Ningxia Sand Lake Pilot Remediation Project Report

August 2016

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And

C3
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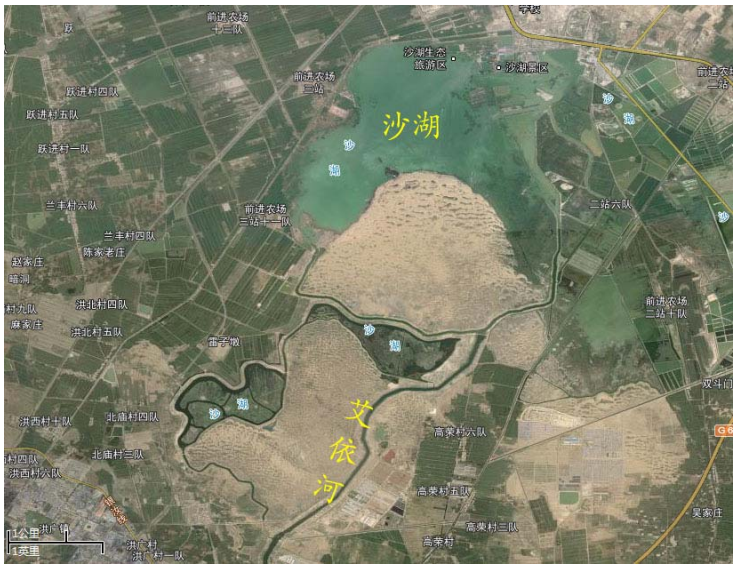
Introduction

Shahu Lake is part of the Yinchuan Plain "Xidatan saucer-shaped depressions", and features silver piece-shaped Lake and Lake flat, with a gradient of 1~2%. It is the largest brackish water lake in Ningxia and has always been used as a water reservoir for irrigation water from the Yellow River, Historically there have been droughts to the lake bottom every year.



1 Sand Lake location map (satellite photo)

1.1 Sand geology

Sand Lake is located between the Helan Shan and Ordos Plateau the Central Graben in the valley is located at the eastern foot of Helan mountain flood plain in the middle of the next, shift barrier the Tengger Desert in the West to the East of the Low Lands; west to east, the ground slope 1/26~1/118, Belonging to the yinchuan plain and Lake bottomland "xidatan saucer shaped depressions" landform, elevation 1093~1102m. Sand Lake habitats can be divided into the desert wetland, dune sand and desert steppe type. Main vegetation types in the habitat can be divided into 3 categories: sand, white stiff soil of achnatherum splendens communities of vegetation and desert wetland biomes.

Sand Lake, due to being landlocked, has arid precipitation and inter-annual variability of large, uneven seasonal distribution. In normal years, the average annual precipitation is about 174.7mm. Sand Lake sits in the evaporation area where average annual evaporation can reach 2041.7mm, 10 times greater than annual rainfall.

1.2 Sand Lake hydrology and water systems

Sand Lake is located in the tail of the Northern Yinchuan irrigation areas, where the lowest terrain is the Yinchuan plain, with lake surface elevation is sea level 1098~1099m. Sand Lake is a closed Lake; connected waterways include the second farm East of the Canal drains, Ai Yihe and an eight branch Canal with no output channel. Meanwhile, Shahu region precipitation is 174.7mm, but evaporation reaches 1400~1600mm in the case of non-artificial water, giving Shahu a negative water balance.

Sand Lake water is sourced from the following five components:

1. A branch canal from the Yellow River in the East: the main source of surface water, the annual quantity of $1000x10^4$~$1700x10^4m^3$;
2. Bayi branch canal diversion: annual formed surface of about $70\times10^4m^3$;
3. AI River, drains and III: annual surface quantity of $150x10^4$~$200x10^4m^3$; due to serious pollution in Ai Yihe, Is currently blocked;
4. Sand lake surface runoff in the catchment area, as well as ground water, leakage and other factors in farmland catchment, annually of about $400x10^4$~$700x10^4$ m^3 ;
5. Precipitation and result of Helan Mountain flood water; water less sporadic or clear.

1.3 Sand Lake pollution

Currently there are two kinds of pollution in Sand Lake; firstly turbidity is high. This is caused by diversion of the Yellow River, which carries a lot of suspended particles; secondly, the waters are green. This is due to the high degree of eutrophication, resulting in large amounts of blue-green algae caused by propagation.

At present, the water quality in Shahu Lake contains major pollution sources in the following four parts:

1. **Contaminated sediments**. Due to Sand Lake being a long water with very little water, year round pollutants on the bottom give rise to lake sediment accumulation, resulting in concentrations of pollutants exceeding the environmental carrying capacity; therefore, released pollutants in the water, become the internal pollution of sand Lake.
2. **Fertilizer and pesticide pollution**. This part of the major pollution sources in the mixed irrigation water of Yellow River water diversion and sand through farmland within the catchments of rain or flood. The water contains large amounts of nitrogen and phosphorus, especially for ammonia, thus leading to water pollution;
3. **Animal waste pollution**. Sand Lake is an annual gathering for large numbers of birds; bird droppings enter the water, increasing nutrient loads as a result of which eutrophication has become more serious;
4. **Domestic waste water and garbage pollution**. Derived from the tourist area; tourist domestic wastewater and garbage.

