**NEOSHO RIVER BASIN TOTAL MAXIMUM DAILY LOAD**

**Water Body: Jones Park Pond**
**Water Quality Impairment: Eutrophication**

## 1. INTRODUCTION AND PROBLEM IDENTIFICATION

**Subbasin:** Neosho Headwaters

**County:** Lyon

**HUC 8:** 11070201 **HUC 11** (HUC 14)**:** **030** (040)

**Ecoregion:** Flint Hills (28)

**Drainage Area:** Approximately 45 acres

**Conservation Pool:** Area = 3.4 acres
Maximum Depth = 2.0 meters (6.6 feet)
Mean Depth = 0.8 meter (2.6 feet)
Retention Time = 0.4 years (5 months)

**Designated Uses:** Primary and Secondary Contact Recreation; Expected Aquatic Life Support; Food Procurement

**Authority:** City of Emporia

**2002 303(d) Listing:** Neosho Basin Lakes

**Impaired Use:** All uses are impaired to a degree by eutrophication

**Water Quality Standard:** Nutrients - Narrative: The introduction of plant nutrients into streams, lakes, or wetlands from artificial sources shall be controlled to prevent the accelerated succession or replacement of aquatic biota or the production of undesirable quantities or kinds of aquatic life. (KAR 28-16-28e(c)(2)(B)).

The introduction of plant nutrients into surface waters designated for primary or secondary contact recreational use shall be controlled to prevent the development of objectionable concentrations of algae or algal by-products or nuisance growths of submersed, floating, or emergent aquatic vegetation. (KAR 28-16-28e(c)(7)(A)).

