APPLICATION FOR RENEWAL

OF THE NPDES PERMIT

FOR

DUKE ENERGY SOUTH BAY LLC'S

SOUTH BAY POWER PLANT

NPDES PERMIT NO. CA0001368
WDR #96-05

SUBMITTED TO

SAN DIEGO
REGIONAL WATER QUALITY CONTROL BOARD

MAY 4, 2001

EPA FORM 2C

APPENDIX F

RECOMMENDATIONS FOR PERMIT MODIFICATIONS AT THE SOUTH BAY POWER PLANT

Recommendations for Permit Modifications

Monitoring and compliance requirements in Order 96-05 were reviewed to make recommendations to the Water Quality Control Board for the upcoming permit renewal. This review considered appropriateness of the monitoring for determination of compliance with water quality objectives, changes in the plant and its discharge that have occurred during the past five years, and factors that might improve the monitoring and assure maintenance of the beneficial uses of bay waters.

Order 96-05 lists seven areas of monitoring, which are evaluated in this review:

1. Bar rack and intake structure,
2. Cooling water intake monitoring,
3. Combined discharge monitoring,
4. Metal cleaning waste monitoring,
5. Low volume waste monitoring,
6. In-plant waste stream monitoring, and
7. Receiving water monitoring.

Order 96-05 indicates that monitoring at the bar rack and intake structure may be deleted if it is demonstrated that no substantive changes in measurements have occurred. These data are evaluated here.

Order 96-05 required the plant to terminate the discharge of industrial process wastes into San Diego Bay by the end of 1997. As such, monitoring and compliance requirements pertaining to the discharge of these wastes are no longer applicable. This evaluation recommends deleting such requirements for the permit renewal.

It is recommended that monitoring be focused on effects related to increased temperature and chlorination necessary to control biofouling. The addition of chlorine to the once-through cooling water reduces the build-up of organic matter in the system and is necessary for efficient plant operations. Monitoring should also include measurements of any metals that may erode from the plant operations system.

1. BAR RACK AND INTAKE STRUCTURE

A. Summary of permit-required monitoring

The bar rack approach velocity and sediment accumulation at the intake structure are measured annually. Operational difficulties are summarized annually. Preventive maintenance and corrective measures to assure proper intake velocities are discussed in the monitoring report.

B. Summary of compliance requirements

The discharger is required to maintain velocities of water entering the intake structures at design levels and to clean the bar racks routinely. The discharger is required to rotate and clean intake screen assemblies for each unit, when operating, as needed for the purpose of maintaining intake water velocities as close as practical to design levels.

The discharger is required to minimize once-through cooling water flow where possible when units are at reduced load or out of service.

The discharger is required to avoid sudden increases in once-through cooling water flow whenever possible.

C. Data collected

Sediment accumulation at the intake structure and bar rack approach velocities were reported each year in the Annual Reports (1996, 1997, 1998, 1999). Operational difficulties (or lack thereof) were summarized annually. Measures taken to assure the intake velocities are as close as practical to design levels were also summarized.

D. Is monitoring appropriate to determine compliance?

Yes, the reports on measures to assure that intake velocities are as close to design levels as possible are appropriate.

E. Recommended changes

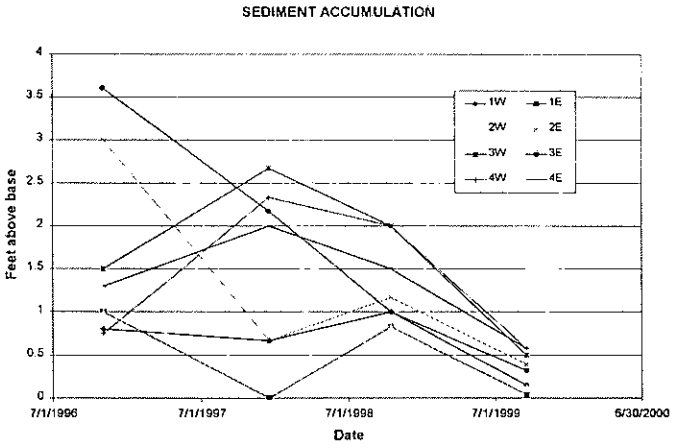
Order 96-05 indicates that the requirement to measure bar rack approach velocity and sediment accumulation may be deleted if it is demonstrated that substantive changes in these measurements have not occurred and are unlikely to occur.