2 Test purpose

The Shahu Tourism Corporation agreed areas for ecological restoration for the Lakes pilot, designed to improve water quality in Shahu Lake. Pilot testing purposes were mainly focused on the following two aspects:

1. Through pilot-scale experiments, Kaitian Environmental will restore Shahu Lake's aquatic environment with a reliable process;
2. A pilot-scale test combining technology from home and abroad with overall water quality of the sand Lake, based on pilot data, optimised for a whole Sand Lake restoration programme with technical details.

3 Testing the raw materials and devices

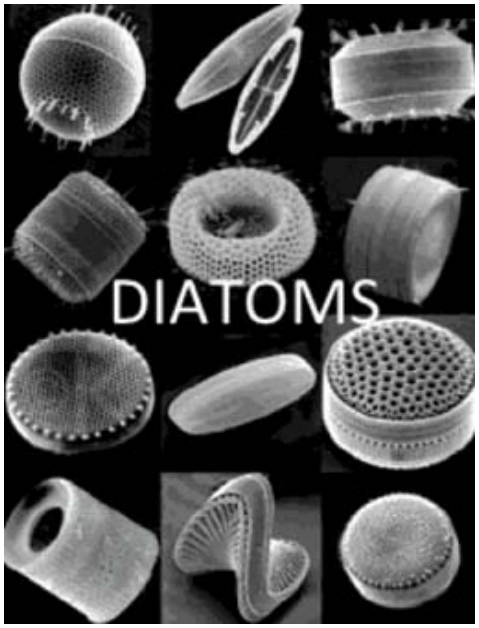
1. **Nualgi**: Clearwater Carbon Capture offers 24L;
2. **Plastic water tanks**: Water tank capacity 1000L;
3. **Pump**: power 1300W;
4. **Aeration device**: power 5000W , Facilitated by Shahu Tourist Company Limited;
5. **Hose**: 100m;
6. **Graduated cylinder**: 1000ml;

7. **Measuring cup**: 1000ml;
8. **Tap valve**;
9. **Portable Water Quality Tester** (YSI 6600 V2, Water Quality Portable): provided by Shahu Tourist Company Limited;
10. **Boats**: used when dosing medicament and water quality testing.

Note: *the above does not indicate the source of the equipment and devices offered by the Kaitian Environmental Technology Company.*

4 Nualgi® working principle

Diatoms are single celled plants which have plastids, often by several or many individual cells into a wide variety of groups, belonging to the producer in the food chain. A key feature of diatom cells overlying siliceous (mainly silica) cell walls. This type of cell wall is solid, stability of diatom cell death will remain very strong, will not be split up.



2 Scanning electron microscope images of diatom cells

Nualgi voted to join the natural Nano-nutrients in water, its small particle size, surface area, with significant surface effects can be quickly absorbed by the diatom cells, promote the diatom cell walls, the formation of chlorophyll, accelerating the growth of diatoms in freshwater environments, promote cell clones. In the process of growing diatoms will continue to absorb n, and p and other nutrients, and under autotrophic photosynthesis and assimilation of proteins and other substances, thereby reducing the level of eutrophication of water body. In addition, due to the rapid growth of diatom water consumed large amounts of n, and p elements, the lack of nutrients will inhibit the growth of cyanobacteria and green algae. Removed by diatom accumulation of eutrophication in the n and the p element can fundamentally improve the State of eutrophication of water body and can promote the growth of zooplankton and fish.

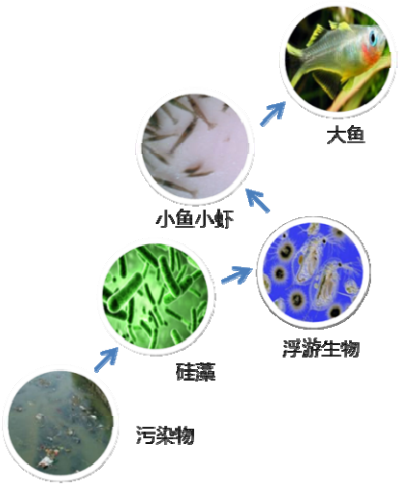
Specific mechanisms in the following areas:

1. Through photosynthesis, carbon dioxide fixation in cells of diatom cells; meanwhile, the absorption of n, and p elements, assimilation of synthetic substances that make up cells. When in water n element content is high, the diatoms synthesize proteins and oils when in water n element content is low, diatom synthesis a lot of oil and a small amount of protein.
2. On Earth there are 70% oxygen is released of phytoplankton, diatoms plankton in number of 60% or more. In the process of photosynthesis, diatom cells release oxygen into the water, can increase the dissolved oxygen in the water, thereby promoting bacterial oxidation and decomposition of organic matter such as microorganisms, enhance water self-purification ability, promote decomposition of pollutants in sediments, help speed up black and odorous, sensory and poor state of the aquatic ecosystem of the Lake returns to normal.
3. Diatom shells have a large number of, an ordered arrangement of micro pore than surface area reaches 3.1-60M^2/g, pore7-125nmcan absorb mass 3-4 times more impurities. Silicon inner surface of the outer surface of the shell and whole distribution in a large number of silanol and ionization in aqueous h^+, show some surface

