 - office (615) 604-4712 - cell (615) 220-7208 - fax

From: Charles Hyatt [charles.hyatt@adenus.com]

Sent: Thursday, April 02, 2015 7:42 AM

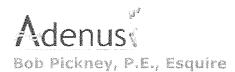
To: Walker, Henry

Subject: FW: Summit View Appeal

From: Bob Pickney [mailto:bob.pickney@adenus.com]

Sent: Tuesday, March 31, 2015 10:01 AM

To: charles.hyatt@adenus.com
Subject: FW: Summit View Appeal



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From: Bob Pickney [mailto:bob.pickney@adenus.com]

Sent: Monday, November 24, 2014 9:40 AM

To: 'Patrick Parker'

Subject: RE: Summit View Appeal

Thank you, Boh



Bob Pickney, P.E., Esquire

Committee of the Commit

一声:"一点,我们就要你们会会会们连续的,这样就是这个人,我们就是这个人,我们也没有什么。""我们还是这一个人,我们就是这个人,我们就是这个人,我们就是这个人,

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From: Patrick Parker [mailto:Patrick.Parker@tn.gov]

Sent: Monday, November 24, 2014 8:56 AM

To: 'Bob Pickney'
Cc: George Bell

Subject: RE: Summit View Appeal

800

It has been sent to APD which I think is what your talking about. I do not believe a ALI has been assigned as yet.

Patrick

Patrick Parker
Tennessee Department of Environment and Conservation
Office of General Counsel
William R. Snodgrass Tennessee Tower, 2nd Floor
312 Rosa L Parks Avenue, Nashville, TN 37243
(615) 532-0129



From: Bob Pickney [mailto:bob.pickney@adenus.com]

Sent: Monday, November 24, 2014 7:51 AM

To: Patrick Parker

Subject: Summit View Appeal

This is an EXTERNAL email. Please exercise caution, DO NOT open attachments or click links from unknown senders or bnexpected email. OIR-Security. ""

Patrick.

I am trying to determine if TDEC has sent my appeal to the AG's office - WPC14-0092. Can you update me on the status of this appeal -

Thank You, Bob



Bob Pickney, P.E., Esquire

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From: Charles Hyatt [charles.hyatt@adenus.com]

Sent: Thursday, April 02, 2015 7:42 AM

To: Walker, Henry

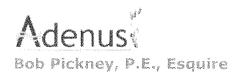
Subject: FW: TWSI Summit View Appeal

From: Bob Pickney [mailto:bob.pickney@adenus.com]

Sent: Tuesday, March 31, 2015 10:01 AM

To: charles.hyatt@adenus.com

Subject: FW: TWSI Summit View Appeal



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From: Bob Pickney [mailto:bob.pickney@adenus.com]

Sent: Tuesday, January 06, 2015 10:40 AM

To: 'Patrick Parker'

Subject: TWSI Summit View Appeal

Patrick,

I still have not heard anything on the WPC14-0092 appeal - can you update me? Bob



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From: Charles Hyatt [charles.hyatt@adenus.com]

Sent: Thursday, April 02, 2015 7:42 AM

To: Walker, Henry

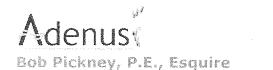
Subject: FW: TWSI Summit View Appeal

From: Bob Pickney [mailto:bob.pickney@adenus.com]

Sent: Tuesday, March 31, 2015 10:01 AM

To: charles.hyatt@adenus.com

Subject: FW: TWSI Summit View Appeal



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NOTICE: This alressage is infended only for the addresser and may contain information that is privileged, confidential advisor attorney work product, if you are not tree intended recribed and determ an advisor attorney and determ or forward this message or any attachment. Please notify the sender immediately and determ all copies of the message or any attachment any experiments. Notified the transmission of this message or any attachment any experiments imposed by the IRS, we inform you that any U.S. federal its advice contained in this communication including any attachments is not infended or written to be used, and cannot be used, for the purpose of avoiding penalties under the thirmal Revenue Code.

From: Bob Pickney [mailto:bob.pickney@adenus.com]

Sent: Tuesday, January 06, 2015 10:40 AM

To: 'Patrick Parker'

Subject: TWSI Summit View Appeal

Patrick,

I still have not heard anything on the WPC14-0092 appeal - can you update me? Bob



Bob Pickney, P.E., Esquire

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From: Charles Hyatt [charles.hyatt@adenus.com]

Sent: Thursday, April 02, 2015 7:42 AM

To: Walker, Henry

Subject: FW: TWSI Summit View Appeal

From: Bob Pickney [mailto:bob.pickney@adenus.com]

Sent: Tuesday, March 31, 2015 10:01 AM

To: charles.hyatt@adenus.com

Subject: FW: TWSI Summit View Appeal



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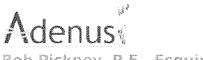
From: Bob Pickney [mailto:bob.pickney@adenus.com]

Sent: Tuesday, January 06, 2015 1:26 PM

To: 'Patrick Parker'

Subject: RE: TWSI Summit View Appeal

Patrick, That would be good. Thonks, Bon



Bob Pickney, P.E., Esquire

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From: Patrick Parker [mailto:Patrick.Parker@tn.gov]

Sent: Tuesday, January 06, 2015 12:48 PM

To: 'Bob Pickney'

Subject: RE: TWSI Summit View Appeal

Bab.

If has been assigned to ALI Ann Johnson. I have not heard from her to schedule a scheduling conference. Do you want me to contact her to see if we can get one scheduled.?

Patrick

From: Bob Pickney [mailto:bob.pickney@adenus.com]

Sent: Tuesday, January 06, 2015 10:40 AM

To: Patrick Parker

Subject: TWSI Summit View Appeal

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Patrick,

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or environmental (1 tella America, 43 vegotio peruna, 45 biologica). Lengentia de la propositional pages, que sebe el Agenda en les especies de vegotio de la completa de la complet

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4

Note that the existence was a standard or some problems of the existence o

From: Sent:

Charles Hyatt [charles.hyatt@adenus.com]

Thursday, April 02, 2015 7:41 AM

To: Subject: Walker, Henry FW: Cedar hill

From: Bob Pickney [mailto:bob.pickney@adenus.com]

Sent: Tuesday, March 31, 2015 10:09 AM

To: charles.hyatt@adenus.com Subject: FW: Cedar hill



and the operation with an area before the transfer

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From: Brad Harris [mailto:Brad.Harris@tn.gov]
Sent: Thursday, June 20, 2013 9:54 AM

To: Bob Pickney Cc: Britton Dotson Subject: RE: Cedar hill

Ok...thanks

From: Bob Pickney [bob.pickney@adenus.com]

Sent: Thursday, June 20, 2013 9:58 AM

To: Brad Harris Subject: Cedar hill

Brad,

Just an update – I expect that Crawford Hydrology Laboratory will begin the dye trace study the first of next week. I also have under contract TTL to make recommendations concerning the liner installation and testing. TTL wants to complete a seismic refraction test before making any final recommendations. I want their recommendations before submitting a CAP. Also the separation berm will be complete this week. All effluent is contained in the upper section of the pond. Depending on timing of reports/approvals we probably will not achieve my original goad of installation of the liner prior to start of school. If you have any question, just let me know.

Thanks,

Bob



Bob Pickney, P.E. Adenus Group

www.adenus.com (615)220-7160 - office (615) 604-4712 - cell (615) 220-7208 - fax

From: Charles Hyatt [charles.hyatt@adenus.com]

Sent: Thursday, April 02, 2015 7:42 AM

To: Walker, Henry

Subject: FW: TWSI Summit View Appeal

From: Bob Pickney [mailto:bob.pickney@adenus.com]

Sent: Tuesday, March 31, 2015 10:00 AM

To: charles.hyatt@adenus.com

Subject: FW: TWSI Summit View Appeal



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To: 'Bob Pickney'

Subject: RE: TWSI Summit View Appeal

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Patrick

From: Bob Pickney [mailto:bob.pickney@adenus.com]

Sent: Tuesday, January 06, 2015 10:40 AM

To: Patrick Parker

Subject: TWSI Summit View Appeal

*** This is an EXTERNAL email. Please exercise caution. EO NOT open attachments or click links from unknown senders or opexpected email - OIR-Security ***

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From:

Charles Hyatt [charles.hyatt@adenus.com]

Sent:

Thursday, April 02, 2015 7:42 AM

To:

Walker, Henry

Subject:

FW: Summit View Appeal

Attachments:

WPC14-0092 Tennessee Wastewater Systems Inc. Case Tracking Sheet.pdf

From: Bob Pickney [mailto:bob.pickney@adenus.com]

Sent: Tuesday, March 31, 2015 10:00 AM

To: <u>charles.hyatt@adenus.com</u> **Subject:** FW: Summit View Appeal

Email to Patrick Parker



Bob Pickney, P.E., Esquire

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From: Patrick Parker [mailto:Patrick.Parker@tn.gov]

Sent: Monday, November 24, 2014 8:56 AM

To: 'Bob Pickney'
Cc: George Bell

Subject: RE: Summit View Appeal

bob.

it has been sent to APD which I think is what your talking about. I do not believe a AU has been assigned as yet.

Patrick

Patrick Parker
Tennessee Department of Environment and Conservation
Office of General Counsel
William R. Snodgrass Tennessee Tower, 2nd Floor

312 Rosa L Parks Avenue, Nashville, TN 37243

(615) 532-0129



1

From: Bob Pickney [mailto:bob.pickney@adenus.com]

Sent: Monday, November 24, 2014 7:51 AM

To: Patrick Parker

Subject: Summit View Appeal

This is an EXTERNAL email. Please exercise coution, DO NOT open attachments or click links from unknown, senders or unexpected email - OIR-Security. ***

Patrick,

I am trying to determine if TDEC has sent my appeal to the AG's office - WPC14-0092. Can you update me on the status of this appeal - Thank You,
Bob



Bob Pickney, P.E., Esquire

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STATE OF TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION DIVISION OF WATER RESOURCES

William R. Snodgrass - Tennessee Tower 312 Rosa L. Parks Avenue, 11th Floor Nashville, Tennessee 37243-1102

September 19, 2013

Mr. Bob Pickney, P.E.
Adenus Group, LLC
e-copy: bob.pickney@adenus.com
849 Aviation Parkway
Smyrna, TN 37167

Subject:

Corrective Action Plan Review, SOP-05039

TN Wastewater Systems - Cedar Hill Treatment Facility

Cedar Hill, Robertson County, Tennessee

Mr. Pickney,

The DWR has reviewed the proposed remediation plan you submitted. While DWR largely agrees with the plan of action and the results from the TTL geophysical investigation the following points should be specifically addressed in a revised corrective action plan.

- The information provided by the seismic refraction study has identified areas that warrant
 additional investigation. A representative from TTL should be present during the investigation to
 observe the test pits and interpret the results. The revised correction action plan should include
 a summary of both the observations and the result interpretations.
- 2. A report from TTL describing the results of the test pit excavations and recommendations for repair must be submitted to the DWR for consideration. If approved a representative from TTL must be present during the repair and must submit a report documenting the repairs.
- 3. A corrective action plan must include flow metering and recording sufficient to monitor the flow into the lagoon continuously to ensure accurate accounting of the wastewater entering the lagoon.
- 4. The CAP should also include the proposed liner specifications and requirements for geologic support describing the base material, thickness, geotechnical properties and installation process, liner manufacturer (EPI, Inc.) warranties and installation specifications. Installation must be certified by manufacturer or a qualified independent third party.

- 5. The CAP must also describe the capabilities of the existing water level monitoring system. A monitoring plan must be designed and established to evaluate the integrity of the lagoon. If the existing water level monitoring system is not sufficient to evaluate lagoon integrity, then the corrective action plan must include a system capable to meet this objective.
- 6. TN Wastewater must demonstrate in the CAP that sufficient suitable soil area exists (by ownership or easement) for the permitted flow.
- 7. The CAP must propose a timeline to have an amended engineering report reflecting the modification of the lagoon and available suitable soils area submitted. The timeline must also speak to the submission of plans for the disposal area and expected installation of the disposal system.

We appreciate your attention to these points.

If you have questions, please contact the division at your local Field Office at 1-888-891-TDEC; or, at this office, please contact Brad Harris at (615) 532-0762 or by E-mail at *Brad.Harris@tn.gov*.

Sincerely,

Britton Dotson Deputy Director

CBD/bch

TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION OFFICE OF GENERAL COUNSEL CASE TRACKING HEARING SCHEDULE

CASE NUMBER WPC14-0092	RESPONDENT(S) or CASE NAME Tennessee Wastewater Systems, Inc.
DOCKET NUMBER	DIVISION/COUNTY
04.30-128350J	WPC/Sevier

Location Of Hearing

Date of Hearing

Hearing Time

() Board (x) ALJ Alone

Nashville Room, 3rd Floor William R. Snodgrass Tn Tower Nashville, TN 37243

CASE DESCRIPTION:

Is a Judge Required: (x) YES

() NO

Is a Court Reporter Required: (x) YES () NO

If "YES" Court Reporter Name:

Hearing Time (estimate):

Name of Board:

Respondent/Defendant Name, Address, Phone Number:

Division Contact Person:

Dana Waits

Respondent/Defendant Attorney Name, Address, Phone Number:

Robert J. Pickney 849 Aviation Parkway Smyrna, TN 37167 (615) 604-4712

OGC Attorney Name:

SITE NAME and address:

George Bell and Patrick Parker Office of General Counsel William R. Snodgrass TN Tower 312 Rosa L. Parks Avenue, 2nd Floor Nashville, Tennessee 37243 Phone: (615) 532-0131

TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION OFFICE OF GENERAL COUNSEL CASE TRACKING HEARING SCHEDULE

CASE NUMBER WPC14-0092	RESPONDENT(S) or CASE NAME Tennessee Wastewater Systems, Inc.
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Date of Hearing

() NO

Hearing Time

() Board

(x) ALJ Alone

Nashville Room, 3rd Floor William R. Snodgrass Tn Tower Nashville, TN 37243

CASE DESCRIPTION:

Is a Judge Required: (x) YES

Is a Court Reporter Required: (x) YES () NO

If "YES" Court Reporter Name:

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Division Contact Person:

Dana Waits

Respondent/Defendant Attorney Name, Address, Phone Number:

Robert J. Pickney 849 Aviation Parkway Smyrna, TN 37167 (615) 604-4712

OGC Attorney Name:

SITE NAME and address:

George Bell and Patrick Parker Office of General Counsel William R. Snodgrass TN Tower 312 Rosa L. Parks Avenue, 2nd Floor Nashville, Tennessee 37243

Phone: (615) 532-0131

Roy Denney

From:

Brian Carter < brian.carter@adenus.com>

Sent:

Saturday, February 1, 2014 6:32 PM

To:

'Mike Thornton'

Cc

'Charles Hyatt'; 'Bob Pickney'; 'Roy Denney'

Subject:

Maple Green Bypass report

Attachments:

Maple Green Bypass Report 2-1-2014.pdf; _Certification_.htm

Mike,

Please find attached the bypass report for the Maple Green Lagoon in Robertson County. Crews are onsite along with TWRA and TDEC representatives.

Thank You,



Brian Carter
Operations & Maintenance Manager
Adenus Utilities Group
615.220.7179(v)
615.220.7207(f)

Wastewater Collection System Overflow Or Treatment Unit Bypass Report Form

System Name; Maple Green Lagoon
County: Robertson
Date & Time Reported To WPC: 2-1-2014 / 4:00 pm
System Contact: Brian Carter
Title: Maintenance Manager
Phone Number(s): 615-220-7200
Location — Cause — Corrective Action
Location of Pump Station, Manhole, Coopertown, TN Other:
Date & Time Overflow or 2-1-2014 / 5:00 am Bypass of Treatment Units Began:
Date & Time Overflow / Bypass Ended: 2-1-2014 / 7:00 pm
Estimated Volume: 7.0 million gallons
Treatment Unit(s) Bypassed:
Cause of Overflow or Bypass: Void collapse
Corrective Action or Repairs: Immediately started constructing berm to hold influent away
from void collapse. Rerouting influent to safe side of berm.
Time & Date Completed, or Estimated; 8:00 pm / 2-2-2014
Volume Contained or Recovered: 100,00 gallons
Potential Impact
Wastewater Entered Stream: Yes
Name of Stream: Millers Creek
Stream Conditions Observed: Muddy
Fish or Aquatic Life Killed; None Noted by TWRA
Distance of Impact: Not known
Actions Taken to Minimize Health Hazards
or impact to Water Quality:
Cleanup, Disinfection of Area:
Public Notified, Signs Posted,
or Access Restricted:
Stream Sampling Conducted:
Comments: TWRA and TDEC representatives onsite along with TNWW personnel on 2-1-2014.
Person Preparing Brian Carter / 2-1-2014
Report & Date Prepared:

Roy Denney

From:

Britton Dotson <Britton.Dotson@tn.gov>

Sent:

Wednesday, February 19, 2014 2:45 PM

To:

Penny, William (william.penny@stites.com); roy.denney@adenus.com

Cc:

Sandra Dudley; Brad Harris

Subject:

Draft Letter

Brad and I have been working on a letter in support of the Maple Green facility. We have forwarded it to Sandra for her review and anticipate having it to you in the morning.