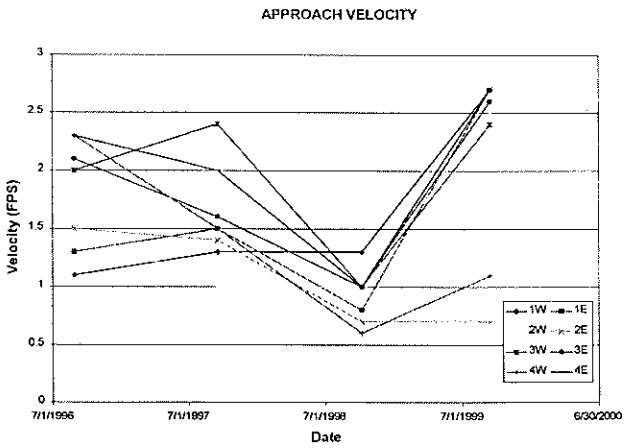
Bar rack sediment accumulation and approach velocity data for 1996 to 1999 were evaluated for significant changes over the four-year period using regression analysis. The four structures were analyzed separately; east and west screens were analyzed as two separate points on the same structure. The null hypothesis was that there was no trend over time. A significant result indicated an increasing or decreasing trend.

There was no significant change in sediment accumulation for Structures 1, 2, or 4 for the four-year period. Structure 3 showed a significant decreasing trend in sediment accumulation from 1996 to 1999.

Tide measurements were considered in the evaluation of approach velocity results. Using data provided in the Annual Reports, it was determined that there is a significant linear relationship between velocity and tide such that velocity decreases as tide increases ($p = 0.0006$). Given this, velocity values were adjusted to differences from this line (adjusted velocity = difference from predicted velocity based on tide). Regression analysis was performed on these adjusted velocity values for each structure. Results indicated that there was no significant change in velocity for Structures 1, 2, or 3 for the four-year period. Velocity at Structure 4 showed a significant decreasing trend from 1996 to 1999.

Three out of four structures showed no significant changes in sediment accumulation for the four-year period. For the one structure where there was a significant change, it was a decreasing trend in accumulation. Similarly, three of the four structures showed no significant changes in approach velocity for the four-year period. One out of the four structures showed a significant change, which was a decreasing trend in velocity. Based on these results, it is recommended that the requirement for annual measurement of sediment accumulation and approach velocity be deleted from the new permit. Operational difficulties (or lack of) should continue to be summarized annually. Measures taken to assure the intake velocities are as close as practical to design levels should also continue to be summarized.





2. COOLING WATER INTAKE MONITORING

A. Summary of permit-required monitoring

Cooling water intake monitoring is required monthly for salinity, dissolved oxygen, pH, and transparency; and continuously for temperature. Tests for acute and chronic toxicity are conducted quarterly.

B. Summary of compliance requirements

Not applicable

C. Data collected

Cooling water intake temperatures were measured and recorded during plant operation, and monthly averages are listed in the Annual Reports. On a monthly basis, data on salinity, dissolved oxygen, transparency, and depth were collected at the intake. Acute and chronic toxicity tests were conducted quarterly.

D. Recommended changes

It is recommended that permit-required monitoring of the cooling water intake be continued as described in Order 96-05. That is, cooling water intake monitoring should be required monthly for salinity, dissolved oxygen, pH, and transparency and continuously for temperature. Acute and chronic toxicity testing should be conducted quarterly.

3. COMBINED DISCHARGE MONITORING

A. Summary of permit-required monitoring

Combined discharge monitoring is conducted continuously for flow and temperature; twice monthly for total residual chlorine; monthly for total suspended solids, oil and grease, and pH; quarterly for acute and chronic toxicity; and semiannually for arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, zinc, total cyanide, ammonia, non-chlorinated phenolic compounds, and chlorinated phenolic compounds.

Sampling locations were established and are described in Order 96-05.

