04-00358

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION

Notice of Determination

Cartwright Creek Utility District, Inc.
Waterbridge Development
Triune, Williamson County, Tennessee
State Operating Permit #SOP-04019
November 10, 2004

INTRODUCTION

On March 19, 2004, the Cartwright Creek Utility District, Inc. applied for a state operating permit to provide wastewater collection and treatment services for an approximate 200 home development in Williamson County near the community of Triune. The treatment system involves the spray irrigation of 0.075 million gallons per day (75,000 gpd) of biologically treated, domestic wastewater effluent on approximately 21 acres of previously farmed land along Arrington Creek at latitude 35.886111 and longitude -86.673056. The applicant proposes biological treatment by two aerated lagoons, approximately 20 feet deep, designed by Sheaffer International, LLC.

On June 7, 2004, the division public noticed its proposal to issue the applicant a non-discharging operating permit. On August 9, 2004, the division public noticed a public hearing scheduled for September 30, 2004, in response to written request for a hearing received July 28, 2004. The hearing was requested due to concern about the suitability of the soil for the intended treatment and disposal system. The division held the public hearing at 7:00 P.M. at the Triune Methodist Church at 7906 Nolensville Pike. The public comment period for this action was open through October 15, 2004. This Notice of Determination (NOD) serves as the division's response to water quality and operational issues identified before, during and subsequent to that hearing and provides the basis for the division's permit decision.

SOIL

Many persons expressed concern regarding the site geology saying the area was a hardwood wetland prior to field drains being installed to allow farming and that the area stays wet four to five months out of the year. They contend that the disposal area will "pond."

The division also expressed concern to the developer about the site soil impermeability and low conductivity in a September 24, 2003, comment letter on the Detailed Soils Investigation Report (DSIR) and Design Development Report (DDR). In January 2004, AMEC Earth & Environmental, Inc., of Nashville published a subsequent Detailed Soil Investigation Report (AMEC File No. 03-4599-0000). The investigation utilized ten shallow-depth, field, constant head permeability tests to test the hypothesis that vertical conductivity in the clay soil is compensated by lateral flow within the soil. The report concluded, via hydraulic modeling of the subsurface water flow, that for the proposed 2.25 inches per week (0.013 in/hr) of treated wastewater requiring disposal, the combination of lateral and vertical permeability should provide adequate drainage and provide for a factor of safety as well. Additionally, the system is designed to provide up to 70 days of storage when irrigating is not feasible during periods of high rainfall or wet winter periods.

The division understands that field drains were installed to allow farming but cannot equate that to inadequate drainage for wastewater disposal. The field drains are located in a section of the field to the east of the proposed spray irrigation site and not on it. Their existence and the fact they made farming possible actually suggests something positive about the vertical and/or lateral movement of water through the soil into the drains. More importantly, management of the spray irrigation site will not require the same accessibility required to plow, plant and harvest row crops.

HYDROLOGY

Several persons expressed concerns that irrigation water would runoff into Arrington Creek contributing nutrients and possibly degrading water quality from its current conditions. They also pointed out that the site occasionally floods and either contains or drains flow from continuous springs.

Based on the above soil investigation findings, runoff should not occur if the spray irrigation site is operated properly. The system designer, Dr. Sheaffer, explained at the hearing that the automatic irrigation system will be controlled with sensors designed to prevent irrigation during rain or when wind conditions might cause aerosol drift beyond the irrigation areas. The lagoon dikes and operational controls for the system are to be constructed above the 100 year flood elevation level of the creek. The lagoon is designed with capacity to store treated wastewater on rain days and on the relatively few days per year that flooding may inundate the irrigation fields. Dr. Sheaffer stated he had studied the hydrology of the site using recorded climatic data but welcomed the opportunity to review any additional information the neighbors could provide. He also welcomed the opportunity to participate on any committee formed to study the site hydrology further.

Regarding baseline conditions of Arrington Creek, the division has assessed the creek as part of its assessments of streams state-wide. Arrington Creek (hydrologic unit code TN05130204016_0500) is currently assessed by the division as not having water quality sufficient to meet all of its designated uses due to siltation from agriculture and land development. The division's philosophy regarding these assessments places higher value on the integrity of the biology rather than on the measurement of individual pollutants. We usually do not have data on specific pollutants in sufficient quantity to draw defensible conclusions about their impact on the stream.

In this specific case, the division sees no need to allocate resources for such thorough characterization of Arrington Creek since a TMDL (total maximum daily load) implementation plan has been developed and approved for siltation in the Harpeth River Watershed. Meeting the permit conditions of the proposed permit and provisions of aquatic resource alteration permits will conform to the implementation plan in the TMDL. Aquatic resource alteration permits may be necessary for, among other activities, road and utility crossings of Arrington Creek. The TMDL may be viewed on the department webpage at:

http://www.state.tn.us/environment/wpc/tmdl/approvedtmdl/HarpSed07.pdf.