Britton Dotson
Deputy Director, Water Quality Branch
Division of Water Resources
britton.dotson@tn.gov
(615) 532-0774

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Version: 2014.0.4335 / Virus Database: 3705/7106 - Release Date: 02/19/14

From:

Robert Odette < Robert.Odette@tn.gov>

Sent:

Friday, April 25, 2014 10:25 AM

To:

'roy.denney@adenus.com'

Cc:

Brad Harris; Fali Kapadia

Subject:

Maple Green

Good Morning Roy,

Sorry to be late getting back to you, but I've been under the weather for the last couple of days.

In response to your email (copied below), I do not believe that we have a discrepancy in units, at least in the equations we've been using. I've gone back and checked my references and all of the equations and site area notations are in feet, million gallons per acre and not in cubic feet per day. There may be other references that provide a basis for design for FWS-CW using cubic feet per day, but I have not seen one.

I have used EPA Manuals, Metcalf & Eddy and WEF MOP-FD-16 and communication with Jim Watson, formerly with TVA.

When we last met I provided my hand written notes and calculation using the EPA equation for As = $[Q \times ln(Co/Ce)]/Kt \times y \times n$

Using your values:

Q = 35,000

Co = 150

Ce = 30

Kt(20) = 0.678

y = 2.5

n = 0.7

Using the Kt at 20 degrees C yielded an As of 47,493 SF. However, this is too high a temperature for Middle Tennessee—using Kt at 1 degree C of 0.339, yielded an As = 94,986 SF

This Kt value is consistent with an example in Metcalf & Eddy at 6 degrees C, where the Kt (6) was shown as 0.36.

I believe that the design for a FWS-CW in Middle Tennessee should use a temperature of around freezing. Thus, a Kt of approximately 0.339 would be acceptable.

The surface area for the proposed Maple Green FWS-CW needs to be approximately 100,000 SF.

Jim Watson said size should be in the range of 50-100 acres per one million gallons per day. For a design flow of 35,000 GPD that translates to a surface area of 76,230 to 152,460 SF.

WEF MOP-FD-16 (Natural Systems for Wastewater Treatment) on page 385, provided some case histories of FWS-CWs as follows:

- 1. Orlando, FL 61 ac/MGD
- 2. Lakeland, FL 95 ac/MGD
- 3. Vermontville, MI 115 ac/MGD

Using these areas for a 35,000 GPD design the area required would be:

93,000 SF 144,837 SF, and 175,329 SF

The temperatures used probably account for the differences in areas, obviously, Florida is much warmer than Michigan—Tennessee is somewhere in the middle, but these case histories substantiate that the FWS-CW surface area for the Maple Green projects needs to be in the vicinity of 100,000 SF.

Hope this helps—take care,

Bob 0'

Robert G. O'Dette, M.S., P.E.

Division of Water Resources
Tennessee Department of Environment and Conservation
William R. Snodgrass Tennessee Tower, 11th Floor
312 Rosa L. Parks Avenue
Nashville, TN 37243-1102
Office: (615) 532-0625

Office: (615) 532-0625 Direct: (615) 253-5319 Fax: (615) 532-0686



Bob.

I'd like to discuss the sizing calculations for Maple Green. We have a discrepancy in units. For some reason the sources I have recommend using cuft per day for the Q, flow value, not gpd. I think this resolves the balance of our number issues. Would you mind looking that over? If you can call to discuss tomorrow, I'll be in and out of cell phone reception but I will certainly call you back. My cell is 615-691-2913. If So I'd love to get the rest of the information over to TDEC soon to expedite the TRA hearing.

Thank you,

Roy

Adenus Roy Denney, P.E.

From:

Brad Harris <Brad.Harris@tn.gov> Tuesday, May 6, 2014 10:01 AM

Sent To:

Roy Denney

Cc:

Robert Odette

Subject:

RE: Maple Green

Yes we have. Bob and I will try to call you later in the day. I am covered up right now. Send me a number that would work. We'll shoot for 1:30pm.

Check your math in the example calc. We would also like you to verify the current obligations for the system?

Brad

From: Roy Denney [mailto:roy.denney@adenus.com]

Sent: Tuesday, May 06, 2014 9:40 AM

To: Brad Harris

Subject: Maple Green

Brad,

Have you had the opportunity to look over the letter and documentation I sent you on the 28th?

Regards,

Roy

From: Sent:

Brad Harris <Brad.Harris@tn.gov> Tuesday, May 6, 2014 10:51 AM

To:

Roy Denney

Subject:

RE: Maple Green

How many connections (existing and future) are involved with Oak Pointe?

Brad

From: Roy Denney [mailto:roy.denney@adenus.com]

Sent: Tuesday, May 06, 2014 10:40 AM

To: Brad Harris
Cc: Robert Odette

Subject: RE: Maple Green

615-691-2913 will be the best number to reach me. I have a meeting at 2:00PM today.

Currently the site serves,

Providence Baptist Church, Robertson County EMS #5, Coopertown Middle School,148 connections at Oak Pointe Subdivision, P&C Corner Market, Pizza Hut, Sudden Service BP, and a Mapco Express.

Roy

From: Brad Harris [mailto:Brad.Harris@tn.gov]

Sent: Tuesday, May 6, 2014 10:01 AM

To: Roy Denney
Co: Robert Odette

Subject: RE: Maple Green

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Regards,

Roy

From:

Brad Harris <Brad.Harris@tn.gov>

Sent:

Tuesday, May 6, 2014 12:21 PM

To: Cc: Roy Denney

cc: Subject: Robert Odette RE: Maple Green

Roy,

Can we try 9:00am in the morning instead of this afternoon?

Thanks, Brad

From: Roy Denney [mailto:roy.denney@adenus.com]

Sent: Tuesday, May 06, 2014 12:01 PM

To: Brad Harris

Subject: Re: Maple Green

144 customers currently. 168 plated lots but the developer defaulted so there appears to be no urgency to developing. Found the error on the math. We can make the cells 10 feet longer.

Sent from my iPhone

On May 6, 2014, at 10:51 AM, Brad Harris < Brad. Harris@tn.gov > wrote:

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Brad

From: Roy Denney [mailto:roy.denney@adenus.com]

Sent: Tuesday, May 06, 2014 10:40 AM

To: Brad Harris Cc: Robert Odette

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Sent: Tuesday, May 6, 2014 10:01 AM

To: Roy Denney

Cc: Robert Odette Subject: RE: Maple Green

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Check your math in the example calc. We would also like you to verify the current obligations for the system?

Brad

From: Roy Denney [mailto:roy.denney@adenus.com]

Sent: Tuesday, May 06, 2014 9:40 AM

To: Brad Harris

Subject: Maple Green

Brad,

Have you had the opportunity to look over the letter and documentation I sent you on the 28th?

Regards,

Roy

From:

Robert Odette < Robert.Odette@tn.gov>

Sent:

Thursday, May 8, 2014 7:51 AM

To: Cc: 'Roy Denney'

c......

Brad Harris

Subject:

RE: WEF fifth edition

Attachments:

WEF_MOP-FD-16.pdf

Good Morning Roy:

Thanks for sending the reference from the fifth edition—their design example used a depth of 2 feet (0.6 meters). However, I would also like to see what the fifth edition did with Table 9.20 that was in the third edition (see attached). Table 9.20 shows a design water depth of between 0.1 and 0.6 meters. Please note that the third edition also states that design depths are typically 20 inches (0.5 meters). As I understand the equation, the depth is the "average" water depth throughout the year.

Additionally, does the fifth addition have a similar chart to 9.1 which shows actual FWS-CWs across the country. The two in Florida are for nutrient removal, but the one in Michigan is a converted land treatment site—in each of these three case histories, the equivalent size for a 35,000 GPD design would be about 100,000 SF which is consistent with the information given to us by Jim Watson (formerly with TVA). Brad may have other questions but I would like to see examples of FWS-CW that are designed and built that are sized in the equivalent range of your design for Maple Green.

Thanks much-take care.

Bob O'

Robert G. O'Dette, M.S., P.E. Division of Water Resources

Tennessee Department of Environment and Conservation William R. Snodgrass Tennessee Tower, 11th Floor 312 Rosa L. Parks Avenue

312 Rosa L. Parks Avenue Nashville, TN 37243-1102 Office: (615) 532-0625

Direct: (615) 253-5319 Fax: (615) 532-0686

---Original Message----

From: Roy Denney [mailto:rov.denney@adenus.com]

Sent: Wednesday, May 07, 2014 2:50 PM

To: Brad Harris; Robert Odette Subject: WEF fifth edition

Brad and Bob.

I haven't pulled up the other references, but you said you had the EPA citing and here is the latest from WEF actually referring to 0.6 meters as shallow and 1 meter as a deep wetland section. While they fail to go into in this volume, the information I have seen suggests that having a deeper pool can allow anoxic processes to take place. I have some other sources, but I don't have them quite as well earmarked.

Thanks again,

Roy

----Original Message----

From: scanner1stfloor@adenus.com [mailto:scanner1stfloor@adenus.com]

Sent: Wednesday, May 7, 2014 2:41 PM

To: roy.denney@adenus.com

Subject: Scanned on Bizhub from NovaCopy

The attached document was scanned on a Konica Minolta Bizhub from Novacopy.

Water quality improvements can be expected through these components and can be estimated using the models presented in this chapter and with deep water zones analyzed with appropriate facultative pond models. The open water zones in such a system should not be larger than a 2- to 3-day detention times each to prevent the development of algae; these habitat components should be followed by a densely vegetated wetland unit with a short residence time for final polishing before final discharge.

1.4.1 Process Design Criteria for Free-Water-Surface Wetlands

The major design parameters are depth, detention time, loading rate, and aspect ratio. Typical design criteria are presented in Table 9.20.

4.4.1.1 Depth

The operating depth in FWS wetlands can range from 0.1 m (4 in.) to 0.6 m (2 ft). Design depths are typically 0.5 m (20 in.) to optimize detention time without exceeding the effective depth of emergent vegetation, which generally do not colonize at depths of 1 m or more.

4.4.1.2 Detention Time

The detention time in FWS wetlands depends on the limiting design parameter. For BOD and nitrate removal, the detention time can be relatively short, as shown in Table 9.20. If the removal of algae (pond TSS) is the limiting design

TABLE 9.20 Typical design criteria and expected effluent quality for FWS constructed wetlands (adapted from Crites and Tchobanoglous, 1998).

1600	Unit	Value
Design parameter		
Detention time	đ	2-5 (BOD) 7-14 (N)
BOD loading rate	kg/ha·d	<110
Hydraulic loading rate	mm/d	25-125
Water depth	m	0.1-0.6
Open water zone percent	% of total area	20-30
Aspect ratio		2:1 to 4:1
Mosquito control		Required
Harvesting interval	yr	3-5
Expected effluent quality*		
BOD ₅	mg/L	<15
The state of the s	mg/L	<15
of the second	mg/L	<10
\$ 3 P	mg/L	and a succession of the succes

^{*} Expected effluent quality based on a BOD loading equal to or less than 110 kg/ha d and typical settled municipal wastewater.

From:

Brad Harris < Brad.Harris@tn.gov>

Sent:

Tuesday, June 10, 2014 9:23 AM

To: Cc: Roy Denney (Roy.Denney@adenus.com)
Britton Dotson; Allen Rather; Robert Odette

Subject:

Maple Green Plans

Attachments:

MapleGreenCAP_ReviewSKD_3_18_14.pdf

Roy,

We reviewed the plans you submitted for Maple Green. We found them acceptable for the most part. We do need some additional information and a few changes as described below.

- 1. The plans must include a flow meter (totalizer) capable of accurately measuring the wastewater flow to the system.
- 2. The plans must incorporate fencing around the wetland cells.
- 3. A description of plant placement and type. Such placement and type should be in line with the EPA recommendations. The plans mention, "If vegetation is problematic, mechanical aeration and a suspended growth media will be used to simulate plant stalks and plant roots." This is not acceptable. If such a redesign is proposed in the future it will require resubmission of plans.
- 4. A Startup and more detailed maintenance plan including tasks and frequencies.
- 5. One year of water use data for the commercial establishments connected to the system.
- 6. Soil information and drip field design supporting the system. We currently have one old map that shows approximately 3.5 acres supporting the system. I don't have any current plans for the drip system.

Give me a call if you would like to discuss or have any questions.

I have attached the letter from Director Dudley regarding the CAP. To my knowledge we haven't received a response from you to her letter.

I am also waiting on the operational manual and as-built for Logue Road.

Brad



STATE OF TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION DIVISION OF WATER RESOURCES

William R. Snodgrass - Tennessee Tower 312 Rosa L. Parks Avenue, 12th Floor Nashville, Tennessee 37243-1102

March 18, 2014

Mr. Roy Denney, P.E. Adenus Group, LLC 849 Aviation Parkway Smyrna, TN 37167

Subject:

State Operating Permit No. SOP-01028

TN Wastewater Systems - Maple Green Reclamation Facility

Coopertown, Robertson County, Tennessee

Mr. Denney:

The Division has reviewed the Preliminary Engineering Report for Remediation and Modification of Maple Green Reclamation Facility of 2/14/2014. We appreciate your timely submission. The Division acknowledges the construction of the emergency berm within the existing lagoon in order to hold and redirect flow to the portion of the lagoon that was not compromised during the events of 2/1/2014. In order for the Division to accept the remainder of the report, the following parts of the submittal must be updated and amended to address the following:

- 1. Stamped engineering plans and engineering report must be submitted to establish the design basis of the temporary treatment.
- 2. Sampling results must be submitted to the Division central office and field office weekly.
- 3. The sampling frequency must remain five days per week until the Division agrees that an acceptable treatment level is reliably being met.
- 4. In order to establish system design of 35,000 GPD, metering results and a detailed list of the system's current and future obligations must be submitted. While treatment system design and construction may not be required presently, to satisfy future commitments it is necessary for collection system and soils area plans review.
- 5. It is unclear how the current temporary drip area is to be used in the future. The report proposes to reclassify the area as a permanent drip area. There may be some potential for the future use of areas that are not impacted through the remediation effort; however, those areas would not be applicable for establishing system capacity.
- 6. The report mentions "surface irrigation" and "non-food subsurface agricultural drip" on portions of the lagoon site after remediation. There isn't sufficient information in the referenced report to consider temporary irrigation at this time.

Comments regarding the use of FWS wetlands were provided in a letter of 2/20/2014 from Sandra K. Dudley, Ph.D., P.E. If you have questions, feel free to contact Brad Harris at 615-532-5367.

Sincerely,

Sandra K. Dudley, Ph.D., P.E.

Sundral Mudley

Director

cc: Permit File

Nashville Environmental Field Office

Mr. Charles R. Hyatt, CEO, Adenus Group, LLC Charles. Hyatt@adenus.com

Mr. Brian Carter, Maintenance Manager, Adenus Operations LLC, brian carter@adenus.com

Ms. Michelle Ramsey, Utilities Division, Tennessee Regulatory Authority, michelle.ramsey@tn.gov

From:

Brad Harris <Brad.Harris@tn.gov>

Sent:

Wednesday, June 25, 2014 10:34 AM Roy Denney (Roy.Denney@adenus.com)

To: Cc

Britton Dotson; Allen Rather; Robert Odette

Subject:

RE: Maple Green Plans

Roy,

We need a new copy of the plans incorporating items, 1,2,3.

We are missing section 6.2 you reference.

The water use numbers you submitted are not representative of one year of water use data. We would like the monthly flows for each establishment for the last year.

I would also like to see the plans used to install the drip system or updated plans if the system wasn't installed as per the original plan. I assume there isn't any additional area mapped other than the 3.5 mentioned.

Brad

Brad C Harris P.E.
Division of Water Resources
William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 11th Floor
Nashville, Tennessee 37243
(615) 532-5367

From: Brad Harris

Sent: Tuesday, June 10, 2014 9:23 AM
To: Roy Denney (Roy Denney@adenus.com)
Cc: Britton Dotson; Allen Rather; Robert Odette

Subject: Maple Green Plans

Roy,

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6. Soil information and drip field design supporting the system. We currently have one old map that shows approximately 3.5 acres supporting the system. I don't have any current plans for the drip system.