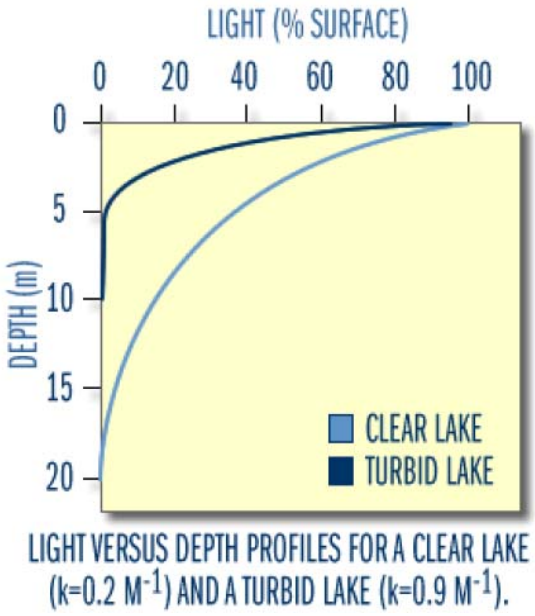
electronegativity can be positively charged colloidal destabilization and adsorption of positively charged by pollutants. In addition, high chemical stability of diatom shells, except in hydrofluoric acid solution, but does not dissolve in any strong acid, when diatoms die still has strong adsorption properties, not desorption of pollutants entering water bodies. Therefore, the diatom cells themselves can be seen as a kind of stable adsorbent material.

4. Zooplankton food diatoms in water; zooplankton can be used as a biological food for fish, shrimp, to form the "big fish eat little fish, small fish eat shrimp" food chains.

Nualgi Nano nutrients stimulate the growth of diatom in the process water eco-system restoration, reduction of cyanobacteria, green algae will significantly enhance the transparency of water. With the increasing depth of light, submerged plants will gradually recover, thus contributing to algal turbidity water gradually from steady-state systems (Optical Depth attenuation frequency ≥0.9m^{-1} water) grass simple steady-state systems (Optical Depth attenuation frequency ≤0.2m^{-1} water) changes. Chain (see figure 3 below), through the food chain N, P And other elements out of the water, reducing water N, P Element concentration, improve the self-purification of water.



3 Aquatic ecosystem food chain



4 Depth of light attenuation of the water system and water system comparison chart

5 Test the implementation

After Hunan Kaitian Environmental Protection Research and Development team and Shahu Lake of Ningxia tourism company limited commenced investigation, two sites were selected as pilot regions (see in particular section 5.2.1). Meanwhile, in order to compare the test results, a small pilot zone parallel to the water was also selected.

5.1 Parallel laboratory tests

5.1.1 Assembly of test devices

Under existing conditions, buy a simple testing device, manually assembled, the steps are as follows:

First of all, 1000L Plastic water tanks were placed outside to receive the Sunlight, near the test zone and selected places;

Secondly, connections were made between hoses, water pumps and plastic storage containers to form closed-circuit water circulation. Among them, a hose to connect the pump inlet, connect another hose water pump outlet and connected to plastic water tanks. Specific port connections are shown in Figure 5 is shown;

Finally, the electricity turned on pump power to pilot devices installed.

5 Parallel pilot installation diagram

5.1.2 Test implementation steps

Specific steps are shown below:

1. Storage tank outlet valve closing, used in the pilot zone into a storage tank of water extraction, retained 10cm the height of the space;
2. Water storage is completed, after treating the water still in the tank, sample the water in the tank, and water quality testing, water quality background value of the test results as a pilot;
3. Use the pump to power cycle the water in the tank;
4. According to certain proportions added Nualgi pharmacy, dosage depending on the dose according to water quality changes (the specific dosing of small test dose and time are shown in table 1 below);

5. Water quality tests to detect water in the tank every day, and make a record (the pilot recording results see section 6.1below).

Table 1 Pilot Nualgi Dosing-dose records

	Nualgi Dosage dose									
Date	First day	Second day	Third day	Fourth day	Fifth day	Sixth day	Seventh day	Eighth day	Ninth day	Tenth day
Dose	300ml	—	—	300ml	—	—	—	200ml	—	—

5.2 Lakes pilot

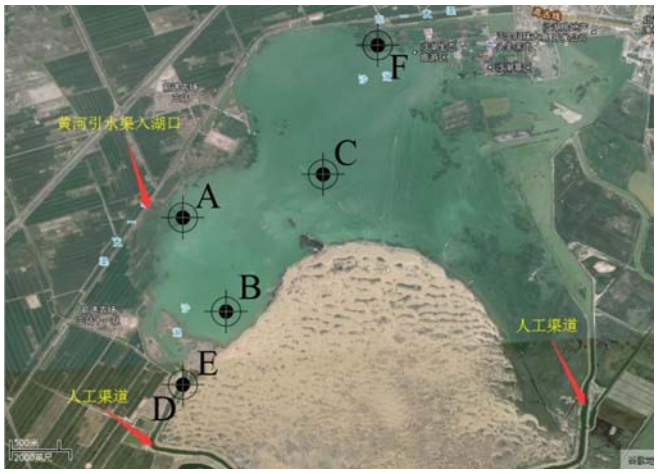
5.2.1 Pilot site

Testing process, first to observe throughout the Lake area, according to the environmental conditions required for testing and topography in the Lake District, selected two ideal zone.