## 2. CURRENT WATER QUALITY CONDITION AND DESIRED ENDPOINT

**Level of Eutrophication:** Fully Eutrophic, Trophic State Index = 57.98

**Monitoring Sites:** Station 068701 in Jones Park Pond (Figures 1 & 2).

**Period of Record Used:** One survey in 1989.

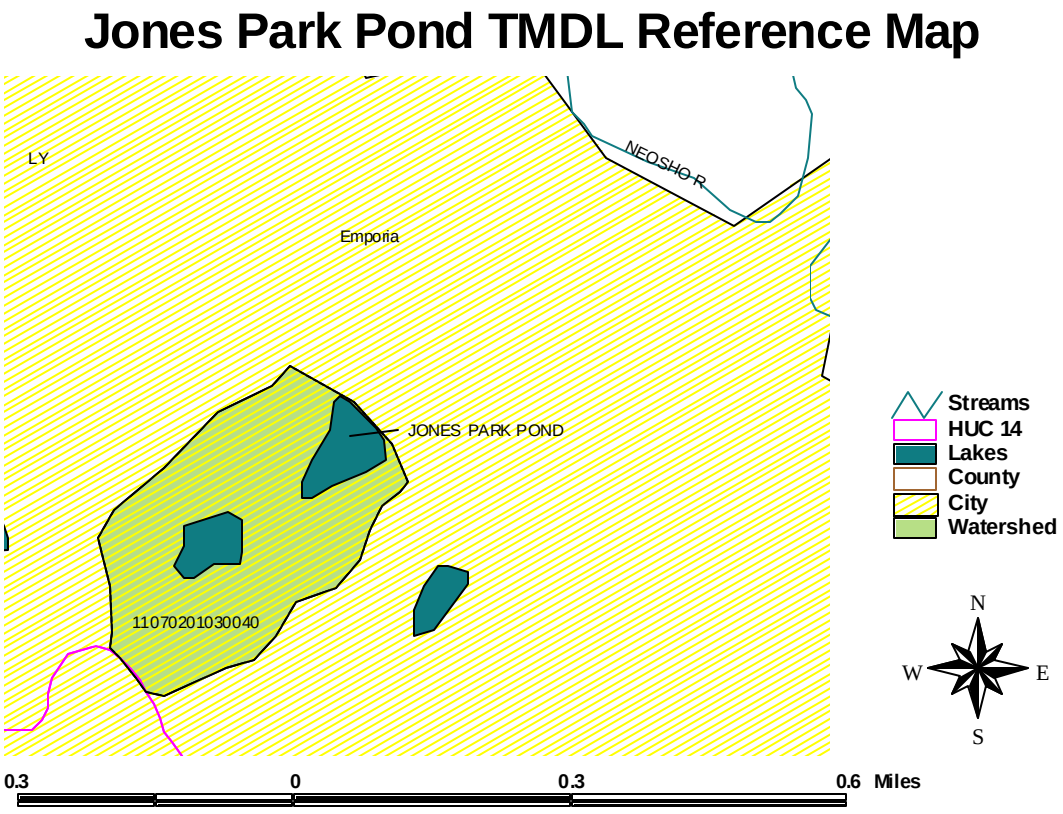



**Figure 1**

**Current Condition**: During 1989, the average chlorophyll a concentration was 16.4 ppb (Appendix A). The average, total phosphorus concentration was 118 ppb. The chlorophyll a to total phosphorus yield is low. The pond is light limited; the clay turbidity is inhibiting algal growth (Appendix B).

The Trophic State Index is derived from the chlorophyll a concentration. Trophic state assessments of potential algal productivity were made based on chlorophyll a concentrations, nutrient levels and values

of the Carlson Trophic State Index (TSI). Generally, some degree of eutrophic conditions is seen with chlorophyll a concentrations over 7 Fg/L and hypereutrophy occurs at levels over 30 Fg/L. The Carlson TSI, derives from the chlorophyll concentrations and scales the trophic state as follows:

1. Oligotrophic TSI < 40
2. Mesotrophic TSI: 40 - 49.99
3. Slightly Eutrophic TSI: 50 - 54.99
4. Fully Eutrophic TSI: 55 - 59.99
5. Very Eutrophic TSI: 60 - 63.99
6. Hypereutrophic TSI: $ 64

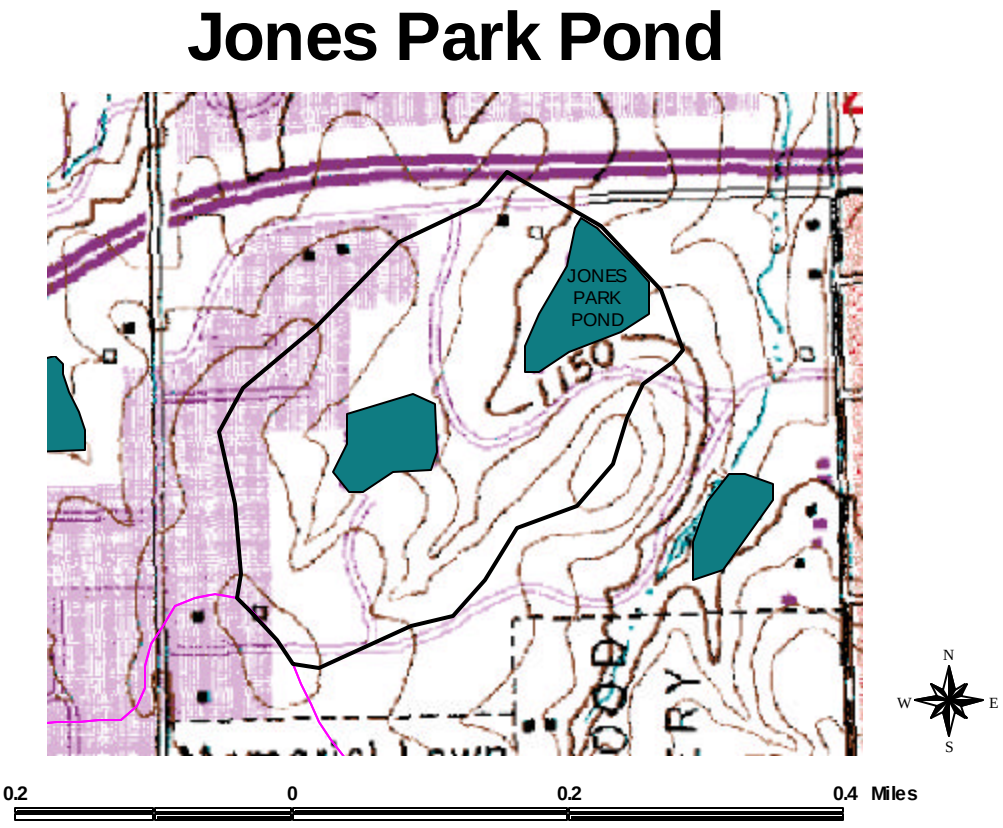



**Figure 2**

**Interim Endpoints of Water Quality (Implied Load Capacity) at Jones Park Pond over 2007 - 2011:**

Current Condition and Reductions for Jones Park Pond

| Parameter | Current Condition | TMDL | Percent Reduction |
|---|---|---|---|
| **Total Phosphorus Load (lb/year)** | **8.3** | **5.8** | **30 %** |
| **Total Phosphorus Concentration (Fg/L)** | **118** | **23** | **81 %** |
| **Chlorophyll a (Fg/L)** | **16.4** | **< 12.0** | **27 %** |