Give me a call if you would like to discuss or have any questions.

I have attached the letter from Director Dudley regarding the CAP. To my knowledge we haven't received a response from you to her letter.

I am also waiting on the operational manual and as-built for Logue Road.

Brad

From:

Brad Harris <Brad.Harris@tn.gov> Wednesday, July 2, 2014 6:54 AM

Sent: To:

Roy Denney

Subject:

RE: Maple Green Plans

Thanks Roy.

Brad

From: Roy Denney [mailto:roy.denney@adenus.com]

Sent: Tuesday, July 01, 2014 3:39 PM

To: Brad Harris

Subject: RE: Maple Green Plans

Brad.

I've sent everything over, except, I got a new person with the Springfield Water System who refused to provide further detail on water records, we've faxed in a written request. I sent you a copy of that as well.

I hope you have a good Fourth.

ROY

From: Brad Harris [mailto:Brad.Harris@tn.gov]
Sent: Wednesday, June 25, 2014 10:34 AM
To: Roy Denney (Roy.Denney@adenus.com)
Cc: Britton Dotson; Allen Rather; Robert Odette

Subject: RE: Maple Green Plans

Roy,

We need a new copy of the plans incorporating items, 1,2,3.

We are missing section 6.2 you reference.

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Brad

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Cc: Britton Dotson; Allen Rather; Robert Odette

Subject: Maple Green Plans

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I am also waiting on the operational manual and as-built for Logue Road.

Brad

From:

Allen Rather < Allen.Rather@tn.gov>

Sent:

Friday, July 25, 2014 2:17 PM

To:

roy.denney@adenus.com

Cc:

Ann Morbitt

Subject:

FW: Maple Green Treatment Facility

Attachments:

14-0471_Maple Green.pdf

Roy,

Attached is the approval letter for your project. The stamped plans and specs should be in Monday's mail. Please let me know if you have any questions.

Thanks,

Allen Rather, LPSS Land Based Systems Unit Division of Water Resources 615-532-5819

From:

Roy Denney <Roy.Denney@adenus.com>

Sent:

Friday, February 7, 2014 11:38 AM

To: Subject: 'Britton Dotson'

maple green

Britton,

Is there a time we can talk by phone to discuss the plan, either this afternoon or maybe Monday? I want to make sure what I present next Friday sounds reasonable to you before I commit and lose a week. You can reach me on my cell phone at 691-2913.

Thank you,

Roy



CTO

Adenus Group, LLC | 849 Aviation Pkwy, Smyrna, TN 37167 Direct: +1 615.220.7176 | Toll Free: +1 888.4.ADENUS Ext: 150 | Mobile: 615.691.2913 | Fax: 615.220.7207

From:

Roy Denney <Roy.Denney@adenus.com>

Sent:

Monday, February 17, 2014 3:13 PM

To:

'Britton Dotson'

Subject:

Maple Green Wetland Design

Attachments:

preliminary design.pdf

Britton,

Here is the preliminary design calculations and details regarding the wetland designs at Maple Green.

I did not put fixed dimensions instead I listed area to support site loading and an aspect ratio target to maintain. This should give a little latitude for the final install while maintaining the correct flow patterns.

I remember the subject of the liner came up. I think for this site, compacted soil supporting a 30 mil liner will be best with woven geofabric underneath to protect from debris.

As mentioned in the narrative, the site will consist of two of the cells shown in the details capable of operating in parallel or series. Details on aeration are still in the works, however to replicate the 1mg/I DO typically provided by vegetation, a very modest blower similar to a farm pond air pump would be sufficient.

At the current loading we should be able to periodically take one side out of service or the other for maintenance and repairs.

If you have any questions, don't hesitate to call my cell phone,

Obviously the detail design will need to include more specifics regarding type of vegetation and hydraulic considerations, however the final design will follow the design criteria pretty closely.

I look forward to your response.

Thank you,

Roy Denney



Adenus Group, LLC | 849 Aviation Pkwy, Smyrna, TN 37167

Direct: +1 615.220.7176 | Toll Free: +1 888.4.ADENUS Ext: 150 | Mobile: 615.691.2913 | Fax: 615.220.7207

Proposal Regarding Constructed Free Water Surface Wetland With Aeration for Treatment of Septic Tank Effluent in Rural Systems.

Abstract Roy Denney, PE Adenus Group

Wetland treatment for wastewater which has already received primary settling and minimal secondary treatment is well establish with systems in the US dating back more than fifty years (EPA, 2000).

The two prevailing approaches are Free Water Surface (FWS) and Subsurface Flow (SSF or VSF(vegetated)) wetlands. Conventional wisdom dictates that a VSF with some insulating cover will higher removal efficiencies and be better protected from extended cold periods, however the EPA findings reported in their 2000 manual indicate most constructed FWS wetlands raise their operating level in freezing weather and the increased detention time offsets the decrease in operational efficiency based on atmospheric conditions.

Maintenance of SSF systems is difficult as expected since the water surface is not visible and subsurface fouling can have a dramatic impact on treatment efficiency. FWS wetlands have the ability to be easily maintained and solids accumulation is mitigated by vegetative growth.

in recent years studies and patents regarding the supplemental addition of air to VSB and SSF wetlands shows potential for very high removal efficiencies even in the absence of active vegetation and during cold weather months with weather temperatures near freezing. (Redmond, 2012)

These findings coincide with the current understanding that these systems utilize a small area for BOD removal, approximately the first 25% to 30% of the detention time followed by the nitrification in the last 70% and denitrification in the last 20 to 25% of the wetland flow area.

There are various approaches to support this biological model. The approach we intend to take is to construct a conventional wetland based on existing models and calculations. Influent flow to the wetland will be installed in such a way as to introduce dissolved oxygen by sawtooth well or a shallow pool overflow. The first 30% of a treatment cell will operate at a sufficiently high elevation to allow overflow by sawtooth weir into the second portion of treatment. Average water depths planned are 2.5 ft and 2 feet. Two treatment cells will be installed with piping to accommodate either parallel or series operation. Most traditional systems rely on anoxic, anaerobic or facultative digestion of solids vastly increasing required sizing of these systems. It is our intent to demonstrate a significantly increased uptake rate in a lightly aerated constructed wetland as opposed to conventional design with the hopes that future designs could be more efficient in space and layout.

Necessary flow diversion and mechanical aeration would be built into the design in the event of sustained freezing conditions or surge flow conditions.

The proposed system will be based on design standards from The EPA Manual Constructed Wetlands Treatment of Municipal Wastewaters 2000 and the WEF/ASCE Design of Wastewater Treatment Plants 2012.

- 1, EPA, "Constructed Wetlands Treatment of Municipal Wastewater" 2000
- 2. Redmond, Eric. "Nitrogen removal from wastewater by an Aerated subsurface flow constructed wetland." Master's thesis, University of lowa, 2012.

Design Criteria

Site Specific Data

Permitted site flow. 35,000GPD based on present disposal Capacity.

Effluent BOD Limit: 45mg/L

Influent BOD: 90mg/L from historical information (averaged) Daily surges appear to have minimal impacts given the collected data from the EPA 2000, Table 4-1.

BOD Daily Loading:

```
35,000GPD*3.78L/Gal = 132300L/Day
132300L/day * 90mg/L = 12kg/day
```

From EPA 2000, Chapter 4

The open water FWS systems which permit reaeration and aerobic oxidation should be designed for an areal loading of no more than 60kg/ha-day.

Surface area:

EPA design calls for an average depth of .6 to .8 meters, 2 to 2.5 feet. This will be used for the depth for the system.

```
12 kg/day / 60kg/ha-day = 0.2ha
0.2ha = .5 acre = 21780ft<sup>2</sup>
```

Volume and HRT

```
21780FT<sup>2</sup> * 2FT = 43560 FT<sup>3</sup> = 325828.8 gallons
```

HRT = 325828.8 gallons / 35000 Gallons/day = 9.3 day HRT

The EPA Design manual calls for a HRT of 7 to 9 Days for effective treatment confirming the intended loading rate. This also coincides with the results showing 50% BOD uptake occurring place in the first 30% of treatment and in the first 3 days of treatment.

Design Layout:

The treatment system will consist of two treatment cells capable to operating in series or in parallel. Each wetland will be constructed to maintain approximately a 3 to 1 aspect ratio with a full width influent and effluent system consisting of 8° perforated pipe protected by #4 stone wire wrapped to allow plug flow.

The wetlands will be excavated 5 feet. The ground is to be compacted, A woven geofabric will be applied to the site to protect the liner. A 30mil PVC or PE liner will be utilized. Soil will be replace above the liner in elevations varying from 6" to 28" above the liner.

The effluent header will be surrounded by #4 stone wrapped in poultry net and placed on geofabric above soil to protect the liners, and to prevent plugging of the effluent header, baffles will be located such as to capture settled solids at approximately 33% of the total length of each cell.

According to the EPA design manual, the primary functions of vegetation are to provide a fixed surface for bacterial growth and to provide dissolved oxygen.

The middle 35% to 40% provides oxygen production via fully submerged vegetation and disinfection by solar inactivation. This section therefore will have both passive and active aeration to augment oxygen when needed. This will be accomplished via air stones and overflow weirs.

The first third will be moderately vegetated at no more than 70% cover. The final third will be lightly vegetated with no more than 50% cover.

If vegetation is problematic, mechanical aeration and a suspended growth media will be used to simulate the plant stalks and root structures.

Under current site flows of 20,000GPD this design has a 16.3 day detention time.

Solids removal will be through uptake by vegetation and manual removal as needed. Vegetation will be cuiled as needed to maintain the moderate to light vegetation.

Each pass will be designed to operate fully independently if needed for repairs or clean up.

Each Cell 6. soil 47/1 upto 28' 30mil PVC liner Geo fabric Compacted Soil operating Profile 344 544 airstone 70% Cover Enclosed/LEFT luret Header stone wrapped in poultry nort 8 pertonda 80

95800

From:

Roy Denney <Roy.Denney@adenus.com>

Sent:

Monday, March 10, 2014 12:42 PM

To:

'Sandra.Dudley@tn.gov'

Cc:

'Charles. Hyatt'; 'Penny, William'; 'Britton Dotson'

Subject:

Maple Green FWS Design OGC14-0013

Attachments:

Cover Letter.pdf; Design Specifications.pdf; Maple Green 2014 Wetland - Cover (1).pdf; Maple Green 2014 Wetland - Site 200 (2).pdf; Maple Green 2014 Wetland - Wetland Site

Layout (3).pdf; Maple Green 2014 Wetland - Wetland Xsection details (4).pdf

Dear Ms. Dudley,

Please see the attached cover letter and design pertaining to Maple Green Reclamation Facility.

Kindest Regards,

Roy Denney

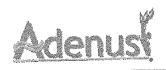


CTO

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Fex: 615.220.7207



March 10, 2014

Ms. Sandra K. Dudley, Ph. D., P.E. Director Division Of Water Resources Department of Environment and Conservation William R. Snodgrass - Tennessee Tower 312 Rosa L. Parks Avenue, 12th Floor Nashville, Tennessee 37243-1102

Subject:

State Operating Permit No. SOP-01028

TN Wastewater Systems - Maple Green Reclamation Facility

Coopertown, Robertson County, Tennessee

Maple Green Design Plans

OCG14-0019

Dear Ms. Dudley:

Please see attached for review one set each:

- Free Surface Wetlands Design Specifications
- Drawings

If there are any Questions Please contact me at this office.

Kindest Regards

Róy Denney, PE

Mr. Charles Hyatt, CEO Adenus Group, LLC, charles.hyatt@adenus.com

Mr. William Penny, Member, Stites and Harbison, PLLC, william.penny@stites.com

Mr. Britton Dodson, Assistant Director, TDEC Division of Water Resources, Britton Dodson@tn.gov

ADENUS SOLUTIONS GROUP

Free Surface Wetland Design Specifications

For The Maple Green Water Reclamation Facility

Roy Denney 3/10/2014



Design Specifications for the free water surface wastewater treatment wetland at Maple Green. Prepared for Tennessee Wastewater. Reference Case Number OGC14-0019

Maple Green Design Specifications

Table Of Contents

Section 1 Abstract

Section 2 Wetland Construction

Section 3 Mechanical Piping

Section 4 Equipment

Section 5 Maintenance Considerations.

Section 6 Design Calculations

Section 7 Geotechnical Study

Section 8 Sources

Appendix 1 Treatment modeling

Appendix 2 Manufacturer's Data sheets for components.

Liner

Blower

Air diffuser

Section 1 Abstract

Proposal Regarding Constructed Free Water Surface Wetland With Aeration for Treatment of Septic Tank Effluent in Rural Systems.

Roy Denney, PE

Adenus Group

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The proposed system will be based on design standards from The EPA Manual Constructed Wetlands Treatment of Municipal Wastewaters 2000 and the WEF/ASCE Design of Wastewater Treatment Plants 2012.

- 1. EPA. "Constructed Wetlands Treatment of Municipal Wastewater" 2000
- 2. Redmond, Eric. "Nitrogen removal from wastewater by an Aerated subsurface flow constructed wetland." Master's thesis, University of lowa, 2012.

Section 2 Wetland Construction

Site grade work and preparation will be performed in compliance with the geotechnical report and the liner manufacturer's recommendations for installation.

A geofabric will be installed above the clay liner to protect the synthetic liner.

The synthetic liner shall be installed above the geofabric. The synthetic liner shall be 30 mil PVC single sheet or approved equal.

Grading above the synthetic liner shall be irregular, but provide at least 6 inches of cover above the liner.

Liner installation to be approved by the manufacturer or their authorized representative.

Section 3 Mechanical Piping

3.1Pipe selection

	Туре	Size	Connections
Process Water	PVC SDR 27 or approved	6 Inch	Gasket bell ends or
1000			Glued couplings
Alr	Schedule 40	1.5 inch	Glued connections /

Connections

For water piping, gasketed bell end conn3ctions and glued coupling or as approved by the engineer.

For air piping, glued couplings or as approved by engineer.

3.2Tubing

For process equipment connections the use of flexible tubing will be permitted. Where exposure to Sunlight is likely UV resistance is required.

Connections shall be barb type connectors with stainless screw drive clamps.

Section 4 Equipment

3.1Aeration equipment:

3.11Blower requirements

Minimum of two blowers required.

Blowers shall be capable of 20CFM at 40 inches of water column.

Blowers shall employ an oil free design.

Blowers shall operate on single phase power.

3.12 Diffuser regulrements

Because of the shallow nature of the treatment system, low flow rate diffusers will be used.

0.25 to 0.5 CFM air stones are currently planned.

Diffusers shall be located along the bottom of the wetlands in a manner to prevent scouring, or erosion of the bottom of the wetland.

Section 5 Maintenance and Operations

Bearing replacement on blowers after 26000 run hours as per manufacturers recommendations.

Stones are to be acid washed when needed to maintain good air flow.

Vegetation should be culled in the late fall to maintain the light to moderate vegetation, culling no more than once a year. The site is designed to operate hydraulically under dense vegetation.

Monthly visual Inspections to ensure no damage or malfunctions.

Testing:

For the FWS system, a testing protocol measuring BOD removal should be employed. In operation a FWS system operates on the similar principals to a fixed film system, a similar consistency in the process is expected.

Section 6 Design Calculations

The site design considerations are as Follows,

Influent characteristics:

	Flow	35000 GPD
	BOD	150mg/L
	Temperature	20C state design requirements
Antonimon	Temperature	4C cold weather capacity

Effluent Characteristics:

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Aeration equipment

A1000000000000000000000000000000000000	BOD peak loading	43.785 lbs per day	
-	Capacity of Aerating equipment	57,600 CF per day	
	CF air per pound of BOD	1315.51	

Sizing Calculations utilized the Design Of Wastewater Treatment Plants Fifth Edition Volume 2: Liquid Treatment Processes, Chapter 18 Section 6.1. Equation 18.17

$$A_{fw} = \frac{q(lnC_o - lnC_e)}{k_t * d * n * (10,000)}$$

Where,

Aw = Surface Area of FWS Wetland

q = Wastewater flow, m³/d

 $C_o = Influent BOD, mg/L$

Co = effluent BOD, mg/L

n = Porosity, fraction

d = wetted depth

kt = first order rate coefficient

The sizing does not account for introduced aeration and is designed around vegetation supplying the required oxygen.

See Appendix For Treatment Models.

Section 7 Geotechnical Study

Prior to commencement of construction a subsurface investigation of the proposed site will be performed and the recommendations of the Geotechnical Consultant.

Investigation shall be Seismic Refraction Method as per ASTM D5777.