1) Observations recorded

According to Shahu basic information, and identified six observation points, observe each and select appropriate test area, observing and recording the following:

Observation point A: for the Yellow River diversion channel in Hukou area, water mobility in the region, and show test results, do not use;
Observation point B: perimeter areas west of sand Lake, did not form an enclosed area in the region, too many factors beyond their control, not comparison test results, do not use;
Observation point C: for Shahu Lake area, conducting pilot tests in the region, will affect the passage of cruise ships, do not use;
Observation point D: Sand Lake West of artificial drainage ports, small water flow in the region, in a closed state, can be used as test area;
Observation point E: Shahu artificial Canal in an enclosed area to the West, near the D Sampling points, closed in the region, is ideal for pilot areas;
Observation point F: is a semi-enclosed area north of sand Lake, small water flow in the region, in a closed state, can be used as a test area. And can be used with e test area at the same time test result as a contrast.



6 Relative position six observation points

2) Pilot areas to determine

According to the analysis of observations, respectively E, F Two point multi-point level detection of water quality in the area, two regional water quality analysis report as shown in the figure. Data can be drawn from the report, two quality indexes COD exceeded GB 3838-

2002 limits on the kinds of the environmental quality standard for surface water (grade v water COD limit value ≤40mg/L). Therefore, to determine e, andf are inferior class of water quality. Among them, thee region water pollution is more serious.

The pilot selected Observation point E for the first pilot area (hereinafter E Test area). Site grounds: (1) the region isolated from the Shahu's home waters, reducing a lot of uncontrollable variables (2) using AUTO CAD on a satellite map, box, calculate the area of the region is approximately 4500m^2 (About 6.76 MU, as shown in Figure 7 Shown), is closer to the pilot scale of (3) Higher degree of water pollution in the region, could be better reflected in test results.

7 E Diagram of test area

8 E Picture site the test area

In addition, upon the request of Shahu Tourism Corporation, selected Observation point area F was chosen for the second pilot area (hereinafter F Test area). Site grounds: (1) Sand Lake waters in the region, more representative of water quality in Shahu lake water quality conditions; (2) the waters as a semi enclosed area, water flow weak water eco-environment is relatively stable (3) using AUTO CAD on a satellite map, box, calculate the area of the

region is approximately 3500m^2(about 5.25 acres, as shown in Figure 9 below), is closer to the pilot scale.

9 F Diagram of test area

10 F Photos of Yan

5.2.2 Pilot implementation steps

The pilot is implemented mainly consists of two parts, adding Nualgi And water quality monitoring, specific steps are described as follows:

1) The addition of Nualgi

1. Use water bottles of Nualgi diluted (100ml Nualgi, 6000ml water diluted);

2. Use the scoop Nualgi dilution evenly sprayed over the test area on the Lake, adding doses of this test are shown in table 2below;

3. In the test area to add aeration device, designed to increase the dissolved oxygen, as well as increased water flow, so as to accelerate the testing process.

Table 2 Pilot tests Nualgi Dosing-dose records

	Nualgi Dosage dose									
Date	First day	Second day	Third day	Fourth day	Fifth day	Sixth day	Seventh day	Eighth day	Ninth day	Tenth day
Test area E	1.5L		1L		1.5L		1.8L	2L		1.5L
Test area F	1L		1.5L	1L	1L	2L		1.5L		

2) Water quality testing

1. Daily water quality testing using a portable instrument for water quality testing, testing three times a day, track changes in water quality, and recording (need to record indicators see table 3 below);

2. In the test area samples taken every other day, laboratory water testing, portable water testing instrument for comparative reference testing the accuracy of data and records.

Table 3 Water quality index

Main index	Secondary indicators (optional tests)
Water temperature	Silicon
pH	Iron
Ammonia nitrogen	Heavy metal
Total nitrogen	
Total phosphorus	
COD	
BOD	
DO	
Salt content	
Chlorophyll a	

6 Test results and analysis

6.1 Parallel laboratory tests results

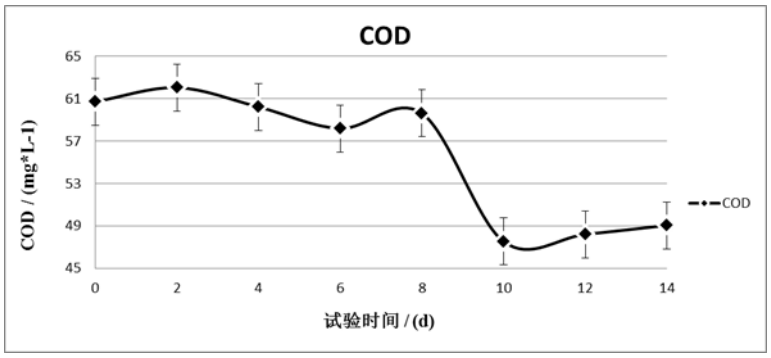
Based on parallel data in the pilot process testing the integrity of and characterisation of selected 4 A comparative analysis of water quality parameters, including COD, BOD, NTU, DO Indicators. During the pilot, every other day to test water in the tank for water quality monitoring, the test results are shown in table 4 below:

Table 4 Parallel pilot indicators of water quality measurements

	Indicators of water quality measurements							
Detection time	The background value	2	4	6	8	10	12	14
COD	60.70	62.02	60.20	58.17	59.59	47.51	48.19	49.03
BOD	13.10	10.82	10.26	9.37	8.23	5.82	5.47	4.95
NTU	33.27	35.43	30.57	28.50	31.49	21.08	20.63	25.83
DO	1.33	2.88	3.01	3.32	—	—	—	7.06