B. Summary of compliance requirements

Interim compliance limitations were established for cadmium, mercury, silver, total cyanide, ammonia, non-chlorinated and chlorinated phenolic compounds, radioactivity, pH, arsenic, chromium, copper, lead, nickel, zinc, total residual chlorine, and toxicity. Final limitations were established for total residual chlorine, pH, acute toxicity, and temperature. Compliance requirements also include that waste discharged from the plant to the bay is free of floatable material, settleable material, substances that may accumulate to toxic levels, substances that significantly decrease natural light, and aesthetically undesirable materials.

C. Data collected

Temperature and flow were reported as monthly averages in the Annual Reports (1996, 1997, 1998, and 1999). Oil and grease, total suspended solids, pH, and daily maximum total residual chlorine values were reported as monthly averages on discharge days in the Annual Reports

(1996, 1997, 1998, and 1999). Semiannual Reports for 1996 and 1997 gave values for the combined discharge for aldrin and dieldrin, arsenic, cadmium, chlordane, chlorinated phenolics, chromium, copper, total cyanide, dichlorodiphenyltrichloroethane (DDT) and derivatives, endrin, toxicity, hexachlorocyclohexane (HCH), lead, mercury, nickel, ammonia, polychlorinated biphenyls (PCBs), non-chlorinated phenolics, silver, toxaphene, and zinc. Semiannual Reports for 1998, 1999, and 2000 gave values for the combined discharge for arsenic, cadmium, chlorinated phenolics, chromium, copper, total cyanide, lead, mercury, nickel, ammonia, non-chlorinated phenolics, silver, and zinc. Quarterly Reports contained values for toxicity.

D. Is monitoring appropriate to determine compliance?

Monitoring conducted for temperature, flow, total residual chlorine, pH, total suspended solids, oil and grease, and toxicity are appropriate to determine compliance. Measurements of total suspended solids and oil and grease provide information for narrative compliance requirements for floatable materials and substances that decrease light. There are currently no compliance requirements for arsenic, lead, chromium, copper, cadmium, mercury, nickel, silver, total cyanide, phenolics, or ammonia, although monitoring is still required for these parameters.

E. Recommended changes

It is recommended that monitoring for flow, temperature, total residual chlorine, pH, total suspended solids, oil and grease, and toxicity be continued as described in Order 96-05 to determine compliance. Other analytes are evaluated below.

Composite intake and effluent waters were collected and analyzed (December 2000) for constituents required for the Application Form 2C- Wastewater Discharge. No volatiles, semivolatiles, chlorinated or non-chlorinated organics (including phenolics), or oil and grease were detected. It is recommended that monitoring for phenolics be discontinued. Oil and grease should continue to be monitored to protect beneficial uses of bay waters.

Of the 23 metals analyzed for Application Form 2C, seven (antimony, beryllium, cadmium, thallium, mercury, tin and zinc) were nondetectable, 11 (aluminum, boron, iron, magnesium, titanium, arsenic, cobalt, manganese, molybdenum, selenium, and silver) had lower concentration in the effluent compared to intake, while five (lead, copper, chromium, nickel, and barium) had higher concentrations in the effluent compared to intake. Differences in metal concentrations were within method variability (typically 10-20%) for all metals except chromium (which had an enrichment factor of 5.1) and nickel (which had an enrichment factor of 1.5). Since some metals (e.g., silver, cadmium, copper, chromium, lead, and nickel) have a strong affinity to bind to particles in the water (i.e., suspended solids) and because the effluent had 20% more total suspended solids than the intake, some enrichment for these metals would be expected. Jenkins (1996) reported incremental releases of copper, zinc, and nickel from plant operations related to the erosion of metal surfaces. It is recommended that semiannual monitoring be continued only for those metals that were detectable and are eroded from plant operations and may affect beneficial uses of bay waters. Thus, monitoring should continue for chromium, copper, nickel, and zinc. It is recommended that monitoring no longer be required for arsenic, cadmium, lead, mercury, or silver, as the discharge of process water has been

but leading up - for discharge.

terminated and there is no evidence that these constituents are being added to bay waters at substantial levels via the once-through cooling system of the plant.