Section 8 Sources

- 1. EPA. "Constructed Wetlands Treatment of Municipal Wastewater" 2000
- 2. Redmond, Eric. "Nitrogen removal from wastewater by an Aerated subsurface flow constructed wetland." Master's thesis, University of Iowa, 2012.
- 3. wefpress. "Design Of Municipal Wastewater Treatment Plants; FIFTH EDITION" 2012.

Appendix 1 Treatment modeling

PWS Wetland Sizing

Variables				
			metric	
BOD imfluent	150 mg/L	ng/L	150	150 mg/L
1 cell BOD eff.	58 1	68 mg/L	පිරි	68 mg/L
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Theta	1.06			
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Ground Loading	155.96	155.96 lb/sq foot		

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peak loading

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PWS Wetland Sizing

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Appendix 2 Manufacturer's Data sheets for components.

Provided as examples.

Liner



SOLUTIONS

ENVIRONMENTAL PROTECTION, INC

1567 W. South Airport Rd. Traverse City, Michigan

Phone | 800-0K-LINER Fax | 231-943-2270

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TYPICAL APPLICATIONS:

Reservoirs

Canals

Bewage **Lagoons**

andfill Glosures

301 Remediation

Farine Ponda

Water Features

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Colt Churse Ponds

Heap Li ach Pads

Industrial Waste

Ponds

Talling Pands

30 mil PVC Geomembrane Specifications

PVC liners fabricated by EPI are a single-ply construction with Polyvinyl Chloride as the principle polymer. Only first quality virgin resins are used and all materials meet or exceed the requirements of ASTM D7176 Standard Specification for PVC geomembranes used in buried applications.

EPI utilizes statistical process control (SPC) to ensure the integrity of each panel produced. Samples from actual factory seams are removed during the welding process for a rigorous, proven testing procedure that assures you of the highest quality factory-fabricated PVC geomembranes available.

PVC Liners are fabricated by EPI in panels, accordion-folded in both directions, and packaged for shipment to your site for quick, easy installation to save you time and money.

Thickness ± 5%	ASTM	D-5199	.080
Specific Gravity (min)	ASTM	D-792	1.20
Tensile (lb/in-width, min)	ASTA	1 D-882	73
Elongation at Break (% min)	ASTM	D-882	380
Modulus (lb/in-widih, min)	ASTM	D-882	30
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Breaking Factor Eiongetion At Break Modulus at 100% Elong	eilon		5 20 20
Impact Cold Crack (°C)	ASTM	D-1790	-29
Dimensional Stability	ASTM	D-1204	
(% change, max)	(212°F	7/15 mln.)	3
Water Extraction (%,max)	ASTM	D-1239	0.15
Volstile Loss (%, mex)	ASTM	D-1203(A)	0.70
Hydrostatic Resistance (pst. min)	ASTM	D-761(A)	100
Plasticizer Min Ave Molec W	t AST	M 2124	400
Factory Fabricated Seams:	}		
Peel Strength (lbs/in, min)	ASTM	D-882	15
Shear Strength (lbs/in, min)	ASTM	D-882	58.4

These date are based on tests balleved to be reliable. However, these are laboratory tests that may not simulate actual use conditions. They are provided for your informational purposes only. No warranty, express or implied, including any other further warranty of fitness for a particular purpose or merchantability, is made by this promotional literature.

Preserving water resources for future generations

Blower

Blower Specifications (at Sea Level, 68°F, 60 Hz)

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Standard with 115V or 230V 8' power cord (230V models are also rated for 206V). Add "230" to part number for 230V.
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 S51 and larger ship via motor freight only.
 Blowers in series double the pressure.

Air diffuser

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**Dimensions of length and width are ±1/8" (3 mm). "Fitting is in center of 3" x 3" dimension. The suggested cfin shown above is typical for aquisculture, higher cfin amounts will create larger bubbles. Nonstandard fittings are available on request. PE is high density linear polyethylene. ABS is green plastin.

EMERGENCY ORDER RENEDATION WETLAND

ROBERTSON COUNTY, IN

COOPERTOWN, ROBERTSON COUNTY, TENNESSEE LOCATED OFF SANDY SPRINGS ROAD



WIEST 4 - WETLAND SECTION DETAILS SHEET 2-SITE LAYOUT (1" = 200)



FEBRUARY 27, 2014

ADENUS SOLUTIONS GROUP 849 AVIATION PARKWAY SMYRNA, TN 37167

Roy Denney

From:

Roy Denney <Roy.Denney@adenus.com>

Sent:

Monday, March 10, 2014 1:59 PM

To:

'Brad Harris'

Subject:

FW: Maple Green FWS Design OGC14-0013

Attachments:

Cover Letter.pdf; Design Specifications.pdf; Maple Green 2014 Wetland - Cover (1).pdf; Maple Green 2014 Wetland - Site 200 (2).pdf; Maple Green 2014 Wetland - Wetland Site

Layout (3).pdf; Maple Green 2014 Wetland - Wetland Xsection details (4).pdf

FYI



CTO

Adenus Group, LLC | 849 Aviation Pkwy, Smyrna, TN 37167

Direct: +1 615.220.7176 | Toll Free: +1 888.4.ADENUS Ext: 150 | Mobile: 615.691.2913 | Fax: 615.220.7207

From: Roy Denney [mailto:Roy.Denney@adenus.com]

Sent: Monday, March 10, 2014 12:42 PM

To: 'Sandra.Dudley@tn.gov'

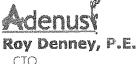
Cc: 'Charles. Hyatt'; 'Penny, William'; 'Britton Dotson' Subject: Maple Green FWS Design OGC14-0013

Dear Ms. Dudley,

Please see the attached cover letter and design pertaining to Maple Green Reclamation Facility.

Kindest Regards,

Roy Denney



Adenus Group, LLC | 849 Aviation Pkwy, Smyrna, TN 37167

Direct: +1 615.220.7176 | Toll Free: +1 888.4.ADENUS Ext: 150 | Mobile: 615.691.2913 | Fax: 615.220.7207

Roy Denney

From:

Roy Denney <Roy.Denney@adenus.com>

Sent:

Thursday, March 13, 2014 2:11 PM

To:

'Brad Harris'

Subject:

Maple Green BOD results

Attachments:

1402312_1 Email L1_Multiple_Sample_Per_Page 02 17 2014 1114.pdf; 1402429_1 Email

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_Multiple_Sample_Per_Page 03 12 2014 1719.pdf

Brad,

Attached is the lab data I have to date. We are still a little above the 45BOD target in the lagoon, although steadily moving that direction. My next step is to do a pond wide DO sampling I'm going to try to characterize portions of the pond and see if this is a stagnation/short circuiting issue or just a treatment time issue.

As we discussed on the phone, there are a couple really high data points which I believe to be improbable, likewise there is a 21mg/l I'd just toss as a sampling or procedural error.

Regards,

Rov



Adenus Group, LLC | 849 Aviation Pkwy, Smyrna, TN 37167

Direct: +1 615.220,7176 | Toll Free: +1 888.4.ADENUS Ext: 150 | Mobile: 615.691.2913 | Fax: 615.220.7207



Knoxville Division

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CHEMISTRY - MICROBIOLOGY - FOOD SAFETY - CONSUMER PRODUCTS - WATER - AIR - WASTES - FOOD - PHARMACEUTICALS - NUTRACEUTICALS

CERTIFICATE OF ANALYSIS

Brian Carter

Adenus Wastewater Professionals 849 Aviation Parkway Smyma, TN 37167

Date Reported:

2/17/2014

Date Received:

2/10/2014 RA135

Guet#:

PO#:

Workorder:

1402312

Project:

MAPLE GREEN - BOD

Analyte

Result

Units

DII Qualifier

K3

Reporting Limit

Analyst

Analyzed

Mathod

MAPLE GREEN

Sampled: 02/10/2014 09:00

1402312-01 (Water)

Wet Chemistry

BOD-5

53.4

mg/L

2.00

JPA 02/11/2014 20:50

Analyzed By: Microbac Knoxville Division SM5210 B-2001

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USDA-EPA-NIOBH Testing Food Sanitistion Consulting or other purposes without approval for laboratory.

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Knoxville Division

505 E. Broadway Avenue Maryville, TN 37804 865.977.1200 Fax:865.984.8616 Tri-Cities, TN 423.926.6385 | Nashville, TN 615.242.1480

> www.microbac.com tennessee@microbac.com

CHEMISTRY MICROBIOLOGY FOOD SAFETY CONSUMER PRODUCTS WATER AIR WASTES FOOD PHARMACEUTICALS MUTRACEUTICALS

CERTIFICATE OF ANALYSIS

Brian Carter

Adenus Wastewater Professionals

849 Aviation Parkway Smyrna, TN 37167 Date Reported:

2/17/2014

Date Received:

2/10/2014 RA135

Cust #:

Workorder:

1402312

Project

MAPLE GREEN - BOD

Certifications

Corle	Description	Number	Expires
A2LAB-KNX	ISO 17025 KNX food	3131.01	05/31/2016
A2LAB-NSH	ISO 17025 NSH food	3131.02	06/30/2014
FI	State of Florida Nelac	E87966	06/30/2014
GA	Georgia Dept Natural Resources	980	04/13/2014
NCENV	NC Environmental	678	12/31/2013
TN_DW	State of Tennessee	TN02017	04/30/2014
USDA	US Department of Agriculture		11/30/2013

Notes and Definitions

K3 Giucose/glutamic acid recovery was above acceptance limits. The reported value is estimated.

DET Analyte DETECTED

ND Analyte NOT DETECTED at or above the reporting limit

NR Not Reported

dry Sample results reported on a dry weight basis

RPD Relative Percent Difference

Microbac Laboratories, Inc. - Kriexville

Danielle Abrams For Byron Evans, Project Manager

Thank you for your business. For any feedback, please contact Ashley Morris, 🖭 ashley.morris@microbac.com. You may also contact Sean Hyde, Chief Operating Officer at sean.hyde@microbac.com or James Nokes, President, at James.nokes@microbac.com.

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USDA-EPA-NIOSH Testing Food Santation Consulting Chemical and Microbiological Analyses and Research

MEMBER





1402312-01

Sampled: 02/10/2014 09:00

Adenus Wastewater Professionals



2/10/14 9.00 × BOD 1000 mL P none 2/10/14 9.00 × Ammonia 250 mL P H ₂ SO ay 1 - pH/Temperature: ay 2 - pH/Temperature: Flow: ATURE REQUIRED OF ALL PERSONS HANDLING SAMPLES IMPLED TIME TIME TEMPERATURE TEMPERATURE TIME TEMPERATURE TEMPERATURE TIME TEMPERATURE TEMPERATURE TO 10 19 9.00 E-10-14 9.00 E-10-14 9.00 E-10-14 9.50	Contact/Address: Brian Carter	/Adenu	lS					and the second s
ample Also include a physical description (Water, DATE TIME \$\frac{1}{6} \frac{1}{6} \frac	Desired Turnaround Time:		***************************************					
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COOLER INSPECTION FORM # 10001.1

Client Name: ALDENSUS	Ďate/Ťím	e Réceived:	Q	2/10/14 0951
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· ·		mpleted By:	11	roalrol(4
Received By: 21				
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After-Hours Receipt? Shipping container in good condition? Custody seals intact on cooler? Custody seals intact on samples? Chain of custody present? Chain of custody includes proper client information? Chain of custody includes proper collection information at Chain of custody includes dates and times of sample collection of custody includes proper sample descriptions? Chain of custody agrees with sample labels? Chain of custody identifies proper sample matrix? Chain of custody identifies proper number of samples? Chain of custody includes required analysis? Chain of custody signed when relinquished and received? Samples are in proper containers/bottles? Sample containers are intact? Sufficient sample volume collected for requested analysis	- -	Yes D	No N	□ Not Present □ □ Not Present □ □ Not Present □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □
VOA vials for aqueous samples have zero headspace?		Yes 🗆 Yes 🗅	• • • •	
Samples received within holding times?		Yes 🗆		
Samples received on ice? Sample properly preserved?		Yes 🛚	No	П
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If No, adjusted by?		Date/Time:	one of the second se	
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tennessee@microbac.com

CHEMISTRY - MICROBIOLOGY - FOOD SAFETY - CONSUMER PRODUCTS - WATER - AIR - WASTES - FOOD - PHARMACEUTICALS - NUTRACEUTICALS

CERTIFICATE OF ANALYSIS

Brian Carter

Adenus Wastewater Professionals

849 Aviation Parkway Smyma, TN 37167

Date Reported:

2/18/2014

Date Received:

2/11/2014 **RA135**

Cust #:

PO#:

Workorder:

Analyte

BOD-5

1402429

Project:

Daily BOD

Result

Units

m

Qualifter

Reporting Limit

2.00

Analyst

Analyzed

Method

MAPLE GREEN

Sampled: 02/11/2014 09:00

1402429-01 (Water)

Wet Chemistry

90.1

mg/L

1

Analyzed By: Microbac Knoxville Division JPA 02/12/2014 18:40

SM5210 B-2001

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Date Reported:

2/18/2014

Date Received: Cust#: 2/11/2014 **RA135**

PO#;

Workorder:

1402429

Project:

Daily BOD

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Code	Description	Number	Expires
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AZLAB-NSH	ISO 17025 NSH food	3131.02	06/30/2014
FI	State of Florida Nelac	E87966	00/30/2014
GA	Georgia Dept Natural Resources	980	04/13/2014
NCENV	NC Environmental	678	12/31/2013
TN_DW	State of Tennessee	TN02017	04/30/2014
USDA	US Department of Agriculture		11/30/2013

Notes and Definitions

DET Analyte DETECTED

ND Analyte NOT DETECTED at or above the reporting limit

NR Not Reported

Sympto results reported on a dry weight basis dry

RPD Relative Percent Difference

Microbac Laboratories. Inc. - Knoxville

Danielle Abrams For Byron Evans, Project Manager

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SAMPLE (1402429-01

Sampled: 02/11/2014 09:00



Emject Number / Title: Daily BOD		<u> </u>	Leg J.		rente de la companya de la companya La companya de la co	~#####################################	
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SAMPLE DESCRIPTION Include all information to completely identify each sample. Also include a physical description. (Water, soil, ground water, etc.)	DATE	TIME	888	COME	ANALYSIS REQUIRED Comments, Instructions, etc.	Number / Type of Containers	Preservative
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Work Order: 1402479	No.	or samples:
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Knoxville Division

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CHEMISTRY · MICROBIOLOGY · FOOD SAFETY · CONSUMER PRODUCTS · WATER · AIR · WASTES · FOOD · PHARMACEUTICALS · NUTRACEUTICALS

CERTIFICATE OF ANALYSIS

Brian Carter

Adenus Wastewater Professionals 849 Aviation Parkway Smyma, TN 37167

Date Reported:

2/18/2014

Date Received:

2/11/2014 **RA135**

Guet#:

PO#:

Workorder:

1402429

Project:

Daily BOD

Analyte

Result

Unite

Dil

Qualifier

Reporting Limit

Analyst

Analyzed

Method

MAPLE GREEN

Sampled: 02/11/2014 09:00

1402429-01 (Weter)

Wet Chemistry

800-6

90.1

mg/L

2.00

JPA 02/12/2014 16:40

Analyzed By: Microbac Knoxville Division SM5210 B-2001

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> www.microbsc.com tennessee@microbac.com

CHEMISTRY MICROBIOLOGY FOOD SAFETY CONSUMER PRODUCTS WATER AIR WASTES FOOD PHARMACEUTICALS NUTRACEUTICALS

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Adenus Wastewater Professionals 849 Aviation Parkway

Smyma, TN 37167

Date Reported:

2/18/2014

Date Received:

2/11/2014 **RA135**

Cust#: PO#

Workorder:

1402429

Project:

Daily BOD

Certifications

Code	Description	Number	Expires
A2LAB-KNX	ISO 17025 KNX food	3131.01	05/31/2015
A2LAB-NSH	ISO 17025 NSH food	3131.02	06/30/2014
FI	State of Florida Nelac	E879 6 8	06/30/2014
GA	Georgia Dept Natural Resources	980	04/13/2014
NCENV	NC Environmental	678	12/31/2013
TN_DW	State of Tennessee	TN02017	04/30/2014
USDA	US Department of Agriculture		11/30/2013