1) COD Index analysis

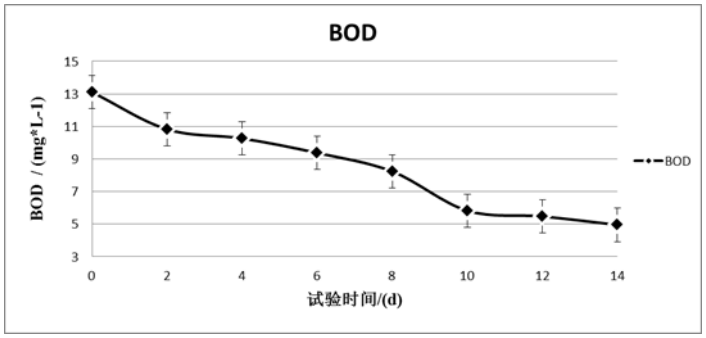
Will pilot the tank water quality indicators COD Change curve, as shown in Figure 11 As shown in. Figure 11 shows that in the beginning of the trial,COD indicator with light upward trend test fourth day after declines late rebound in volatility and test on the eighth day of a turning point,COD index sharply lower, reducing by more 20.6%. Then in a State of dynamic balance, the short term remained at 48mg/L per cent.



11 Pilot water quality COD Change curve

2) BOD Index analysis

Will pilot the tank water quality indicators BOD Change curve, as shown in Figure 12 As shown in. Figure 12 shows that throughout the entire testing process, water BOD indicators show a declining trend, overall decline to reach 58.2%. Then in a State of dynamic balance, the short term remained at 5.0mg/L per cent.

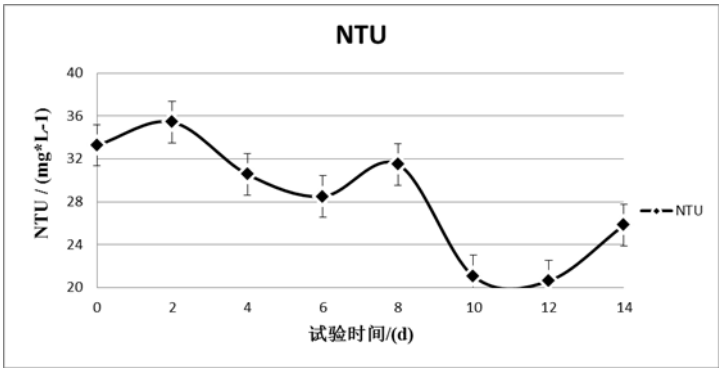


12 Pilot water quality BOD Change curve

3) NTU Index analysis

Will pilot the tank water quality indicators NTU Change curve, as shown in Figure 13 As shown in. Figure 13 shows that trends in water turbidity with COD index trends are similar,

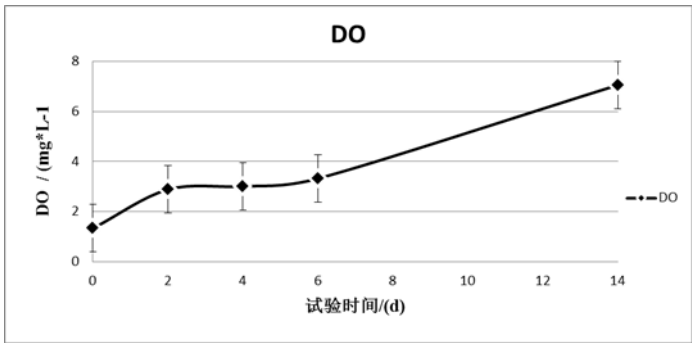
showing, rose slightly in the early and medium-term fluctuations, the eighth day a turning point, the overall decline to 38.0%. Then in a State of dynamic balance, the short term remained at 21mg/L per cent.



13 Pilot water quality NTU Change curve

4) DO Index analysis

Will pilot the tank water quality indicators DO Change curve, as shown in Figure 14 As shown in. Figure 14 shows that dissolved oxygen trends continue to rise, rose more slowly in the early, rapid growth in the late 14th day increased to 7.06mg/L.



14 Pilot water quality DO Change curve

5) Summary

In the beginning of the trial Nualgi Nano-nutrients promote the growth of diatoms in water, increased oxidation of organic compounds in water content, water COD Transient increase, transient increases in turbidity and then also; as the trial goes on, gradually increase in diatoms, and biodegradable organic matter in the water as nutrients were absorbed by diatoms and, therefore, BOD Index decrease; increased as the number of diatoms, photosynthesis increases dissolved oxygen in the water, prompting oxidisable organic matter in water by oxidation and decomposition. And green algae, blue-green algae, such as the biological competitive decreased quantity decreases, resulting in COD, turbidity index fluctuation in the middle and later period of reduced.

6.2 Test results in the Lake District

According to test data integrity of the detection and characterization of, respectively, in E Test area and F Test area selected4 A comparative analysis of water quality parameters, including COD, BOD, NTU, DO Indicators.