It is worthy to note that the previous farming operation at the site had the potential to discharge nutrient and silt laden runoff to the creek if best management practices were not strictly controlled. The spray irrigation site, once sown, should not contribute silt. It will also serve as a secondary removal mechanism for the nutrients not utilized in the biological treatment lagoon whereas the farming operation had no secondary removal mechanism for the fertilizers applied to crops.

MAINTENANCE

Several persons questioned the ability to maintain this system since there is currently not another exactly like it in the state. Another person expressed concern about operation of the collection system grinder pumps when the power is off. Conversely, another person questioned how proper operation/maintenance of the system would affect the crayfish living in countless burrows on the site.

It was pointed out that the use of lagoons for the treatment of domestic wastewater is not unique in the state and that the division has permitted a number of various type lagoon systems. The Sheaffer system is somewhat unique by its depth, the depth of the anaerobic zone of treatment at the bottom of the lagoon, and the depth of the extensive aeration between the aerobic and anaerobic zones. The equipment and controls used in the treatment process are not unique to this design. Grinder pump low pressure collection sewers are numerous throughout the state and even in Middle Tennessee. Maintenance should not be an issue so long as the permittee maintains spare parts for night and weekend repairs. This is especially true for the grinder pump systems.

Typically, homeowners dramatically reduce water usage (showers, dishwashers) when the power is off. Still, the pump tanks have the possibility of filling and possibly overflowing at some point in the homeowner's collection system whenever power is unavailable. In periods of extended power failure, the sewer service provider, Cartwright Creek Utility District, will be responsible for operating the collection system to prevent such overflows and for pumping and hauling the sewage if necessary.

Organisms such as crayfish that live in the site soil are not specifically afforded protection by the state water quality criteria. More specifically, the division does not view soils of the irrigation site as having special habitat consideration since it was recently used for farming.

DETERMINATION

Based on information obtained regarding the Sheaffer system, it has been determined that this lagoon system is capable of meeting effluent limitations better than that established by EPA for secondary treatment systems. Therefore, lower limits are proposed for the following reasons:

The proposed limitation of 45 mg/l for biochemical oxygen demand, CBOD5, designed to prevent long-term build up of organics in the spray plot, is too high to reflect good operation of a highly aerated lagoon.

The long detention time and aeration are expected to convert almost all the ammonia in the wastewater to other forms of nitrogen.

Additionally, this lagoon is designed to remove some portion of the wastewater nitrogen. Per the engineering report entitled, *Design Development Report And Engineering Report, Waterbridge Sheaffer System, Williamson County, Tennessee, January 2004 Revision*, the anaerobic zone is designed to convert several compounds, including nitrogen, into gas, and the loading calculations in the same report conservatively assume total nitrogen of 15 mg/l in the effluent to the spray fields (even though the designer expects only half that amount in the effluent.) This represents a reduction in wastewater nitrogen as domestic wastewater would be expected to have concentrations in the range 20 to 85 mg/l. The loading calculations predict that, at the conservative levels of 15 mg/l, there will be insufficient nitrogen in the wastewater to ever exceed the ability of the spray fields to assimilate it.

A second limitation for *E. coli* is added with the notation that it will apply if wastewater is ever used for reuse purposes. Dr. Sheaffer indicated at the public hearing a hope and vision for this possibility in the future.

The division reconsidered the monitoring frequencies. The instantaneous and quarterly monitoring frequencies are practical for established systems or system designs with a proven history in Tennessee. Since this type lagoon is new to Tennessee and will be in start up mode during the initial permit term, the division proposes more frequent effluent monitoring. The frequency may be reduced in subsequent permit renewals.

The Division's determination is to issue a final permit that differs from the draft in the following ways:

- The five-day biochemical oxygen demand (BOD5) limit is reduced from 45 to 10 mg/l, ammonia has been changed from report only to 5 mg/l, and a total nitrogen limitation of 15 mg/l has been added. All of these limitations are daily maximums. The facility has been designed to routinely achieve better concentrations than these on an average basis year-round.
- Monitoring frequencies for chemical parameters and *E. coli* have been increased from once per quarter to once per month.
- A second limitation on *E. coli* has been added to apply in the case of wastewater reuse.
- The monitoring frequency for flow as been increased from once per month to daily.
- Record keeping and reporting requirements have been expanded to include the weather and soils data collected by the automatic irrigation controls.
- Permit language is added to specifically prohibit and require reporting of collection system overflows.
- The division modified the fencing requirement for the spray area to allow the possibility of inhibiting access by natural means (e.g. plants).
- The division added a retest and reporting requirement for when a monthly grab sample yields unexpected value(s).

Edward M. Polk, P.E.
Manager, Permit Section

11/10/09
Date