Notes and Definitions

DET Analyte DETECTED

Analyte NOT DETECTED at or above the reporting limit ND

NR Not Reported

dry Sample results reported on a dry weight basis

Relative Percent Difference RPD

Microbac Laboratories, Inc. - Knoxville

Danielle Abrams For Byron Evans, Project Manager

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SAMPLE (1402429-01

Sampled: 02/11/2014 09:00

Adenus Wastewater Professionals



Project Number / Title: Daily BOD	7/	ANE	GA	262	5N			
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Received By: QUONNE Lee	s	***************************************		-	11/14	0944	- 39	Ž.
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COOLER INSPECTION FORM # 10001.1

	mi salahi	- Brankingt	2/11/14 0944
Client Name: ADENUS			•
Work Order: 1402434		of Samples:	
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After-Hours Receipt? Shipping container in good condition? Custody seals intact on cooler? Custody seals intact on samples? Chain of custody present? Chain of custody includes proper client information? Chain of custody includes proper collection information at Chain of custody includes dates and times of sample collection of custody includes proper sample descriptions? Chain of custody agrees with sample labels? Chain of custody identifies proper sample matrix? Chain of custody identifies proper number of samples? Chain of custody identifies proper number of samples? Chain of custody includes required analysis? Chain of custody signed when relinquished and received? Samples are in proper containers/bottles? Sample containers are intact? Sufficient sample volume collected for requested analysis VOA vials for aqueous samples have zero headspace? Samples received within holding times? Samples received on ice? Sample properly preserved?	CHOIT	Yes U U Yes	No II
If No, adjusted by?		Date/Time:	
Remarks:			
ANY "NO" EVALUATION REQUIRES CLI	ENT NOTIFICATION	(excluding Af	ter-Hours Receipt).
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Knoxville Division

505 E. Broadway Avenue Maryville, TN 37804 865.977.1200 Fax:865.984.8616 Tri-Cities, TN 423.926.6385 | Nashville, TN 615.242.1480

www.microbac.com tennessee@microbac.com

CHEMISTRY - MICROBIOLOGY - FOOD SAFETY - CONSUMER PRODUCTS - WATER - AIR - WASTES - FOOD - PHARMACEUTICALS - NUTRACEUTICALS

CERTIFICATE OF ANALYSIS

Brian Carter

Adenus Wastewater Professionals 849 Aviation Parkway

Smyrna, TN 37167

Date Reported:

2/19/2014

Date Received:

2/12/2014 RA135

Cust #:

PO#:

Workorder:

Analyte

1402477

Project:

Daily BOD

Result

Units

Dil Qualifier Reporting Lbnit

Analyst

Analyzed

Method

MAPLE GREEN

Sampled: 02/12/2014 08:45

1402477-01 (Water)

Wet Chemistry

BOD-5

76.7

mg/L

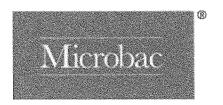
2.00

JPA 02/13/2014 16:00

Analyzed By: Microbac Knoxville Division SM5210 B-2001

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dry Sample results reported on a dry weight basis

RPD Relative Percent Difference

Microbac Laboratories, Inc. - Knoxville

Danielle Abrains For Byron Evans, Project Manager

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UNDA-EPA-NIOSH Teating Food Samuation Consulting Chemical and Microbiological Analyses and Research

member





1402477-01

Sampled: 02/12/2014 08:45

SAMPLE

Adenus Wastewater Professionals



Project Number / Title: Daily BOD	M-111111111111111111111111111111111111	MAF	16	68	EEN_			
Contact/Address: Brian Carter/	'Adenu	8						
Desired Turnamund Time:	NEW COMMISSION CONTRACTOR OF STREET							
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SAMPLE DESCRIPTION Include all information to completely identify each sample. Also include a physical description. (Water, soil, ground water, etc.)	DATE		College and the contraction of t	COMP	ANALYSIS Comments, onc.	REQUIRED	Number / Type of Containers	Preservative
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Delivered to Lab By: B- Cart		THE STREET STREET			111./14	<u> </u>		
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Batch Number (Office Wse Only):	***************************************		mannana	a till til til til til til til til til ti		And the second s		9229



COOLER INSPECTION FORM # 10001.1

Client Name: AOSNUS	Date/iln	ne Received:	02/V/H 1090
Work Order: 1402477	No.	of Samples:	· A
& 4	ou	malatad Bu	W/02/12/14
Received By:			
Carrier: FedEx(_) UPS(_) Client	Field Services(_)	Other(_):	
After-Hours Receipt? Shipping container in good condition? Custody seals intact on cooler? Custody seals intact on samples? Chain of custody present? Chain of custody includes proper client information? Chain of custody includes proper collection information and Chain of custody includes dates and times of sample collect Chain of custody includes proper sample descriptions? Chain of custody agrees with sample labels? Chain of custody identifies proper sample matrix? Chain of custody identifies proper number of samples? Chain of custody identifies proper number of samples? Chain of custody signed when relinquished and received? Samples are in proper containers/bottles? Sample containers are intact? Sufficient sample volume collected for requested analysis? VOA vials for aqueous samples have zero headspace? Samples received within holding times? Samples received on ice?	l signatures? ion?	Yes D Pes	No D Not Present No D Not Present No D Not Present No D Not Present No D No
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Roy Denney

From:

Roy Denney <Roy.Denney@adenus.com>

Sent:

Monday, March 24, 2014 11:56 AM

To:

'Brad Harris'; 'ann.morbit@tn.gov'

Subject:

Maple Green Lab Results OCG14-0019

Attachments:

1404379_1 Email L1_Multiple_Sample_Per_Page 03 21 2014 0034.pdf; 1404281_1 Email

L1_Multiple_Sample_Per_Page 03 20 2014 0126.pdf; 1404175_1 Email L1

_Multiple_Sample_Per_Page 03 18 2014 2354.pdf

Brad,

I've attached the lab data for last week. For the samples grabbed on the 12th, Sample A is from the pump building after the level rose enough to flow into the outlet riser. Sample B is from the same sample location previously used at the lagoon. Subsequent samples are from the Pump House.

The level In the lagoon is at the point where it will be necessary to go to drip irrigation to minimize storage in the lagoon and . We will begin utilizing the drip to maintain the 6ft level described in the PER.

Regards,

Roy



CTO

Adenus Group, LLC | 849 Aviation Pkwy, Smyrna, TN 37167

Direct: +1 615.220.7176 | Toll Free: +1 888.4.ADENUS Ext: 150 | Mobile: 615.691.2913 | Fax: 615.220.7207



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> www.microbac.com tennessee@microbac.com

CHEMISTRY - MICROBIOLOGY - FOOD SAFETY - CONSUMER PRODUCTS - WATER - AIR - WASTES - FOOD - PHARMACEUTICALS - NUTRACEUTICALS

CERTIFICATE OF ANALYSIS

Brian Carter

Adenus Wastewater Professionals 849 Aviation Parkway

Smyrna, TN 37167

Date Reported:

3/21/2014

Date Received:

3/13/2014 **RA135**

Cust#:

PO#:

Workorder:

1404379

Project:

Maple Green

Analyte

Result

Units

Dil

Qualifier

Reporting Limit

Anaivet

Analyzed

Mathod

Maple Green

Sampled: 03/13/2014 09:00

1404379-01 (Water)

Wet Chemistry

BOD-5

63.1

mg/L

4

2.00

JPA 03/14/2014 19:10

Analyzed By: Microbac Knoxville Division SM5210 B-2001

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CHEMISTRY MICROBIOLOGY FOOD SAFETY CONSUMER PRODUCTS WATER AIR WASTES FOOD PHARMACEUTICALS NUTRACEUTICALS

CERTIFICATE OF ANALYSIS

Brian Carter

Adenus Wastewater Professionals 849 Aviation Parkway

Smyma, TN 37167

Date Reported:

3/21/2014

Date Received:

3/13/2014

RA135

Cust#:

PO#:

Workorder:

1404379

Project

N

Maple Green

Certifications

Code	Description	Number	Expires
A2LAB-KNX	ISO 17025 KNX food	3131.01	05/31/2015
A2LAB-NSH	ISO 17025 NSH food	3131.02	06/30/2014
FL	State of Florida NELAC	E87966	06/30/2014
GA	Georgia Dept Natural Resources	980	04/13/2014
NCENV	NC Environmental	678	12/31/2013
TN_DW	State of Tennessee	TN02017	04/30/2014
USDA	US Department of Agriculture		11/30/2013

Notes and Definitions

R1 Duplicate RPD is outside of acceptance limits.

DET Analyte DETECTED

ND Analyta NOT DETECTED at or above the reporting limit

NR Not Reported

dry Sample results reported on a dry weight basis

RPD Relative Percent Difference

Microbac Laboratories, Inc. - Knoxville

Brian Richard, Project Manager

Thank you for your business. For any feedback, please contact Ashley Morris, at ashley.morris@microbac.com. You may also contact Trevor Boyce, President, at trevor.boyce@microbac.com.

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Member



SAMPLE CHAIN OF CUSTODY

ØMICROBAC*	1404379-01
SAMPLE CHAIN OF CUSTODY Project Number / Title: Daily BOD MAPLE GREEN	
Project Number / Title: Daily BOD MAPLE GREEN	Sam
Contact/Address: Brian Carter/Adenus	<u>8</u>
Desired Turnaround Time:	8
SAMPLE DESCRIPTION Include all information to complerely identify each sample. Also include a physical description, (Water, DATE TIME E Comments, Instructions, Type of Type of Comminers action of the complex of the complex of the comments of the comments of the comments of the comminers of the comminers of the comments of the comments of the comminers of the comminers of the comminers of the comments of the co	Sampled: 03/13/2014 09:00
3)8/14 q;∞ √ BOD 1000 mLP none	
Day 1 - pH/Temperature: Flow: Day 2 - pH/Temperature: Flow:	
GNATORE REQUIRED OF ALL PERSONS HANDLING SAMPLES DATE TIME TEMPERATURE ample Collected By: 3/13/14/9/00	
Delivered to Lab By: 73 Company 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2	





Client Name: AOPULS	Date	/Time Received	: 3	1007
Work Order: 1404319		No. of Samples	:	
Received By:	Checklis	t Completed By	: <u>V</u>	13/13/14
Carrier: FedEx(_) UPS(_) Client(_)	Field Services(_) Other(_)	*	
After-Hours Receipt? Shipping container in good condition? Custody seals intact on cooler? Custody seals intact on samples? Chain of custody present? Chain of custody includes proper client information? Chain of custody includes proper collection information at Chain of custody includes dates and times of sample colle Chain of custody includes proper sample descriptions? Chain of custody includes proper sample descriptions? Chain of custody identifies proper sample matrix? Chain of custody identifies proper number of samples? Chain of custody includes required analysis? Chain of custody signed when relinquished and received? Samples are in proper containers/bottles? Sample containers are intact? Sufficient sample volume collected for requested analysis VOA vials for aqueous samples have zero headspace? Samples received within holding times? Sample properly preserved?	ection?	Yes I Yes I Yes I Yes I Yes I Yes I Yes I Yes I Yes I Yes I	NO N	Not Present A
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ANY "NO" EVALUATION REQUIRES CLI	ENT NOTIFICATI	ON (excluding	After-Hou	ure Receipt).
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Knoxville Division

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CHEMISTRY - MICROBIOLOGY - FOOD SAFETY - CONSUMER PRODUCTS - WATER - AIR - WASTES - FOOD - PHARMACEUTICALS - NUTRACEUTICALS

CERTIFICATE OF ANALYSIS

Brian Carter

Adenus Wastewater Professionals 849 Aviation Parkway Smyrna, TN 37167

Date Reported:

3/20/2014

Date Received:

3/12/2014

Cost #: PO#:

RA135

Workorder:

Ansiyte

1404281

Project:

Result

Maple Green

933 Qualifler Reporting Limit

Analyst

Analyzed

Method

Maple Green A

Sampled: 03/12/2014 09:00

1404281-01 (Water)

Wet Chemistry

BOD-8

74.8

mg/L

Units

1

Analyzed By: Microbac Knoxville Division 2.00

2.00

JPA 03/13/2014 17:00

SM5210 B-2001

Maple Green B

Sampled: 03/12/2014 09:00

1404281-02 (Water)

Wet Chemistry

BOD-S

38.7

mg/L

4

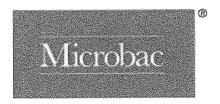
Analyzed By: Microbac Knoxville Division JPA 03/13/2014 17:00

SM5210 B-2001

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CHEMISTRY - MICROBIOLOGY - FOOD SAFETY - CONSUMER PRODUCTS - WATER - AIR - WASTES - FOOD - PHARMACEUTICALS - NUTRACEUTICALS

CERTIFICATE OF ANALYSIS

Brian Carter

Adenus Wastewater Professionals

849 Aviation Parkway Smyrna, TN 37167 Date Reported:

3/20/2014

Date Received:

Cust#:

3/12/2014 RA135

PO#:

Workorder:

1404281

Project:

Maple Green

Certifications

Code	Description	Number	Expires
A2LAB-KNX	ISO 17025 KNX food	3131.01	05/31/2015
AZLAB NSH	ISO 17025 NSH food	3131.02	06/30/2014
FL	State of Florida NELAC	1987966	06/30/2014
GA	Georgia Dept Natural Resources	980	04/13/2014
NCENV	NC Environmental	678	12/31/2013
TN_DW	State of Tennessee	TN02017	04/30/2014
USDA	US Department of Agriculture		11/30/2013

Notes and Definitions

DET

Analyte DETECTED

ND

Analyte NOT DETECTED at or above the reporting limit

NR

Not Reported

dry

Sample results reported on a dry weight basis

RPD

Relative Percent Difference

Microbac Laboratories, Inc. - Knoxville

Brian Richard, Project Manager

Thank you for your business. For any feedback, please contact Ashley Morris, at ashley morris@microbac.com. You may also contact Trevor Boyce, President, at trevor boyce@microbac.com.

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USDA-EPA-NIOSH Tosting Pand Santiation Consulting Chemical and Microbiological Analyses and Research

Hewber



SAMPLE CHAIN OF CUSTODY

Project Number / Title: Daily BOD	MA	E CHA		0	F CUS	TODY			1404281-01 Sam Adenus Wastewater Professionals
Contact/Address: Brian Carter/	<u> Adenu</u>	<u> </u>	***************************************	*************	M		the state of the s		8
Desired Turnaround Time:	Construction of the second section of the sec	***************************************	***************************************		~	www.			8
SAMPLE DESCRIPTION Include all information to completely identify each sample. Also include a physical description. (Water, soil, around water, etc.)	DATE		Call P. M.	882	ANALYSI Comments, etc.	IS REQUIRED Instructions,	Number / Type of Containers		Sampled: 03/12/2014 09:00
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	3/12/19	9:00	V		300-	Ž.	10001-2	Nonz	
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Day 2 - pH/Temperature:		and the second second			ow:		on the state of th		
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Batch Number (Office Use Only):	*************************************	anga managa m	w <i>ananaa</i>				and the second and th		



COOLER INSPECTION FORM # 10001.1

Client Name: AOE/UUS	Date/Tin	ne Received	d:	3	<u>B(14)049</u>
Work Order: 140 4281		of Samples	أسر	2	
Received By:	Checklist Co	mpleted By	y: <u>l</u>	Ļ	13/12/14
Carrier: FedEx(_) UPS(_) Client()	Field Services(_)	Other(_):		
After-Hours Receipt? Shipping container in good condition? Custody seals Intact on cooler? Custody seals intact on samples? Chain of custody present? Chain of custody includes proper client information? Chain of custody includes proper collection information and chain of custody includes dates and times of sample collection of custody includes proper sample descriptions? Chain of custody includes proper sample descriptions? Chain of custody identifies proper sample matrix? Chain of custody identifies proper number of samples? Chain of custody identifies proper number of samples? Chain of custody signed when relinquished and received? Samples are in proper containers/bottles? Sample containers are intact? Sufficient sample volume collected for requested analysis? VOA vials for aqueous samples have zero headspace? Samples received within holding times?	tion?	Yes			Not Present A
Samples received on ice? Sample properly preserved?				NO No	
If No, adjusted by? Remarks:		Date/Time			
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Knoxville Division

505 E. Broadway Avenue Maryville, TN 37804 865.977.1200 Fax:865.984.8616 Tri-Citics, TN 423.926.6385 | Nashville, TN 615.242.1480

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tennessee@microbac.com

CHEMISTRY - MICROBIOLOGY - FOOD SAFETY - CONSUMER PRODUCTS - WATER - AIR - WASTES - FOOD - PHARMACEUTICALS - NUTRACEUTICALS

CERTIFICATE OF ANALYSIS

Brian Carter Adenus Wastewater Professionals 849 Aviation Parkway Smyma, TN 37167

Date Reported:

3/18/2014

Date Received:

3/11/2014 **RA135**

Cust #:

PO#

Workorder:

Analyte

1404175

Project

Maple Green

Result

Unite

DII

Qualifier

Reporting Limit

Analyst

Analyzed

Method

Maple Green

Sampled: 03/11/2014 08:42

1404175-01 (Water)

Wet Chemistry

BOD-5

43.0

mg/L

1

2.00

JPA 03/12/2014 18:15

Analyzed By: Microbac Knoxville Division SM5210 B-2001

The data and information on this, and other accompanying documents, represent unity the sample(s) analyzed and is rendered upon condition a momentum on this, also density accompaning an observation, represent unit into analysis of an analysis of the first state of the per approduced wholly or in part for advertising or other purposes without approval from the laboratory.