Analyses for 16 inorganic/nutrient parameters of the intake and effluent waters (as listed in the Application Form 2C- Wastewater Discharge) found eight (sulfite, total cyanide, ammonia, fluoride, phosphorus, nitrate/nitrite, sulfide, and surfactants) were not detected at or above the reporting limit, one (sulfate) had no difference between intake and effluent concentrations, three (bromide, organic nitrogen, and total Kjeldahl nitrogen) had lower concentrations in the effluent compared to intake, and four (biochemical oxygen demand [BOD], chemical oxygen demand [COD], total organic carbon, and total suspended solids) had higher concentrations in the effluent compared to intake. Observed decreases were within method variability, while the small increase in total organic carbon and COD were most likely related to the 20% greater concentration of total suspended solids found in the effluent. Further monitoring of COD and total organic carbon does not appear to be warranted for the once-through cooling system. The increase in BOD (which had an enrichment factor of 3.5) is outside of the range of method variability. This increase may be related to the degradation of organic matter during the once-through cooling process. BOD should be monitored, as sufficient oxygen is important to maintaining a healthy biotic community and protecting the beneficial uses of bay waters. Total suspended solids should continue to be monitored as an increase in this parameter may reduce levels of light in the water column. Sufficient light is important to maintaining a healthy biotic community and protecting the beneficial uses of bay waters.

4. METAL CLEANING WASTE MONITORING

A. Summary of permit-required monitoring

Whenever metal cleaning wastes were discharged into the Bay, total suspended solids, total copper, total iron, and polynuclear aromatic hydrocarbons (PAHs) were monitored using a 24-hour composite, and pH and oil and grease were monitored using a grab sample. Flow was determined continuously. Monitoring was conducted until it was determined that the discharge of all metal cleaning wastes was terminated.

B. Summary of compliance requirements

Interim effluent limitations were established for total suspended solids, oil and grease, total copper, and total iron (Order No. 96-05 Section B8).

C. Data collected

The 1996 Annual Report contains results for measurements of total suspended solids, copper, iron, oil and grease, and flow.

D. Is monitoring appropriate to determine compliance?

It was, but it is no longer applicable because the flows are no longer discharged into San Diego Bay.

E. Recommended changes

The discharge of industrial process wastes, including metal cleaning wastes, from the plant to San Diego Bay, was phased out at the end of 1997. Therefore, it is recommended that compliance requirements (Order No. 96-05 Section B8 Metal Cleaning Wastes) and monitoring requirements (Monitoring and Reporting Program No. 96-05 Section E Metal Cleaning Waste Monitoring) for metal cleaning wastes be deleted from the new permit.

5. LOW VOLUME WASTE MONITORING

A. Summary of permit-required monitoring

On a monthly basis, total suspended solids were monitored using a 24-hour composite, and oil and grease was monitored using a grab sample. Flow was determined continuously.

B. Summary of compliance requirements

Interim effluent limitations (until 12/31/97) were established for total suspended solids and oil and grease. Final effluent limitations (Order 96-05 Section B7) for total suspended solids and oil and grease became effective on 12/31/97.

C. Data collected

Monthly values for total suspended solids, oil and grease, and flow were reported in the 1996 (January –December) and 1997 (January –November) Annual Reports.

D. Is monitoring appropriate to determine compliance?

It was, but it is no longer applicable because the flows are no longer discharged into San Diego Bay.

E. Recommended changes

The discharge of industrial process wastes, including low-volume wastes, from the plant to San Diego Bay, was phased out at the end of 1997. Therefore, it is recommended that compliance requirements (Order No. 96-05 Section B7 Low Volume Wastes) and monitoring requirements (Monitoring and Reporting Program No. 96-05 Section F Low Volume Waste Monitoring) for low-volume wastes be deleted from the new permit.

6. IN-PLANT WASTE STREAM MONITORING

A. Summary of permit-required monitoring

In-plant waste streams were monitored using grab samples for arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, zinc, total cyanide, ammonia, non-chlorinated phenolic compounds, chlorinated phenolic compounds, bis (2-chloroethoxy) methane, bis (2-ethylhexyl) phthalate, chloroform, chromium III, di-n-butyl phthalate, and halomethanes on a semiannual basis. Flow was monitored continuously.

B. Summary of compliance requirements

Interim effluent limitations were established for arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, zinc, total cyanide, ammonia, non-chlorinated and chlorinated phenolic compounds, bis (2-chloroethoxy) methane, bis (2-ethylhexyl) phthalate, chloroform, chromium, di-n-butyl phthalate, halomethanes, and PAHs (Order 96-05 Section B9).