In order to improve the trophic condition of the lake from its current fully eutrophic status, the desired endpoint will be to maintain summer chlorophyll a concentrations at or below 12 Fg/L. Refined endpoints will be developed in 2007 to reflect additional sampling and artificial source assessment and confirmation of impaired status of lake.

## 3. SOURCE INVENTORY AND ASSESSMENT

**Land Use:** The watershed around Jones Park Pond has a low potential for nonpoint source pollutants. An annual phosphorus load of 8.3 pounds per year is necessary to correspond to the concentrations seen in the lake (Appendix C).

The Jones Park Pond watershed is 100% urban. Fertilizer applications to lawns within the drainage and stormwater delivery to the lake are probable loading sources. Twelve percent of the watershed is residential, and 74% is urban grassland. Commercial/industrial property makes up 11% of the drainage area. The population density is 288 people per square mile. The population of Emporia is expected to increase 3.7% through 2020. Wastewater from the watershed is sent to the Emporia MWTP.

**Background Levels:** The atmospheric phosphorus and geological formations (i.e., soil and bedrock) may contribute to phosphorus loads. Wind mixing and carp may cause some resuspension of sediment.

## 4. ALLOCATION OF POLLUTANT REDUCTION RESPONSIBILITY

While light is the limiting factor in Jones Park Pond, phosphorus is allocated under this TMDL. The Load Capacity is 5.8 pounds per year of phosphorus. More detailed assessment of sources and confirmation of the trophic state of the lake must be completed before detailed allocations can be made. The general inventory of sources within the drainage does provide some guidance as to areas of load reduction.

**Point Sources:** A current Wasteload Allocation of zero is established by this TMDL because of the lack of point sources in the watershed. Should future point sources be proposed in the watershed and

discharge into the impaired segments, the current wasteload allocation will be revised by adjusting current load allocations to account for the presence and impact of these new point source dischargers.

**Nonpoint Sources:** Water quality violations are predominantly due to nonpoint source pollutants. Background levels may be attributed to atmospheric and geological sources. The assessment suggests that fertilizer applications to lawns and stormwater delivery contribute to the elevated total phosphorus concentrations in the lake. Generally a Load Allocation of 5.2 pounds of total phosphorus per year, leading to a 30% reduction, is necessary to reach the endpoint.

**Defined Margin of Safety:** The margin of safety provides some hedge against the uncertainty of variable annual total phosphorus and the chlorophyll a endpoint. Therefore, the margin of safety will be 0.6 pounds per year of total phosphorus taken from the load capacity subtracted to compensate for the lack of knowledge about the relationship between the allocated loadings and the resulting water quality.

**State Water Plan Implementation Priority:** Because more data are needed to determine the trophic state of the lake, the Jones Park Pond TMDL will be a Low Priority for implementation.

**Unified Watershed Assessment Priority Ranking:** This watershed lies within the Neosho Headwaters (HUC 8: 11070201) with a priority ranking of 38 (Medium Priority for restoration).

**Priority HUC 11s:** The watershed is within HUC 11 (030).

## 5. IMPLEMENTATION

### Desired Implementation Activities

There is some potential for reducing pollutant loads to this lake through the use of urban best management practices.

### Implementation Programs Guidance

Until the 2007 assessment of the continuation of monitoring is made, no direction can be made to those implementation programs.

**Time Frame for Implementation:** Continued monitoring over the years from 2002 to 2007.

**Targeted Participants:** Primary participants for implementation will be residents of the City of Emporia. A detailed assessment of sources will be conducted by KDHE over 2002-2007.

**Milestone for 2007:** The year 2007 marks the midpoint of the ten-year implementation window for the watershed. At that point in time, sampled data from Jones Park Pond will be reexamined to confirm the impaired status of the lake. Should the case of impairment remain, source assessment, allocation, and implementation activities will ensue.

**Delivery Agents:** Depending upon confirmation of impairment and assessment of probable sources, the primary delivery agents for program participation will be resident of the City of Emporia, conservation districts for programs of the State Conservation Commission, and the Natural Resources Conservation Service.