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MENGER





Knoxville Division

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CHEMISTRY - MICROBIOLOGY - FOOD SAFETY - CONSUMER PRODUCTS - WATER - AIR - WASTES - FOOD - PHARMACEUTICALS - NUTRACEUTICALS

CERTIFICATE OF ANALYSIS

Brian Carter Adenus Wastewater Professionals

849 Aviation Parkway Smyrna, TN 37167

Date Reported: Date Received: 3/18/2014 3/11/2014 **RA135**

Cust#: PO#:

Workorder: 1404175

Project:

Maple Green

Certifications

Code	Description	Number	Expires
A2LAB-KNX	ISO 17025 KNX food	3131.01	05/31/2015
A2LAB-NSH	ISO 17025 NSH food	3131.02	06/30/2014
FI.	State of Florida NELAC	E87966	06/30/2014
GA	Georgia Dept Natural Resources	980	04/13/2014
NCENV	NC Environmental	678	12/31/2013
TN_DW	State of Tennessee	TN02017	04/30/2014
USDA	US Department of Agriculture		11/30/2013

Notes and Definitions

DET Analyte DETECTED

ND Analyte NOT DETECTED at or above the reporting limit

NR Not Reported

dry Sample results reported on a dry weight basis

RPD Relative Percent Difference

Microbac Laboratories, Inc. - Knoxville

Brian Richard, Project Manager

Thank you for your business. For any feedback, please contact Ashley Morris, at ashley morris@microbac.com. You may also contact Trevor Boyce, President, at trevor.boyce@microbac.com.

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SAMPLE CHAIN OF CUSTODY

Project Number / Title: Daily BOD								## ## ## ## ## ## ## ## ## ## ## ## ##
Contact/Address: Brian Carter,	/Adenu	6	***************************************			00000000000000000000000000000000000000		
Desited Turnaround Time:	.00111111111111111111111111111111111111	***************************************		···	······································		A	The second secon
			····	·			and the second s	
SAMPLE DESCRIPTION Include all information to completely identify each sample. Also include a physical description. (Water, soil, ground water, etc.)			CRAB	COMA	ANALYSI: Continents, etc.	S REQUIRED	Number / Type of Containers	
18/14/- 6-10	3/1/14	2:12	X					
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Day 2 - pH/Temperature:		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		Fic)W.			
		<u></u>					TYATIA	
Sample Collected By: TRACE N, 240				3/11	ariani ani ang ani ani ani ani	8.42	2 401144 410444	20 MA 4 4 MA
Delivered to Lab By: Tizar y Niz (8)	<u> </u>			7/11	714	9.33		
Delivered to Lab By: Tracy Wield Received By:	1	***************************************		3/	11/14	005	<u>2 13.8° <</u>	Temp, taker
Batch Number (Office Use Only):			*		*	Control of the Contro		after resci
								11.11.W



Effective Date: 05/05/11

COOLER INSPECTION FORM # 10001.1

rai adisi serendik É 8 8° ak			the same	I. fan	Ken a ground
Client Name: AOBNUS	Date/Tim	ne Received:			<u> </u>
Work Order: 1404175		of Samples:	2		
Received By:	Checklist Co	mpleted By:	<u>U</u>	13/11	114-
Carrier: FedEx(_) UPS(_) Clients	Field Services(_)	Other(_):_			005000695000000000000000000000000000000
After-Hours Receipt? Shipping container in good condition? Custody seals intact on cooler? Custody seals intact on samples? Chain of custody present? Chain of custody includes proper client information? Chain of custody includes proper collection information ar Chain of custody includes dates and times of sample collect Chain of custody includes proper sample descriptions? Chain of custody identifies proper sample matrix? Chain of custody identifies proper number of samples? Chain of custody identifies proper number of samples? Chain of custody includes required analysis? Chain of custody signed when relinquished and received? Samples are in proper containers/bottles? Sample containers are intact? Sufficient sample volume collected for requested analysis? VOA vials for aqueous samples have zero headspace? Samples received within holding times?	ction?	Yes U Yes U Yes	No No No No No No No No No No No No	Not Present Not Present Not Present	
Sample properly preserved?		Yes © Date/Time:	No		
If No, adjusted by?Remarks:		LOV CARDY 183 RD-			
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	in the second				
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From:

Roy Denney <Roy.Denney@adenus.com>

Sent:

Monday, March 24, 2014 12:21 PM

To:

'ann.morbitt@tn.gov'

Subject:

FW: Maple Green Lab Results OCG14-0019

Attachments:

1404379_1 Email L1_Multiple_Sample_Per_Page 03 21 2014 0034.pdf; 1404281_1 Email

L1 Multiple Sample_Per_Page 03 20 2014 0126.pdf; 1404175_1 Email L1

_Multiple_Sample_Per_Page 03 18 2014 2354.pdf

Ann,

Sorry, failed to copy.

Roy



CTC

Adenus Group, LLC | 849 Aviation Pkwy, Smyrna, TN 37167

Direct: +1 615.220.7176 | Toll Free: +1 888.4.ADENUS Ext: 150 | Mobile: 615.691.2913 | Fax: 615.220.7207

From: Roy Denney [mailto:Roy.Denney@adenus.com]

Sent: Monday, March 24, 2014 11:56 AM To: 'Brad Harris'; 'ann.morbit@tn.gov'

Subject: Maple Green Lab Results OCG14-0019

Brad,

I've attached the lab data for last week. For the samples grabbed on the 12th, Sample A is from the pump building after the level rose enough to flow into the outlet riser. Sample B is from the same sample location previously used at the lagoon. Subsequent samples are from the Pump House.

The level in the lagoon is at the point where it will be necessary to go to drip irrigation to minimize storage in the lagoon and . We will begin utilizing the drip to maintain the 6ft level described in the PER.

Regards,

Roy



CTO

Adenus Group, LLC | 849 Aviation Pkwy, Smyrna, TN 37167

Direct: +1 615.220.7176 | Toll Free: +1 888.4.ADENUS Ext: 150 | Mobile: 615.691.2913 | Fax: 615.220.7207

From:

Roy Denney <Roy.Denney@adenus.com>

Sent:

Wednesday, March 26, 2014 11:53 AM

To:

'Brad Harris'

Subject:

FWS Wetlands

Attachments:

20140326101004848.pdf

Brad,

I have reviewed the case studies and pilots you mentioned yesterday. From a first look it appears that several key factors are substantially different. The SUD system is a much shallower system with the majority of the surface area limited to 6 inches of depth. The "pools" are only 3 ft deep. While the areal loading rate is significantly lower, the hydraulic detention time is about the same and the shallow design could potentially lead to limitations. The depth used in their design isn't wrong, rather one of many alternatives that are out there.

Although the difference between 30mg/L BOD to 9 mg/L and 150mg/L to 45mg/L may seem large the natural log reduction is the same in both cases, 1.204.

It is important to remember the biological reaction is a first order reaction rate so different ranges of treatment will see different treatment requirements. Ultimately the equation is fairly conservative. I've attached the worksheet with the criteria used in planning the SUD wetland. You'll see it actually calls for a higher surface area, using the model we've worked with to get area for the Sewanee project, it calls for a 36 acre treatment area.

The areal loading rates are highly subjective and large shallow marshes would increase the volume required by increasing the vegetation density.

The system we've proposed should be sufficient to treat summer flows with only one cell in operation. At current site flows into Maple Green a single treatment cell should be sufficient to about 5 degrees Celsius.

As I mentioned the I did not intend for the aeration to be a primary mechanism in the treatment capacity of this system. It is sized with rather traditional design considerations. The aeration concept is intended as a method of improving upon the standard design, however such conditions would be closely monitors for the purposes of establishing a superior level of treatment and the eventual increase in capacity, not as a basis of the proposed design capacity.

With regard to utilizing the system in series. Most designs we've seen for wetlands allow for series or parallel use. Since they are commonly used for tertiary treatment there is no anticipated issue with a similar use after a wetland system.

Finally our design should allow for easy routine maintenance allowing for the easy removal of detritus and vegetation.

If there are further questions please don't hesitate to ask.

Thanks,

Roy



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PWS Wedland Sizing

Variables		A THE RESERVE AND A PARTY OF THE PARTY OF TH		,
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Theta	1.06			
Aspect Ratio X:1	w			
porosity	p 6.0	D.		
Ground Loading	31.19	31.19 b/sq foot		

1 WGD Site

Light Vegitation

6 inch depth

30 mg/L BOD Influent

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From:

Roy Denney <Roy.Denney@adenus.com>

Sent:

Monday, March 31, 2014 1:14 PM

To:

'Brad Harris'; 'ann.morbitt@tn.gov'

Subject:

Maple Green BOD5

Attachments:

1404580_1 Email L1_Multiple_Sample_Per_Page 03 24 2014 2215.pdf; 1404672_1 Email

L1_Multiple_Sample_Per_Page 03 25 2014 1839.pdf; 1404870_1 Email L1 _Multiple_Sample_Per_Page 03 28 2014 1147.pdf; 1404800_1 Email L1

_Multiple_Sample_Per_Page 03 28 2014 1148.pdf

Brad, Ann,

Please see attached results for the treatment at Maple Green.

With the exception of Sample 1404870, all results have been below the permit limits.

If this week's results show we are achieving the treatment limits, we intend to reduce sampling of the lagoon to monthly.

Kind Regards,

Roy Denney



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Knoxville Division

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> www.microbac.com tennessee@microbac.com

> > Reporting

Limit

2.00

CHEMISTRY - MICROBIOLOGY - FOOD SAFETY - CONSUMER PRODUCTS - WATER - AIR - WASTES - FOOD - PHARMACEUTICALS - NUTRACEUTICALS

CERTIFICATE OF ANALYSIS

Dil

4

Qualifier

Brian Carter

Adenus Wastewater Professionals 849 Aviation Parkway Smyma, TN 37167

Date Reported:

3/24/2014

Date Received:

3/17/2014

Cust #:

RA135

PO#:

Workorder:

Analyto

1404580

Project:

Maple Green

Result

Analyzed

Maple Green

Sampled: 03/17/2014 10:00

1404580-01 (Water)

Analyst

Wet Chemistry

BOD-5

43.4

mg/L

Units

Analyzed By: Microbac Knoxville Division JPA 03/18/2014 19:30

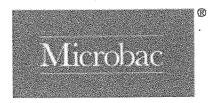
SM5210 B-2001

Method

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CHEMISTRY - MICROBIOLOGY - FOOD SAFETY - CONSUMER PRODUCTS WATER - AIR WASTES FOOD - PHARMACEUTICALS - NUTRACEUTICALS

CERTIFICATE OF ANALYSIS

Date Reported:

3/24/2014

Brian Carter Adenus Wastewater Professionals

Date Received:

3/17/2014

849 Aviation Parkway Sinyma, TN 37167

Cust#: PO#: RA135

Workorder:

1404580

Project

Maple Green

Certifications

Code	Description	Number	Expires
A2LAB-KNX	ISO 17025 KNX food	3131.01	05/31/2015
A2LAB-NSH	ISO 17025 NSH food	3131.02	06/30/2014
FL	State of Florida NELAC	€87966	06/30/2014
GA	Georgia Dept Natural Resources	980	04/13/2014
NCENV	NC Environmental	678	12/31/2013
TN DW	State of Tennessee	TN02017	04/30/2014
USDA	US Department of Agriculture		11/30/2013

Notes and Definitions

DET

Analyte DETECTED

ND

Analyte NOT DETECTED at or above the reporting limit

Nis

Not Reported

dry

Sample results reported on a dry weight basis

RPD

Relative Percent Difference

Microbac Laboratories. Inc. - Knoxville

Brian Richard, Project Manager

Thank you for your business. For any feedback, please contact Ashley Morris, at ashley.morris@microbac.com. You may also contact Trovor Boyce, President, at trevor.boyce@microbac.com.

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MPMRFR



SAMPLE CHAIN OF CUSTODY

Project Number / Title: Daily BO	D ///	APLE	61	127	FA			
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COOLER INSPECTION FORM # 10001.1

		3/17/14/107
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After-Hours Receipt? Shipping container in good condition? Custody seals intact on cooler? Custody seals intact on samples? Chain of custody present? Chain of custody includes proper client information? Chain of custody includes proper collection information and signatures? Chain of custody includes dates and times of sample collection? Chain of custody includes proper sample descriptions? Chain of custody agrees with sample labels? Chain of custody identifies proper sample matrix? Chain of custody identifies proper number of samples? Chain of custody includes required analysis? Chain of custody signed when relinquished and received? Samples are in proper containers/bottles? Sample containers are intact? Sufficient sample volume collected for requested analysis? VOA vials for aqueous samples have zero headspace? Samples received within holding times? Samples received on ice? Sample properly preserved?	Yes D	No D Not Present C
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Knoxville Division

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www.microbac.com tennessee@microbac.com

CHEMISTRY - MICROBIOLOGY - FOOD SAFETY - CONSUMER PRODUCTS - WATER - AIR - WASTES - FOOD - PHARMACEUTICALS - NUTRACEUTICALS

CERTIFICATE OF ANALYSIS

Brian Carter

Adenus Wastewater Professionals 849 Aviation Parkway

Smyrna, TN 37167

Date Reported:

3/25/2014

Date Received:

3/18/2014 RA135

Coat #:

PO#:

Workorder:

1404672

Project:

Maple Green

Analyte

Result

Units

Oll

Qualifler

Reporting Limit

Analyst

Analyzed

Method

Maple Green

Sampled: 03/18/2014 09:00

1404672-01 (Water)

Wet Chemistry

BOD-5

40.2

mg/L

Analyzed By: Microbac Knoxville Division 2.00 JPA 03/19/2014 18:20

SM5210 B-2001

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CERTIFICATE OF ANALYSIS

Brian Carter

Adenus Wastewater Professionals

849 Aviation Parkway Smyma, TN 37167

Date Reported:

3/25/2014

Date Received: Cust #:

3/18/2014 **RA135**

PO#:

Workorder:

1404672

Project

Maple Green

Certifications

Code	Description	Number	Expires
A2LAB-KNX	ISO 17025 KNX food	3131.01	05/31/2015
AZIJAB-NSH	ISO 17025 NSH tood	3131.02	06/30/2014
FL.	State of Florida NELAC	E87966	06/30/2014
GA	Georgia Dept Natural Resources	980	04/13/2014
NCENV	NC Environmental	678	12/31/2013
TN_DW	State of Tennessee	TN02017	04/30/2014
USDA	US Department of Agriculture		11/30/2013

Notes and Definitions

DET Analyte DETECTED

Analyte NOT DETECTED at or above the reporting limit ND

Not Reported NR

Sample results reported on a dry weight basis dry

RPD Relative Percent Difference

Microbac Laboratories, Inc. - Knoxville

Brian Richard, Project Manager

Thank you for your business. For any feedback, please contact Ashley Morris, at ashley morris@microbac.com. You may also contact Trevor Boyce. President, at trever.boyce@microbac.com.

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MEMBER





SAMPLE CHAIN OF CLISTODY

1404672-01

Sampled: 03/18/2014 09:00

Adenus Wastewater Professionals



Project Number / Title: Daily BUD				***************************************			
Contact/Address: Brian Carter	/Adenu	8		00:00.00			
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COOLER INSPECTION FORM # 10001.1

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After-Hours Receipt? Shipping container in good condition? Custody seals intact on cooler? Custody seals intact on samples? Chain of custody present? Chain of custody includes proper client information? Chain of custody includes proper collection information and sig Chain of custody includes dates and times of sample collection? Chain of custody includes proper sample descriptions? Chain of custody agrees with sample labels? Chain of custody identifies proper sample matrix? Chain of custody identifies proper number of samples? Chain of custody includes required analysis? Chain of custody signed when relinquished and received? Samples are in proper containers/bottles? Sample containers are intact? Sufficient sample volume collected for requested analysis? VOA vials for aqueous samples have zero headspace? Samples received within holding times? Sample properly preserved?		Yes D Yes D Yes	No
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Remarks:			
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	one of the state o		

From:

Roy Denney <Roy.Denney@adenus.com>

Sent:

Monday, March 31, 2014 1:14 PM

To:

'Brad Harris'; 'ann.morbitt@tn.gov'

Subject:

Maple Green BOD5

Attachments:

1404580_1 Email L1_Multiple_Sample_Per_Page 03 24 2014 2215.pdf; 1404672_1 Email

L1_Multiple_Sample_Per_Page 03 25 2014 1839.pdf; 1404870_1 Email L1 _Multiple_Sample_Per_Page 03 28 2014 1147.pdf; 1404800_1 Email L1

_Multiple_Sample_Per_Page 03 28 2014 1148.pdf

Brad, Ann,

Please see attached results for the treatment at Maple Green.