C. Data collected

The 1996 Semiannual Report contains in-plant data for aldrin and dieldrin, arsenic, cadmium, chlordane and related compounds, chlorinated phenolics, chromium, copper, total cyanide, DDT and derivatives, endrin, HCH, lead, mercury, nickel, ammonia, PCBs, phenolic compounds, silver, toxaphane, and zinc.

The 1997 Semiannual Report contains in-plant data for arsenic, cadmium, chlorinated phenolics, chromium, copper, total cyanide, lead, mercury, nickel, ammonia, phenolic compounds, silver, zinc, bis (2-chloroethoxy) methane, bis (2-ethylhexyl) phthalate, chloroform, di-n-butyl phthalate, and halomethanes.

The 1998 Semiannual Report contains in-plant data for arsenic, cadmium, chlorinated phenolics, chromium, copper, total cyanide, lead, mercury, nickel, ammonia, phenolic compounds, silver, and zinc.

D. Is monitoring appropriate to determine compliance?

It was, but it is no longer applicable because the flows are no longer discharged into San Diego Bay.

E. Recommended changes

The permit required that monitoring continue until the discharge of all in-plant wastes, except freshwater reverse osmosis brine, has terminated and it is certified that these constituents are not present in the in-plant waste discharges into the bay. Given that in-plant wastes are no longer discharged into San Diego Bay, it is recommended that compliance requirements (Order No. 96-05 Section B9 In-plant Wastes) and monitoring requirements (Monitoring and Reporting

Program No. 96-05 Section G In-plant Waste Stream Monitoring) for in-plant wastes be deleted from the new permit.

7. RECEIVING WATER MONITORING

A. Summary of permit-required monitoring

Receiving water monitoring is conducted monthly at 11 stations for temperature, salinity, dissolved oxygen, and transparency, as required in the permit.

B. Summary of compliance requirements

The discharge must not cause non-attainment of certain water quality objectives from the Basin Plan and Ocean Plan, including:

Physical Characteristics

- ✓ Waters shall not contain oils, greases, waxes, or other materials in concentrations that result in a visible film or coating on the surface of the water or on objects in the water, or that cause nuisance or otherwise adversely affect beneficial uses.

- ✓ The discharge of waste shall not cause aesthetically undesirable discoloration of the bay surface.

- ✓ Natural light shall not be significantly reduced as a result of the discharge of waste.

- ✓ The rate of deposition of inert solids and the characteristics of inert solids in bay sediments shall not be changed such that benthic communities are degraded.

- ✓ Waters shall not contain floating materials, including solids, liquids, foams, and scum in concentrations that cause nuisance or adversely affect beneficial uses.

- ✓ The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses.

- ✓ Waters shall not contain suspended and settleable solids in concentrations that cause nuisance or adversely affect beneficial uses.

- ✓ Waters shall not contain taste- or odor-producing substances at concentrations that cause a nuisance or adversely affect beneficial uses.

- ✓ Waters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses. Also, the transparency of bay waters shall not be less than 8 feet in more than 20% of the readings in any zone. If the water is less than 10 feet deep, Secchi disk

readings shall not be less than 80% of the depth in more than 20% of the readings in any zone.

Chemical Characteristics

- ✓ The pH shall not be changed more than 0.2 units from that which occurs naturally. The pH shall not be depressed below 7.0 nor raised above 9.0.

- ✓ The dissolved sulfide concentration of waters in and near sediments shall not be significantly increased above that of natural conditions.

- ✓ The concentrations of substances in marine sediments established in Receiving Water Limitation D.2 of the Ocean Plan shall not be increased to levels that would degrade indigenous biota.

- ✓ The concentration of organic materials in marine sediments shall not be increased to levels that would degrade marine life.

- ✓ Nutrient materials shall not cause objectionable aquatic growth or degrade indigenous biota.

- ✓ Waters shall not contain biostimulatory substances in concentrations that promote aquatic growth to the extent that such growths cause nuisance or adversely affect beneficial uses.

- ✓ The discharge of wastes shall not cause concentrations of un-ionized ammonia to exceed 0.025 mg/L in the bay.