**Reasonable Assurances:**

**Authorities:** The following authorities may be used to direct activities in the watershed to reduce pollutants.

1. K.S.A. 65-171d empowers the Secretary of KDHE to prevent water pollution and to protect the beneficial uses of the waters of the state through required treatment of sewage and established water quality standards and to require permits by persons having a potential to discharge pollutants into the waters of the state.

2. K.S.A. 2-1915 empowers the State Conservation Commission to develop programs to assist the protection, conservation and management of soil and water resources in the state, including riparian areas.

3. K.S.A. 75-5657 empowers the State Conservation Commission to provide financial assistance for local project work plans developed to control nonpoint source pollution.

4. K.S.A. 82a-901, et seq. empowers the Kansas Water Office to develop a state water plan directing the protection and maintenance of surface water quality for the waters of the state.

5. K.S.A. 82a-951 creates the State Water Plan Fund to finance the implementation of the *Kansas Water Plan.*

6. The *Kansas Water Plan* and the Neosho Basin Plan provide the guidance to state agencies to coordinate programs intent on protecting water quality and to target those programs to geographic areas of the state for high priority in implementation.

**Funding:** The State Water Plan Fund annually generates $16-18 million and is the primary funding mechanism for implementing water quality protection and pollutant reduction activities in the state through the *Kansas Water Plan*. The state water planning process, overseen by the Kansas Water Office, coordinates and directs programs and funding toward watersheds and water resources of highest priority. Typically, the state allocates at least 50% of the fund to programs supporting water quality protection. This watershed and its TMDL are a Low Priority consideration and should not receive funding until after 2007.

**Effectiveness:** Effectiveness of corrective actions will depend upon the sources which contribute to the impairment at the lake.

## 6. MONITORING

Additional data, to establish nutrient ratios, source loading and further determine mean summer lake trophic condition, would be of value prior to 2007. Further sampling and evaluation should occur twice before 2007.

## 7. FEEDBACK

**Public Meetings:** Public meetings to discuss TMDLs in the Neosho Basin were held January 9, 2002 in Burlington and March 4, 2002 in Council Grove. An active Internet Web site was established at http://www.kdhe.state.ks.us/tmdl/ to convey information to the public on the general establishment of TMDLs and specific TMDLs for the Neosho Basin.

**Public Hearing:** Public Hearings on the TMDLs of the Neosho Basin were held in Burlington and Parsons on June 3, 2002.

**Basin Advisory Committee:** The Neosho Basin Advisory Committee met to discuss the TMDLs in the basin on October 2, 2001, January 9, March 4, and June 3, 2002.

**Discussion with Interest Groups:** Meetings to discuss TMDLs with interest groups include:

Kansas Farm Bureau: February 26 in Parsons and February 27 in Council Grove

**Milestone Evaluation**: In 2007, evaluation will be made as to the degree of impairment which has occurred within the watershed and current condition of Jones Park Pond. Subsequent decisions will be made regarding the implementation approach and follow up of additional implementation in the watershed.

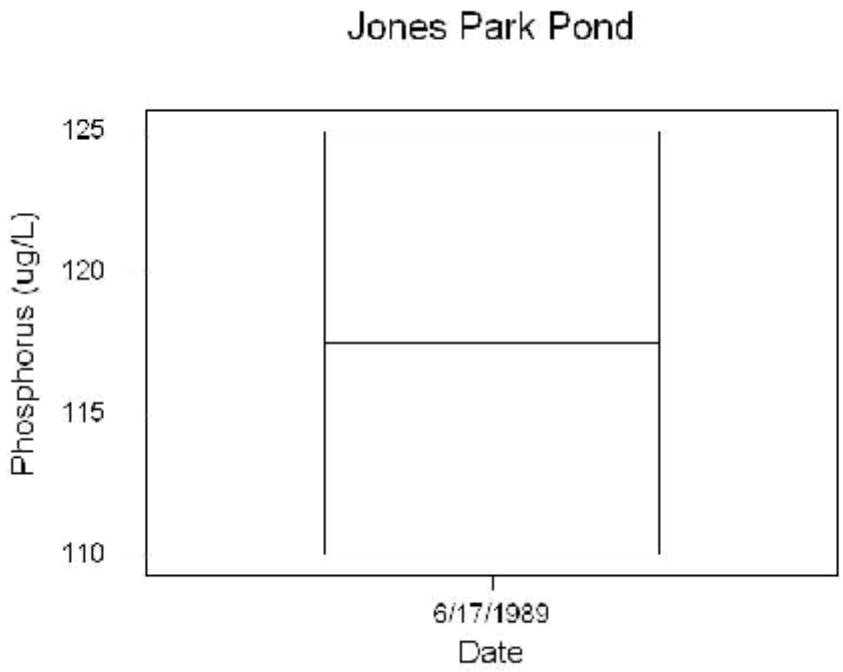
**Consideration for 303(d) Delisting**: The lake will be evaluated for delisting under Section 303(d), based on the monitoring data over the period 2007-2011. Therefore, the decision for delisting will come about in the preparation of the 2012 303(d) list. Should modifications be made to the applicable water quality criteria during the ten-year implementation period, consideration for delisting, desired endpoints of this TMDL and implementation activities may be adjusted accordingly.