With the exception of Sample 1404870, all results have been below the permit limits.

If this week's results show we are achieving the treatment limits, we intend to reduce sampling of the lagoon to monthly.

Kind Regards,

Roy Denney



Adenus Group, LLC | 849 Aviation Pkwy, Smyrna, TN 37167

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www.microbac.com tennessee@microbac.com

CHEMISTRY - MICROBIOLOGY - FOOD SAFETY - CONSUMER PRODUCTS - WATER - AIR - WASTES - FOOD - PHARMACEUTICALS - NUTRACEUTICALS

CERTIFICATE OF ANALYSIS

Brian Carter Adenus Wastewater Professionals 849 Aviation Parkway Smyrna, TN 37167

Date Reported:

3/28/2014

Date Received:

3/20/2014 **RA135**

Cust#:

PO#:

Workorder:

1404870

Project:

Maple Green

Analyte

Result

Units

Oii

Qualifier

Reporting Limit

Analyst

Analyzed

Method

Maple Green

Sampled: 03/20/2014 08:10

1404870-01 (Water)

Wet Chemistry

BOD-5

47.9

mg/L

Analyzed By: Microbac Knoxville Division 2.00 JPA 03/21/2014 16:50

SM5210 B-2001

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www.microbac.com tennessee@microbac.com

CHEMISTRY - MICROBIOLOGY - FOOD SAFETY - CONSUMER PRODRICTS - WATER - AIR - WAS 1ES - FDOO - PHARMACEUTICALS - NUTRACEUTICALS

CERTIFICATE OF ANALYSIS

Brian Carter

Adenus Wastewater Professionals

849 Aviation Parkway Smyrna, TN 37167

Date Reported:

3/28/2014

Date Received: Cust #: 3/20/2014 RA135

PO#:

Workorder:

1404870

Project

Maple Green

Certifications

Code	Description	Number	Expires
A2LAB-KNX	ISO 17025 KNX food	3131.01	05/31/2015
A2LAB-NSH	ISO 17025 NSH food	3131.02	06/30/2014
FL.	State of Florida NELAC	E87966	06/30/2014
GA	Georgia Dept Natural Resources	980	04/13/2014
NCENV	NC Environmental	678	12/31/2013
TN DW	State of Tennessee	TN02017	04/30/2014
USDA	US Department of Agriculture		11/30/2013

Notes and Definitions

DET Analyte DETECTED

Analyte NOT DETECTED at or above the reporting limit ND

NR Not Reported

Sample results reported on a dry weight basis dry

RPD Relative Percent Difference

Microbac Laboratories, Inc. - Knoxville

Brian Richard, Project Manager

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1404870-01

Project Number / Title: Daily BOD MAPLE GOL EEN

Sampled: 03/20/2014 08:10

Adenus Wastewater Professionals



Contact/Address: Brian Carter	r/Ademu	18	(Allene)(come					
Desired Turnaround Time:					,			
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COOLER INSPECTION FORM # 10001.1

Client Name: ADENUS	Date/Tim	e Received:	3/20/1	L.	10300
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CERTIFICATE OF ANALYSIS

Brian Carter

Adenus Wastewater Professionals 849 Aviation Parkway Smyma, TN 37167

Date Reported:

3/28/2014

Date Received:

3/19/2014 RA135

Cust#: PO#:

Workorder:

Analyte

1404800

Project:

Maple Green

Result

DII Qualifier Reporting Llmlt

2.00

Analyst

Analyzed

Method

Maple Green

Sampled: 03/19/2014 07:30

1404800-01 (Water)

Wet Chemistry

BOD-6

41.5

mg/L

Units

JPA 03/20/2014 18:00

Analyzed By: Microbac Knoxville Division SM5210 B-2001

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Brian Carter

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849 Aviation Parkway Smyma, TN 37167 Date Reported:

3/28/2014

Date Received: Cust#: 3/19/2014 RA135

PO#:

Workorder:

1404800

Project

Maple Green

Certifications

Corie	Description	Number	Expires
A2LAB-KNX	ISO 17025 KNX food	3131.01	05/31/2015
A2LAB-NSH	ISO 17025 NSH food	3131.02	06/30/2014
FL	State of Florida NELAC	E87966	06/30/2014
GA	Georgia Dept Natural Resources	980	04/13/2014
NCENV	NC Environmental	678	12/31/2013
TN_DW	State of Tennessee	TN02017	04/30/2014
USDA	US Department of Agriculture		11/30/2013

Notes and Definitions

DET

Analyte DETECTED

ND

Analyte NOT DETECTED at or above the reporting limit

NR

Not Reported

dry

Sample results reported on a dry weight basis

RPD

Relative Percent Difference

Microbac Laboratories, inc. - Knoxville

Brian Richard, Project Manager

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REMBER





1404800-01

Sampled: 03/19/2014 07:30

SAMPLE (Adenus Wastewater Professionals



Project Number / Title: Daily BOD		***************************************		***************************************			
Contact/Address: Brian Carter	/Adenu	85			AA.		
Desired Turnaround Time:					- 11.44 - 5-6-6-12.54 (1977-11.27 11.27 11.27 11.27 11.27 11.27 11.27 11.27 11.27 11.27 11.27 11.27 11.27 11.2		***************************************
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SAMPLE DESCRIPTION Include all information to completely identify each sample. Also include a physical description. (Water, soil, ground water, etc.)	DATE		Colon A. Col	COMP	ANALYSIS REQUIRED : Comments, Instructions, etc.	Number / Type of Containers	Preservative
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COOLER INSPECTION FORM # 10001.1

Client Name: Adenus	Date/Tim	ne Received: _ ವೆ	3.19.14/1260	opi syste albidosa ridoki argopsyko oksykolos
Work Order: 140 4800	No.	of Samples:	<u> </u>	100 44400004000400000000000000000000000
Received By: Leanne Lee	Checklist Completed By: ANA / 3.19.14			
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CERTIFICATE OF ANALYSIS

Brian Carter Adenus Wastewater Professionals

849 Aviation Parkway Smyma, TN 37167

Date Reported:

3/28/2014

Date Received:

3/19/2014 **RA135**

Cust#:

PO#:

Workorder:

1404800

Project

Maple Green

Analyte

Result

Units

DII Qualifler

Reporting Limit

2.00

Analyst

Analyzed

Method

Maple Green

Sampled: 03/19/2014 07:30

1404800-01 (Water)

Wet Chemistry

BOD-5

41.5

mg/L

1

JPA 03/20/2014 18:00

Analyzed By: Microbac Knoxville Division SM5210 B-2001

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CHEMISTRY MICROBINLOGY FOOD SAFETY CONSUMER PRODUCTS WATER - AIR - WASTES FOOD PHARMACEUTICALS NUTRACEUTICALS

CERTIFICATE OF ANALYSIS

Brian Carter

Adenus Wastewater Professionals

849 Aviation Parkway Sinyma, TN 37167

Date Reported:

3/28/2014

Date Received:

3/19/2014 **RA135**

Cust#: PO#:

Workorder:

1404800

Project:

Maple Green

Certifications

Code	Description	Number	Expires
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A2LAB-NSH	ISO 17025 NSH food	3131.02	06/30/2014
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NCENV	NC Environmental	678	12/31/2013
TN_DW	State of Tennessee	TN02017	04/30/2014
USDA	US Department of Agriculture		11/30/2013

Notes and Definitions

DET

Analyte DETECTED

ND

Analyte NOT DETECTED at or above the reporting limit

NR

Not Reported

dry

Sample results reported on a dry weight basis

RPD

Relative Percent Difference

Microbac Laboratories, Inc. - Knoxville

Brian Richard, Project Manager

Thank you for your business. For any feedback, please contact Ashley Morris, at ashley.monis@microbac.com. You may also contact Trevor Boyce, President, at trevor.boyce@microbec.com.

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1404800-01

Sampled: 03/19/2014 07:30

SAMPLE (Adenus Wastewater Professionals



Project Number / Title; Daily BOD						**************************************	
Contact/Address: Brian Carter	/Adenu	8					
Desired Turnaround Time:	Maria and a superior of the parties						
SAMPLE DESCRIPTION Include all information to completely identify each sample. Also include a physical description. (Water, soil, ground water, etc.):	DATE		CRAZ	â S	AMALYSIS REQUIRED Comments, Instructions, letc.	Number / Type of Containers	Preservative
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### COOLER INSPECTION FORM # 10001.1

Client Name: Adenus	Date/Tim	e Received	1: <u>3</u>	.19.	14/1250	<u> </u>
Work Order: 140 4800		of Samples			•	
Received By: LeAnne Lee	Checklist Completed By: ANN / 3.19.14					
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Sufficient sample volume collected for requested analysis	?	Yes		No		
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From:

Roy Denney <roy.denney@adenus.com>

Sent:

Monday, April 28, 2014 2:36 PM

To:

'brad.harris@tn.gov'

Cc:

charles.hyatt@adenus.com; bob.pickney@adenus.com; william.penny@stites.com

Subject:

Maple Green Response

Attachments:

Maple Green Free Water Surface Wetland Surface Calculation.pdf; error regarding engineering units.pdf; EPA Chapter 4 HRT sizing.pdf; epa excerpt regarding using multiple cells in series in a free water surface wetland.pdf; Response to Brad Harris

regarding Maple Green.pdf

Brad,

Please see attached letter and supporting documentation.

Kind Regards,

Roy Denney

Maple Green Free Water Surface Wetland Surface Calculation

Description of sizing calculation for the treatment area for the free water surface wetland proposed at Maple Green Reclamation Facility.

Equation provided by TDEC In comments dated 3/24/14. This equation is the same equation as the one used in the original design submittal.

$$A_{S} = \frac{Q \times ln\left(\frac{C_{O}}{C_{E}}\right)}{K_{T} \times y \times n}$$

A_s = Surface Area (ft²; m²) (note - ft² used in first submittal and this submittal)

Q = Average Flow (ft³/day; m³/day) (note- ft³ used in first submittal and this submittal)

Co = Influent BOD concentration = 150 mg/L

 $C_e$  = effluent BOD Design with safety factor = 30 mg/L (Note: Permit limit is 45 mg/l, however this is a technology limit for the previous treatment system and not a limit intended for soil loading.)

K_T = Temperature Dependent First Order Rate Reaction constant for BOD₅

y = Depth of Free Surface Wetland

n = Porosity (as defined in Design of Municipal Wastewater Treatment Plants Fifth Edition; Volume 2; Liquid treatment Processes; Chapter 18; section 6.6; ISBN 978-0-07-16358-8)

 $\theta$  = 1.06 (as suggested by Design of Municipal Wastewater Treatment Plants Fifth Edition; Volume 2; Liquid treatment Processes; Chapter 18; section 6.6; ISBN 978-0-07-16358-8)

 $K_{20} = 20^{\circ}$  C First Order Rate Reaction constant for  $BOD_5 = 0.678$  Days⁻¹ (Design of Municipal Wastewater Treatment Plants Fifth Edition; Volume 2; Liquid treatment Processes; Chapter 18; section 6.6; ISBN 978-0-07-16358-8)

Ţ.

Q = Current approved site disposal capacity

$$Q = 35000 \frac{Gallons}{Day}$$

$$Q = 35000 \frac{Gallons}{Day} \times \frac{1}{7.48} \frac{ft^3}{Gallon}$$

$$Q = 35000 \frac{Gallons}{Day} \times 0.1337 \frac{ft^3}{Gallon}$$

$$Q = 4680 \, \frac{ft^3}{Day}$$

2.

$$\ln\left(\frac{C_o}{C_e}\right) = \ln\left(\frac{150}{30}\right)$$

$$\ln\left(\frac{C_o}{C_e}\right) = \ln(5)$$

$$\ln\left(\frac{C_o}{C_e}\right) = 1.61$$

3.

 $K_T = K_{20} \times (\theta)^{(T-20)}$  (Rate reaction temperature correction as presented in Design of Municipal Wastewater Treatment Plants Fifth Edition; Volume 2; Liquid treatment Processes; Chapter 18; section 6.6; ISBN 978-0-07-16358-8)

T is assumed to be 1°C. (1°C is selected to be a conservative low estimate of the temperature of the wastewater in the system. Surface icing and continual flow would prevent the wetland from entirely freezing. The aeration is also an effective means of deicing shallow bodies of water through the mechanical introduction of energy into the system; in fact the model indicated in the design is actually sold for that express purpose.)

$$K_T = 0.678 \times (1.06)^{(1-20)}$$

$$K_T = 0.678 \times (1.06)^{(-19)}$$

$$K_T = (0.678) \times (0.331)$$

$$K_T = 0.2244 Day^{-1}$$

4.

Porosity (n) is accepted as 0.7 which is actually representative of a densely vegetated system however it shows a more conservative number. A range of 0.7 to 0.9 porosity is used to indicate the flow restriction of vegetation where 0.7 indicates a densely vegetated wetland with restricted flow and reduced volume and 1.0 represents open water with no vegetation. (Design of Municipal Wastewater Treatment Plants Fifth Edition; Volume 2; Liquid treatment Processes; Chapter 18; section 6.6; ISBN 978-0-07-16358-8)

$$A_{S} = \frac{Q \times ln\left(\frac{C_{O}}{C_{E}}\right)}{K_{T} \times y \times n}$$

$$A_S = \frac{4680 \frac{ft^3}{Day} \times 1.61}{0.2244 Day^{-1} \times 2.5 ft \times 0.7}$$

$$A_{S} = \frac{7534 \frac{ft^{3}}{Day}}{0.6171 \frac{ft}{Day}}$$

$$A_S = 12,208.72 \frac{ft^3 * Day}{ft * Day} = 12,208.72 ft^2$$

5.

Currently, each proposed wetland cell has a wetted surface area of 60 ft in width by 150 ft in length. This provides in the two cell arrangement the following.

$$A_{Individual\,cell}=60\,ft imes150\,ft$$
 $A_{Individual\,cell}=9000\,ft^2$ 
 $A_{Total\,Area}=A_{Individual\,cell} imes Number\,Of\,Cells$ 
 $A_{Treatment\,Area}=9000\,ft^2 imes2$ 
 $A_{Treatment\,Area}=18000\,ft^2$ 

public access is restricted and habitat values are minimized. Tertiary treatment with nutrient removal may be necessary prior to discharge to natural wetlands where preservation of the existing habitat and ecosystem is desired. Common preliminary features in stormwater wetlands are a trash rack and a forebay to allow the settling and removal of large objects carried with the stormwater runoff. Wetlands designed for mine drainage treatment may require a preliminary unit for pH or alkalinity adjustment (Brodie et al. 1993).

#### 6.5.3 GENERAL DESIGN PROCEDURES

All constructed wetland systems can be considered to be attached-growth biological reactors, and their performance can be estimated with first-order plug-flow kinetics for BOD and nitrogen removal. Design models are presented in this chapter for removal of BOD, TSS, ammonia nitrogen, nitrate, total nitrogen, and phosphorus, for both FWS and SSF wetlands. In some cases, an alternative model from other sources is also presented for comparison purposes because a universal consensus does not exist on the "best" design approach. The basic relationship for plug-flow reactors is given by Equation 6.8:

$$C_{i} / C_{i} = \exp[-K_{i}t]$$
 (6.8)

where

C = Effluent constituent concentration (mg/L).

C_g = Influent constituent concentration (mg/L).

K, Temperature-dependent, first-order reaction rate constant (d*).

I hydraulic residence time (d).

The hydraulic residence time in the wetland can be calculated with Equation 6.9:

$$i = LW(m + Q) \tag{6.9}$$

where

- L = Length of the weiland cell (ft. m).
- If Width of the wetland cell (ft; m).
- y Depth of water in the wetland cell (ft; m).
- n = Porosity, or the space available for water to flow through the wetland. Vegetation and litter occupy some space in the FWS wetland, and the media, roots, and other solids do the same in the SSF case. Porosity is a percent (expressed as a decimal).
- Q * The average tion through the wetland (tř. Aban. 'd);

$$Q = (Q_{ic} + Q_{out})/2 \tag{6.10}$$

It is necessary to determine the average flow with Equation 6.10 to compensate for water losses or gains via seepage or precipitation as the wastewater flows through the wetland. A conservative design might assume no seepage and adopt reasonable estimates for evapotranspiration losses and rainfall gains from local records for each month of concern. This requires a preliminary assumption regarding the surface area of the wetland so the volume of water lost or added can be calculated. It is usually reasonable for a preliminary design estimate to assume that  $Q_{\text{real}}$  equals  $Q_{\text{in}}$ .