6.2.1 E Zone analysis of test results

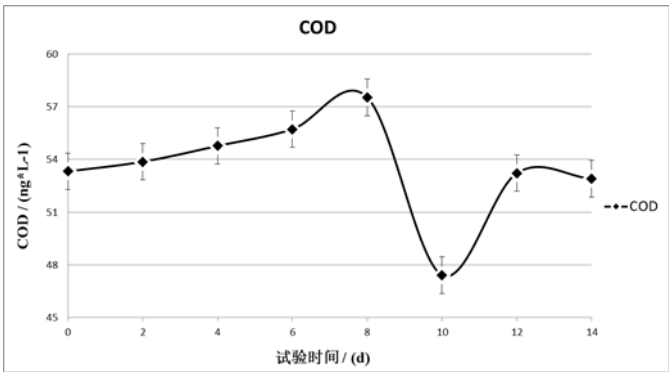
In the pilot process, every other day for E Zone track water quality tests, the test results are shown in table 5 Shown here:

Table 5 E Detection zone test water quality objectives values

	Indicators of water quality measurements							
Detection time	The background value	2	4	6	8	10	12	14
COD	53.32	53.87	54.77	55.72	57.53	47.42	53.22	52.90
BOD	3.53	3.83	4.03	3.89	4.12	2.16	2.89	2.88
NTU	37.22	35.67	35.99	37.76	39.63	26.59	33.04	32.95
DO	1.55	6.49	4.77	—	—	—	—	8.06

1) COD Index analysis

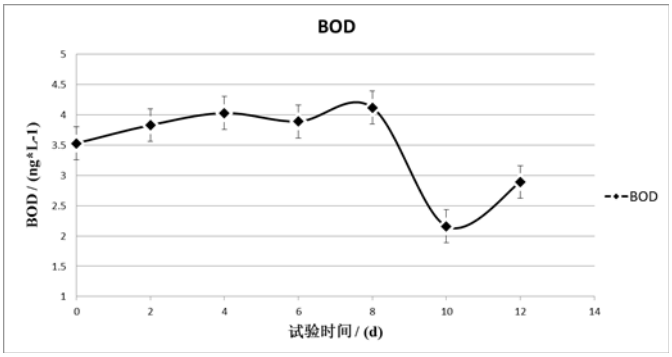
Will try the test area in the water quality index COD Change curve, as shown in Figure 15 As shown in. Figure 15 shows that in the course of testing,COD indicators show a gradual upward trend and test on the eighth day of a turning point,COD index sharply lower, reducing the rate of 11.1% Then index there is a certain level of recovery, floating rate 5.8mg/L.



15 E Test area water quality COD Change curve

2) BOD Index analysis

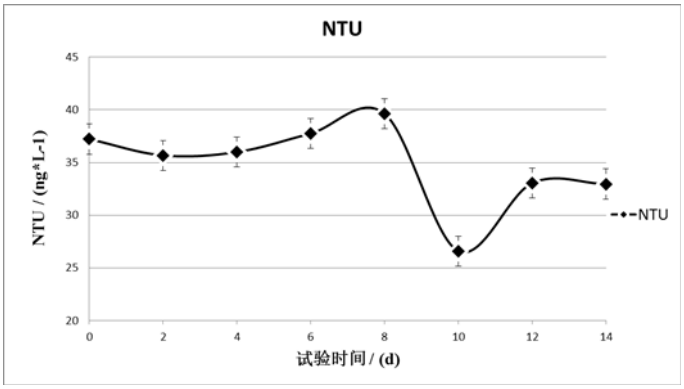
Will try the test area in the water quality index BOD Change curve, as shown in Figure 16 As shown in. Figure 15 shows that in the beginning of the trial,BOD index on the rise, with volatility in the middle and test on the eighth day of a turning point,BOD index sharply lower, reducing the rate of 38.8%; Index then there is a certain level of recovery, floating rate 0.73mg/L.



16 E Test area water quality BOD Change curve

3) NTU Index analysis

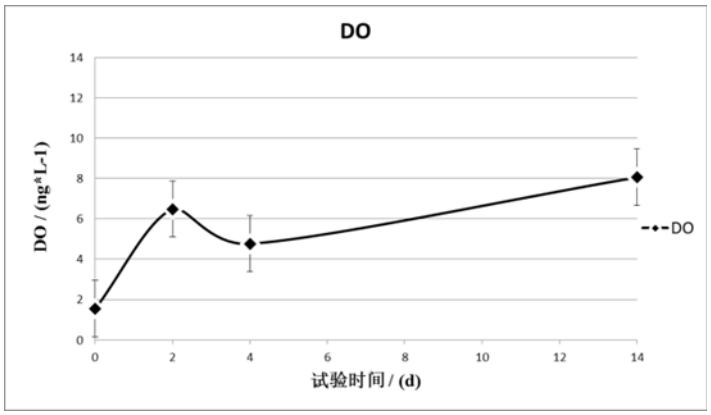
Will try the test area in the water quality index NTU Change curve, as shown in Figure 17 As shown in. Figure 17 shows that in the beginning of the trial,NTU indicators on the rise, with volatility in the middle and test on the eighth day of a turning point,NTUindex sharply lower, reducing the rate of 28.6%. Index then there is a certain level of recovery, floating by 6.45mg/L.



17 E Test area water quality NTU Change curve

4) DO Index analysis

Will pilot the tank water quality indicators DO Change curve, as shown in Figure 18 As shown in. Figure 18 shows that dissolved oxygen trends continue to rise, test some fluctuation in the 14th day increased to 8.06mg/L.