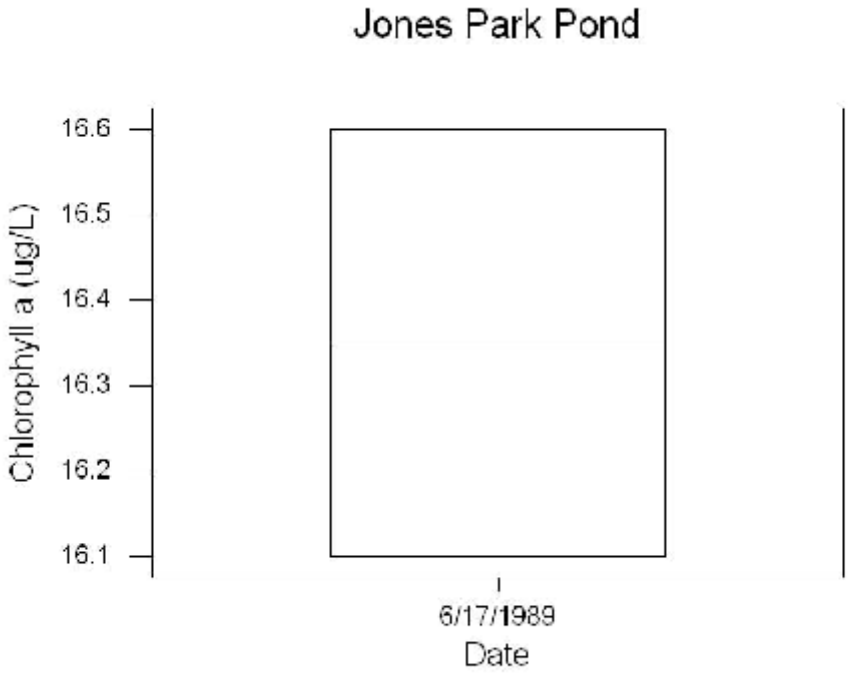
**Incorporation into Continuing Planning Process, Water Quality Management Plan and the Kansas Water Planning Process:** Under the current version of the Continuing Planning Process, the next anticipated revision will come in 2003 which will emphasize revision of the Water Quality Management Plan. At that time, incorporation of this TMDL will be made into both documents. Recommendations of this TMDL will be considered in *Kansas Water Plan* implementation decisions under the State Water Planning Process for Fiscal Years 2003-2007.