It is then possible to determine the surface area of the wetland by combining Equation 6.8 and Equation 6.9:

$$A_{s} = (LW)$$

$$= \underbrace{O\ln(C_{b}C_{s})}_{K_{s}yn}$$
(6.11)

where  $A_1$  is the surface area of wetland ( $\Omega^2$ ;  $\Omega^2$ ). The value used for  $K_1$  in Equation 6.1 or Equation 6.4 depends on the pollutant that must be removed and on the temperature; these aspects are presented in later sections of this chapter.

Because the biological reactions involved in treatment are temperature dependent it is necessary, for a proper design, to estimate the water temperature in the wetland. The performance and basic feasibility of FWS wetlands in very cold climates are also influenced by ice formation on the system. In the extreme case, a relatively shallow wetland might freeze to the bottom and effective treatment would cease. This chapter contains calculation procedures for estimating water temperatures in the wetland and for estimating the thickness

stir up settled solids contributing to an increase in turbidity, TSS, and BOD. Table 4-4 shows the typical background levels for the constituents of interest recommended for users of this document. Designs requiring effluent quality close to the values in Table 4-4 must be aware of the natural fluctuations about the mean values, as shown in Figure 4-12. For more details on the numerical values in the table, the reader is urged to refer to Reed, et al, (1995), Kadlec and Knight, 1996, and Gearheart, 1992.

A similar approach to the one suggested here for designing FWS wetlands, referred to as the "sequential model", has been developed by Gearheart and Finney (1999). The overall approach of the model is to consider the dominant physical and biological processes responsible for determining effluent quality from each distinctive area or zone of the constructed wetland and allow the designer to specify areal requirements and wetland depth for each of these specific functions. This methodology recognizes that while some of the constituent transformations and removal mechanisms are to some degree occurring simultaneously throughout the wetland, the majority of the removal occurs in a sequential fashion, with one process or mechanism providing the products for the next process or mechanism. The total area required for treatment is then a sum of each of the zones required to reach a specific effluent objective. This approach allows the designer to sequentially determine the range of effluent characteristics which are attainable in a given definable zone before entering a subsequent reactor (zone) which has known treatment capabilities.

Table 4-4. Background Concentrations of Water Quality Constituents of Concern in FWS Constructed Wetlands

Parameter	Range r (mg/L)	Typical (mg/L)	Factors governing
TSS	2 - 5	3	Plant types, plant coverage, climate, wildlife activity
יםספ	2 - 8	5	Plant types, plant coverage, plant density, climate, wildlife activity
BODs	5 - 12	10	Plant types, plant coverage, plant density, climate
TN	1-3	2	Plant types, plant coverage, climate, oxic/anoxic conditions
NH ₃ -N	0.2 - 1.5	1	Plant types, plant coverage, climate, oxio/anoxic conditions
TP soli	0.1 - 0.5	0.3	Plant types, plant coverage, climate, type
FC³	50 - 5000	200	Plant types, plant coverage, climate, wildlife activity

^{&#}x27;FWS with open water and submergent and floating aquatic macrophytes.

The sequential model approach recognizes that all the treatment objectives beyond secondary require a minimum of three general wetland "compartments" (see Figure 4-13): (1) an initial compartment where the bulk of the flocculation and sedimentation will occur, (2) an aerobic compartment where soluble BOD reduction and nitrification can occur, and (3) a vegetated polishing compartment where further reductions in TSS and associated constituents and nitrogen (via denitrification) can occur. Permanent phosphorus removal in wetlands is generally small and is largely the result of phosphorus adsorption to sollds and plant detritus. Sedimentation and pathogen reduction are related to detention time in zone 1, to retention time and temperature in zone 2, and to retention time in zone 3. As noted earlier, the notion of "compartments" is artificial as the treatment processes overlap in time and space, and no specific physical compartment is necessarily implied. However, separation of an FWS into a series of single-function zones (cells) with individual outlet controls is not an unattractive concept.

A rational overview of the FWS system is depicted in Figure 4-14. It Mustrates that the primary mechanisms in zone 1, which is fully vegetated and anaerobic throughout its depth during the growing season, are sedimentation and flocculation, as determined by transect measurements of dissolved oxygen and pollutant concentrations. Any extension of the HRT in zone 1 beyond approximately 2 days at Qmax would be essentially wasteful since the anaerobic conditions will not result in any significant further removal of soluble constituents and flocculation sadimentation has been effectively completed. The TSS and associated constituents (particulate BOD, organic nitrogen and phosphorous, metals and certain semivolatile organic compounds) have also reached this same status. Volatile organics are likely to be removed from the wastewater during the collection or oxidation pond treatment processes (Hannah, et al., 1986), while most semivolatiles are removed with the solids in the exidation pend or in zone 1 of the FWS system.

For many years it has been recognized that effluent flocculation is primarily a function of energy input from either external sources or internal hydrodynamic forces, and that reduced Reynolds' Numbers (Re) induce optimal sedimentation of particles. Over the past several decades this phenomena has been applied in the development of hydrodynamic devices which accomplish excellent flocculation and/ or sedimentation without moving parts, such as pipe mixers and flooculators, tube and plate settlers, and pebble bed and wedgewire outlet devices for clairifers. Flow through the emerging vegetation is extremely tortuous and is accompanied by a very small hydraulic radius. The Reynolds Number (Re) is a direct function of the hydraulic radius (diameter, if the path were round (as in a pipe), If the Re falls in a range which corresponds to laminar flow, sedimentation is maximized. Re is several thousand in large basins, and even larger in non-vegetated ponds. No direct measurements of Re or laminar flow have been made at the time of this writing, but analogous results from studies

Fully vegetated with emergent macrophytes and with a minimum of coan water.

²Messured in cfu/100 mi

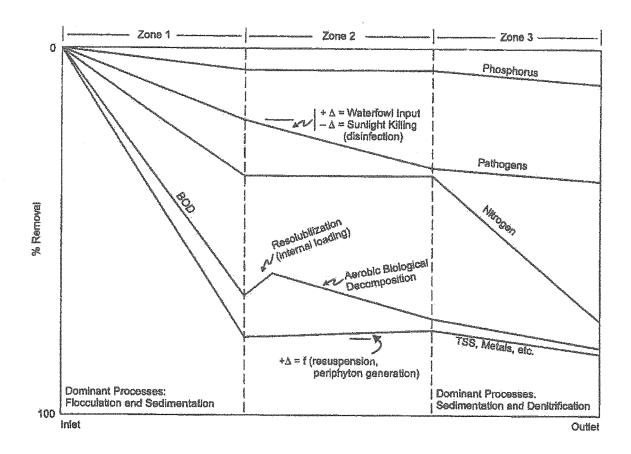


Figure 4-14. Generic removal of pollutants in 3-zone FWS system

of tube settlers and particle-size removals support this theory, given the large amount of wetted surface available. (Sparham, 1970). This concept also supports the use of fully vegetated areas immediately preceding outlet weirs.

In zone 2, which is primarily open-water, the natural reaeration processes are supplemented by submerged macrophytes during daylight periods to elevate dissolved oxygen in order to oxidize carbonaceous compounds (BOD) to sufficiently low levels to facilitate nitrification of the NH,-N to NO,-N. These processes require large amounts of oxygen and time in a passive system (no mechanical assistance). The maximum HRT in zone 2 is generally limited to about 2 to 3 days before unwanted algal blooms occur. Therefore, more than one open zone may be required to complete these reactions. If so, the result would be a five (or more) zone design since each open zone would be followed by a fully vegetated zone. The reactions in zone 2 are essentially the same as in a facultative lagoon. Therefore, the equations which apply to those systems might offer reasonable approximations to the rate of transformations occurring in this open-water zone. Therefore, the first-order Marais and Shaw (1961) equation for

fecal coliform dieoff could be applied as an approximation. along with its temperature dependancy:

$$\frac{\mathrm{Ce}}{\mathrm{Co}} = \frac{1}{(1 + t\mathrm{K}_{\mathrm{p}})^{\mathrm{N}}} \tag{4-7}$$

where: Co = Influent FC concentration, cfu/100 ml Ce = effluent FC concentration, cfu/100 mi N = number of open-water zones in the

**FWS** t = HRT (T)

K_o = fecal coliform removal rate constant  $= 2.6 (1.19)^{T-20}$ 

(4-8)

where:

T = temperature, °C

BOD removal in the open-water zone should also follow existing equations such as (Crites and Tchobanoglous,

$$\frac{Ce}{Co} = \frac{1}{(1+iK_p)^N} \tag{4-9}$$

where: C = BOD, ma/L

Kb = specific BODs removal rate constant
(T-1)
Kb = 0.15 (1.04)^{T-20}
(4-10)

Therefore, in analyzing Figure 4-14 the downward stope in FC and BOD in zone 2 can be approximated through the above equations, without considering offsets from wild-life. As noted previously, the nitrifying bacteria can proliferate and convert ammonia-nitrogen to nitrate(NO₃-N) and will be the primary nitrogen transformation role of zone 2. However, the carbonaceous BOD must be low enough to allow these reactions to occur. In rotating biological contactors this concentration of BOD is about 15 mg/l (USEPA, 1993). As noted by Gearheart (1992) increasing the size of the open-water zone generally increases dissolved oxygen, pH, and NO₃-N, while decreasing soluble BOD and ammonium.

U.K.'s Department of Environment has studied lagoon systems treating similar quality influent to that of zone 2. They have noted that algal growth generally starts to occur between days 2 and 3 (UK, 1973). Algal growth can raise pH, interfere with FC kill and the growth of submerged plants, increase NH,-N volatilization, and induce phosphorus precipitation. Also, the additional biomass and precipitates that must be removed in zone 3 will add to the internal loading on the FWS system. The primary goal of the open-water zone is to provide dissolved oxygen to remove BOD and convert NH,-N to NO,-N. Therefore, the optimium sizing of this zone would be an HRT of 2 to 3 days. Assuming a Q_{max}/Q_{ere} of 2, the designer might choose an HRT of 2 days at Q_{max} or an HRT of 3 days at Q_{max}. Climate would likely be the final criterion, with the larger size favored in northern areas and the smaller in southern ones.

The third zone is fully vegetated like zone 1 and has a similar function. Zone 3, like zone 1 is also capable of denitrification if the influent flow contains NO,-N. Where oxidetion pond pretreatment of municipal wastewaters is employed, zone 1 of the FWS system is not generally required to denitrify, but zone 3 will if zone 2 induces nitrification. The primary energy source for successful denitrification is the release of organic substrates from the detritus from decaying plants. However, partially digested, previously removed organics may also be available. Denitrifying bacteria perform only under anaerobic conditions and best when attached to large surface areas, e.g., plants. Denitrification, like nitrification, is temperature-sensitive. Nitrification and denitrification are greatly impaired when water temperatures are reduced below 10°C. Gearheart (1992) showed total inorganic nitrogen in the Arcata Marsh to be reduced from 25 to 5 mg/L. In 1995 he demonstrated pilotscale removal of NO,-N from 130 mg/L to 6 mg/L using no supplemental carbon sources in 80 hours at 15°C. The primary limitation in a three-zone FWS system designed

to remove nitrogen is the rate of nitrification in the openwater zone. If the open-water zone succeeds in nitrifying the NH_z-N, the system should be able to denitrify it. Reed, et al. (1995) indicate that denitrification should require less than one day hydraulic retention time (HRT) for denitrification from municipal wastewater concentrations to an effluent requirement of  $\leq 10$  mg/L. Kadlec and Knight (1996) found that 1 to 2 days should suffice to reach 90% NO_z-N removal. Therefore the previously-stated requirement for zone 3 (HRT of 2 days) should meet this retention requirement and ensure significant denitrification. WEF Manual of Practice FD-16 (1990) indicates that the denitrification rate can be as high as 10 kg/ha-d. Loadings must be within the limits of available labile carbon to proceed at the maximum rate.

As with zone 1 there is additional, temporary nutrient (N and P) removal by plant uptake in zone 3, which may be significant at certain times during the year, while release of most of these nutrients occurs at other times. These plant effects can mask the effects of other processes which could be impacting the system performance at the same times. Unfortunately, there are insufficient data to fully quantify the nutrient cycle for each zone of the FWS system.

#### 4.5.2 Total Suspended Solids Removal Design Considerations

Since prior discussion indicates that TSS removal (rather than BOD removal) drives the sizing process, there is a need to provide further discussion of the mechanisms involved and their implications on design. Treatment mechanisms which dominate in the vegetated inlet zone of a FWS constructed wetland volume are floculation, sedimentation and anaerobic decomposition. Discrete and flocculent settling occurs as the wastewater flows through the initial fully vegetated zone. Since the FWS was likely preceded by an oxidation pond where most discrete settling has occurred already, the enhanced settling in zone1 is mostly due to flocculation of large supracolloidal solids in passage through the emergent vegetation. The processes are generally not temperature dependent and occur at relatively high hydraulic loading rates. TSS removal rates of 40 to 60% are common with a q of 0.06 m/day to 0,27 m/ day, but relative removals are more accurately determined by influent characteristics and the hydrodynamics of the initial vegetated zone.

The majority of incoming solids are removed in this initial settling volume. Hyacinth and duckweed systems are similar to (but not as good as) zone 1 of an FWS in the hydrodynamics which promote excellent flocculation and sedimentation. The mechanisms of the fully vegetated zone 1 can be estimated from the use of particle size distribution analysis. Generally, wastewaters have been analyzed in form size ranges:

Settleable (>100 µm)
Supracolloidal (1 to 100 µm)
Colloidal (0.001 to 1 µm)
Dissolved (< 0.001 µm)

From:

Roy Denney <roy.denney@adenus.com>

Sent:

Tuesday, May 6, 2014 9:40 AM

To:

brad.harris@tn.gov

Subject:

Maple Green

Brad,

Have you had the opportunity to look over the letter and documentation I sent you on the 28th?

Regards,

Roy

From:

Roy Denney <roy.denney@adenus.com>

Sent:

Tuesday, May 6, 2014 10:40 AM

To:

'Brad Harris'

Cc

'Robert Odette'

Subject:

RE: Maple Green

615-691-2913 will be the best number to reach me. I have a meeting at 2:00PM today.

Currently the site serves,

Providence Baptist Church, Robertson County EMS #5, Coopertown Middle School,148 connections at Oak Pointe Subdivision, P&C Corner Market, Pizza Hut, Sudden Service BP, and a Mapco Express.

Roy

From: Brad Harris [mailto:Brad.Harris@tn.gov]

Sent: Tuesday, May 6, 2014 10:01 AM

To: Roy Denney Cc: Robert Odette

Subject: RE: Maple Green

Yes we have. Bob and I will try to call you later in the day. I am covered up right now. Send me a number that would work. We'll shoot for 1:30pm.

Check your math in the example calc. We would also like you to verify the current obligations for the system?

Brad

From: Roy Denney [mailto:roy.denney@adenus.com]

Sent: Tuesday, May 06, 2014 9:40 AM

To: Brad Harris

Subject: Maple Green

Brad,

Have you had the opportunity to look over the letter and documentation I sent you on the 28th?

Regards,

Roy

From:

Roy Denney <roy.denney@adenus.com>

Sent

Tuesday, May 6, 2014 12:38 PM

To:

'Brad Harris'

Cc:

'Robert Odette'

Subject:

RE: Maple Green

Yes,

I look forward to the call

From: Brad Harris [mailto:Brad.Harris@tn.gov]

Sent: Tuesday, May 6, 2014 12:21 PM

To: Roy Denney Cc: Robert Odette

Subject: RE: Maple Green

Roy,

Can we try 9:00am in the morning instead of this afternoon?

Thanks, Brad

From: Roy Denney [mailto:roy.denney@adenus.com]

Sent: Tuesday, May 06, 2014 12:01 PM

To: Brad Harris

Subject: Re: Maple Green

144 customers currently. 168 plated lots but the developer defaulted so there appears to be no urgency to developing. Found the error on the math. We can make the cells 10 feet longer.

Sent from my iPhone

On May 6, 2014, at 10:51 AM, Brad Harris < Brad. Harris@tn.gov > wrote:

How many connections (existing and future) are involved with Oak Pointe?

Brad

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To: Brad Harris
Cc: Robert Odette

Subject: RE: Maple Green

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