18 E Test area water quality DO Change curve

6.2.2 F Zone analysis of test results

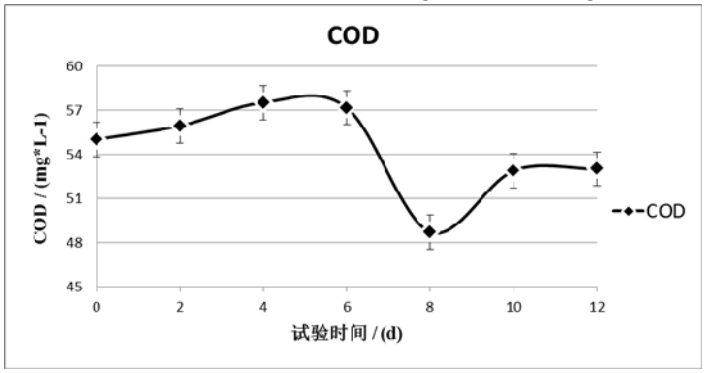
In the pilot process, every other day for F Zone track water quality tests, the test results are shown in table 6 Shown here:

Table 6 F Detection zone test water quality objectives values

	Indicators of water quality measurements						
Detection time	The background value	2	4	6	8	10	12
COD	55.01	55.94	57.52	57.17	48.72	52.88	53.01
BOD	1.58	1.52	1.82	2.07	0.24	0.96	0.87
NTU	40.08	42.78	45.95	42.82	33.24	37.09	37.31
DO	3.84	3.88	3.94	—	—	—	6.44

1) COD Index analysis

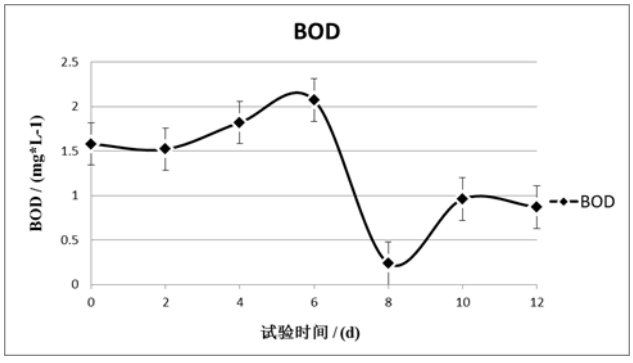
Will try the test area in the water quality index COD Change curve, as shown in Figure 19 As shown in. Figure 19 shows that in the course of testing,COD indicators show a gradual upward trend and test on the sixth day of a turning point,COD index sharply lower, reducing the rate of 11.4%. Then index must rebound, floating rate 4.16mg/L.



19 F Test area water quality COD Change curve

2) BOD Index analysis

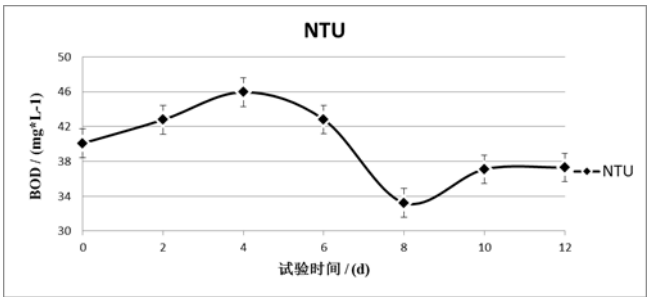
Will try the test area in the water quality index BOD Change curve, as shown in Figure 20 As shown in. Figure 20 shows that in the beginning of the trial,BOD index on the rise; and test on the sixth day of a turning point,BOD index sharply lower, reducing the rate of 84.8%. Then index must rebound, floating rate 0.72mg/L.



20 F Test area water quality BOD Change curve

3) NTU Index analysis

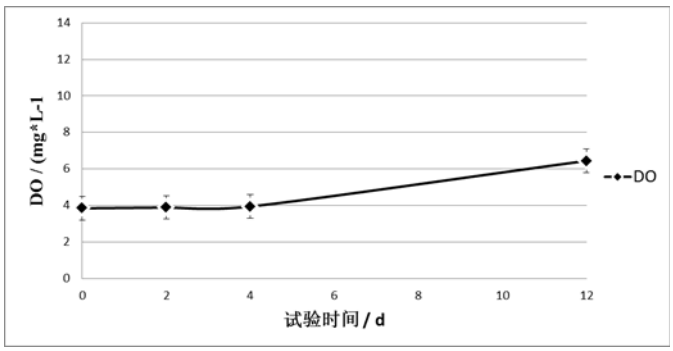
Will try the test area in the water quality index NTU Change curve, as shown in Figure 21 As shown in. Figure 21 can be seen in the beginning of the trial,NTU indicators on the rise; and test on the sixth day of a turning point,NTU index sharply lower, reducing the rate of 17.1%then index turned up there is a certain level of , Floating rate 3.85mg/L.



21 F Test area water quality NTU Change curve

4) DO Index analysis

Will pilot the tank water quality indicators DO Change curve, as shown in Figure 22 As shown in. Figure 22 shows that dissolved oxygen increased, the 12th day increased to 6.44mg/L.



22 F Test area water quality DO Change curve

6.2.3 Small Knot

Compare sections 6.1, 6.2.1 and 6.2.2 Chart shows that the pilot indicators of water quality in the Lake District the exponential trend to lagging indicators of water quality in small tanks, especially on the tenth day pilot unexpected rebound in the Lake District. This is due to test water in a more stable system, less affected by weather changes. Mainly due to long periods of wet weather (from 8 months 14 days has been raining), which leads to photosynthesis intensity of diatom water (especially at the bottom of water) decrease in dissolved oxygen, anaerobic microorganisms have rebounded, blue-green algae bio-competitive recovery, resulting in COD, and BODand theNTU index rebounded. In addition, Lakes pilot small cans of water volumes equivalent of 4000 times, therefore, during the experiment, water quality indexes of a relatively slow, lag.