**Bibliography**

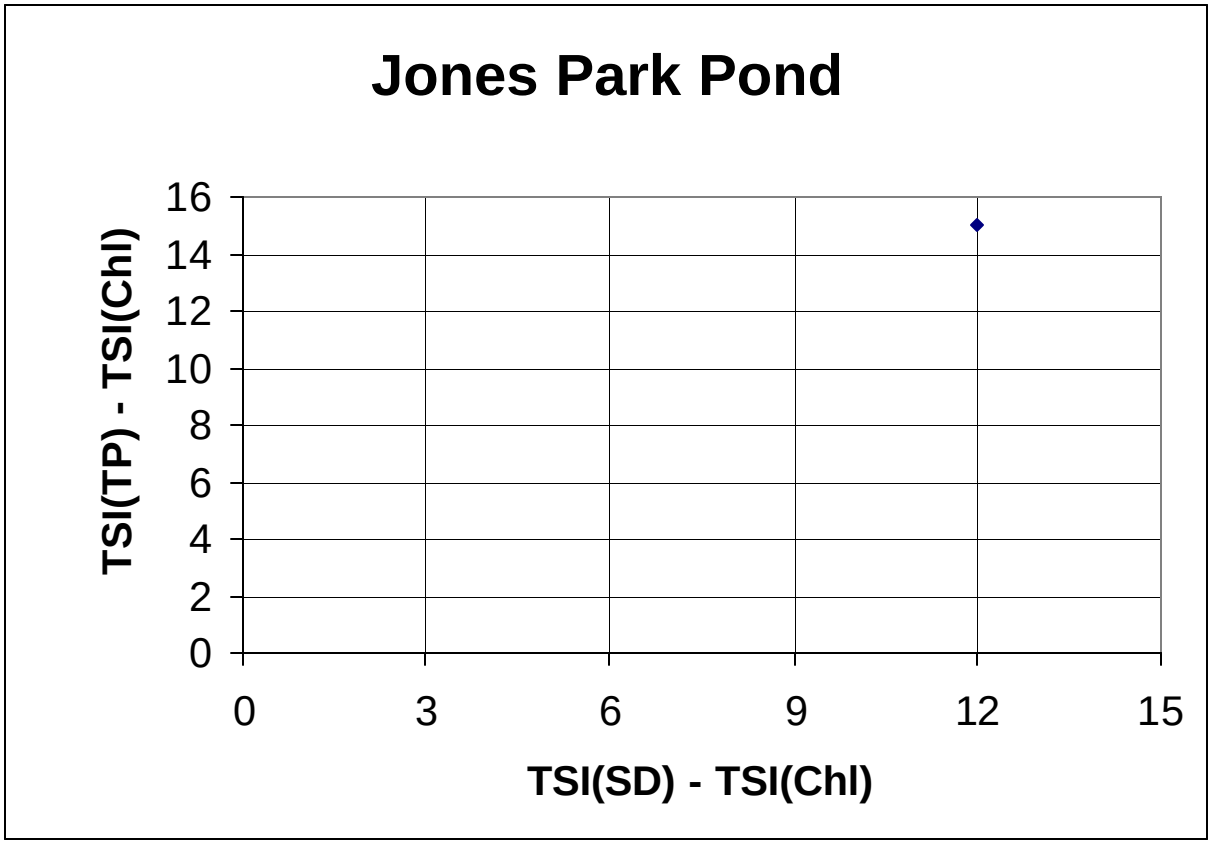
Liscek, Bonnie C. Methodology Used in Kansas Lake TMDLs [web page] Jul. 2001; http://www.kdhe.state.ks.us/tmdl/eutro.htm [Accessed 17 May 2002].

**Appendix A–Boxplots**



**Appendix B - Trophic State Index Plot**




The Trophic State Index plots indicate that light is the primary limiting factor, due to clay turbidity. This is inferred by examining the relationship between the TSI(SD) - TSI(Chl) and TSI(TP)-TSI(Chl). The deviation of chlorophyll from the sediment load indicates the degree of light penetration, while the difference between chlorophyll and phosphorus indicates the level of phosphorus limitation. Therefore, if the final plot is in the first quadrant, it shows that the transparency of the water is impaired due to the presence of small particles, and that phosphorus does not limit algae growth.

**Appendix C - Input for CNET Model**

| Parameter | Value Input into CNET Model |
|---|---|
| Drainage Area ($km^2$) | 0.182 |
| Precipitation (m/yr) | 0.86 |
| Evaporation (m/yr) | 1.30 |
| Unit Runoff (m/yr) | 0.19 |
| Surface Area ($km^2$) | 0.014 |
| Mean Depth (m) | 0.8 |
| Depth of Mixed Layer (m) | 0.60 |
| Depth of Hypolimnion (m) | 0.17 |
| Observed Phosphorus (ppb) | 118 |
| Observed Chlorophyl-a (ppb) | 16.4 |
| Observed Secchi Disc Depth (m) | 0.5 |

**Output from CNET Model**

| Parameter | Output from CNET Model |
|---|---|
| Load Capacity (LC)* | 5.8 lb/yr |
| Waste Load Allocation (WLA) | 0.0 lb/yr |
| Load Allocation (LA) | 5.2 lb/yr |
| Margin of Safety (MOS) | 0.6 lb/yr |

***LC = WLA + LA + MOS**

07/07/04