- ✓ Pesticides shall not be present in the water column, sediments, or biota at concentrations that affect beneficial uses. Pesticides shall not be present at levels that will bioaccumulate in aquatic organisms to concentrations that are harmful to human health, wildlife, or aquatic organisms.

Biological Characteristics

- ✓ Marine communities, including vertebrate, invertebrate, and plant species, shall not be degraded.

- ✓ The natural taste, odor, and color of fish, shellfish, or other marine resources used for human consumption shall not be altered.

- ✓ The concentration of organic materials in fish, shellfish, or other marine resources used for human consumption shall not bioaccumulate to levels that are harmful to human health.

Radioactivity

- ✓ Radionuclides shall not be present in concentrations that are deleterious to human, plant, animal, or aquatic life nor that result in the accumulation of radionuclides in the food web to the extent that they present a hazard to human, plant, animal, or aquatic life.

Toxicity

- ✓ All waters shall be maintained free of toxic substances in concentrations that are toxic to or produce detrimental physiological responses in human, plant, animal, or aquatic life.

Receiving Water Limits

- ✓ Interim (until 12/15/99) receiving water limits were established for arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, zinc, total cyanide, total chlorine residue, ammonia, acute toxicity, non-chlorinated and chlorinated phenolics, and radioactivity. Interim receiving water limits were established for bis (2-chloroethoxy) methane, bis (2-ethylhexyl) phthalate, chloroform, chromium, di-n-butyl phthalate, halomethanes, and PAHs until the cessation of discharge of in-plant wastes. Final (effective 12/15/99) receiving water limits were established for arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, zinc, total cyanide, total chlorine residue, ammonia, acute toxicity, non-chlorinated and chlorinated phenolics, and radioactivity.

C. Data collected

On a monthly basis, data on temperature, salinity, dissolved oxygen, transparency, and depth are collected at 11 receiving water stations.

D. Is monitoring appropriate to determine compliance?

The existing receiving water monitoring program is focused on monitoring water quality in south San Diego Bay outside of the discharge channel. The receiving water monitoring program was designed to track effects related to increased temperature due to the once-through cooling system. The existing sampling conducted by the plant satisfies the current permit-required monitoring. A number of water quality objectives stated in the permit and summarized above in Section 7B were not required to be monitored. These objectives include the following:

- visible oil and grease
- water discoloration
- floating materials
- taste- or odor-producing substances
- degradation of benthic communities
- objectionable aquatic growth
- adverse effects due to suspended or settleable solids
- pesticides
- radioactivity
- dissolved sulfides
- pH
- ammonia
- arsenic
- cadmium
- chromium
- copper

- lead
- mercury
- nickel
- silver
- zinc
- total cyanide
- total residual chlorine
- chlorinated or non-chlorinated phenolic compounds

Such objectives generally would be applicable to a discharge that included process water. However, the plant has eliminated process water from the once-through cooling water discharge. Therefore, the objectives listed above are no longer applicable, and the corresponding receiving water compliance requirements should be eliminated from the renewed permit.

E. Recommended changes

It is recommended that the compliance requirements be evaluated for the new permit. As discussed above, since there is no longer a discharge of process water, many of the receiving water objectives listed in Order 96-05 and summarized above in Section 7D are no longer applicable and should be eliminated from the receiving water compliance portion of the renewed permit.

The current monitoring program and compliance requirements should be maintained for effects related to increased temperature due to the once-through cooling water system and the addition of chlorine used to reduce biofouling. Receiving water monitoring should continue to be conducted monthly at 11 stations for temperature, salinity, dissolved oxygen, and transparency, just as it is now. The existing receiving water monitoring program serves to monitor the effects of temperature on receiving waters. Concentrations of dissolved oxygen are directly related to water temperature. Transparency should be monitored, as it may be an indicator of a plankton bloom. A reduction in light in the surface waters may have detrimental effects to water quality as well as photosynthetic organisms in the bay.

Visual observations for plankton blooms or any indications of objectionable aquatic growth could be added to receiving water monitoring, since warm waters have the potential to lead to phytoplankton blooms and/or increases in ephemeral algae. Observations of floatables, oil, discoloration, or other aesthetically undesirable materials could also be added to the monitoring program as any increases in these parameters may affect the beneficial uses of bay waters.