In addition, tests on the 12th day F Lake outside the zone were detected (detection of data-see photos 2 Shown), which CODIndicators for the 56.71mg/L ; BOD Index for the 0.68 mg/L ; NTU Index for the 43.77 mg/L. From a numerical point of view,COD, andNTUindicators are higher than the indicator values within the test area. This shows that water quality has improved, and the ability to resist environmental impacts can be improved.

7 Conclusions and recommendations

7.1 Conclusion

1. Test results, water quality parameters COD, BOD Index lower, indicating diatoms can resolve to absorb the nutrients in the water, reduce the content of organic matter in the water;
2. Results in the reduction of turbidity in water quality parameters index, description Nualgi Nano-nutrients can promote the growth of primary producers of indigenous diatoms and Diatoms are more biological competitive, so as to inhibit the propagation of blue-green algae and improve water clarity;
3. Nualgi Nano nutrients repair process of water quality for ecosystem restoration, repair the ecological network by this process is the basis of most primary producers as a starting point, will gradually repair to improve aquatic ecosystem, is a long slow process, repair cycle 1~3 Year. Therefore, the pilot testing process in the short term, improvement of the water quality indicator is not very clear, stable efficiency accelerate pilot effect, drop index is more ideal, can be used as evidence.

7.2 Recommendations

After nearly a month of research and pilot experiments, and according to the test results, in order to expedite the resumption of shahu Lake aquatic environment, Kay day of environmental protection research and development team is given the following seven recommendations:

1. To increase the complement of Yellow River water diversion of water. Ningxia location, small rainfall and long hours of sunshine, and the soil is dominated by sand, strong permeability. Therefore, the large amount of sand lake water evaporation, seepage, and loss of water is less than the amount, resulting in high water salinity, level of mineralization. Increase in Yellow River water diversion is there are more effective ways to alleviate water mineralization;
2. Of clean sand into the water. Proposed new sedimentation and artificial wetland in Yellow River water diversion entrance in order to achieve the objective of clean sand into the water. Yellow River water diversion and sand lake water, and the water contains large amounts of sediment in the Yellow River into Lake adsorption of pollutants in water, and precipitation on the lake bottom or suspended in the water column, the formation of new sources.Therefore, at the entrance to the Yellow River water diversion, new sedimentation tank, remove the sediment carried in the water, and then into a deep purification of artificial wetland treatment, final introduction of sand Lake. Clean water will enhance environmental bearing capacity of sand;
3. Reinforced Sand Lake hydrodynamics. Recommends that the new pumping station and artificial wetland in order to achieve the objective of increased water flow. Because of the terrain, sand lake water in a closed state, poor water flow, resulting in water exchange slow, affect the metabolic functions of the ecosystem. Therefore, use pump contaminated water depth up to artificial wetland treatment, clean water again to gravity, a drop form back into sand, forming a water power cycle system;
4. Rich in sand Lake plant diversity. At present, shahu single water plant species, dominated by Macrophytes Phragmites australis. Single plant system is more fragile, weak environmental impact-resistant ability. And because the water quality in shahu Lake with high alkalinity and salinity characteristics, it is recommended that increased resistance to salt and alkali resistance of indigenous aquatic plants. Emersed plants may increase plant Cattail, Lotus, Zhi Cong; floating-leaf plants may increase plant water lilies; submerged plants may increase plant bath, Ceratophyllum demersum, etc;
5. Increased dissolved oxygen content. Proposed different points in the Lake District to add artificial aeration device, for the purpose of upgrading parts dissolved oxygen;

6. Fix the AI River. Ai Yihe river water pollution more seriously than shahu, recommended Ai Yihe governance. Ai Yihe water to restoration, will effectively solve the sand fill water and hydrodynamic problems such as inadequate, and helped shahu to quickly form a stable long-term water ecosystems;
7. Ecological restoration of water bodies. By adding Nualgi Nano-nutrients in order to achieve the purpose of refactoring shahu primary producers of ecological platform. Nualgi Nano-nutrients promote the growth of primary producers of diatoms, build a stable ecological primary platform, on the basis of this, sand lake water ecological network will be gradually improved and restored, leading to ecosystem restoration of self-purification capacity of the water body.

The drawings 1: E F Zone background water quality analysis report form

2016/8/8 E试验区试验数据
Test Data of the First Site

	指标 index	小试罐中 In the tank	中试池中 In the pond						地表水环境质量标准（GB 3838-2002） Environmental Quality Standard for Surface Water		
			①	②	③	④	⑤	Average	III类 classIII	IV类 classIV	V类 class V
设备一 equipment one	温度 temperature	32.00	30.84	31.46	31.33	29.71	30.23	**30.71**			
	溶解氧 DO	1.33	1.42	1.46	1.50	1.61	1.66	**1.53**	5	3	2
	PH	8.89	8.93	8.92	8.92	8.94	8.93	**8.93**		6~9	
	NH4-	7.34	5.67	5.38	5.49	5.12	5.26	**5.38**			
	硝酸盐 NO3-	18.65	20.70	19.40	18.84	20.06	15.63	**18.93**			
	浊度 NTU	12.20	13.40	10.70	14.10	12.70	10.10	**12.20**			
	Cl-	694.50	708.30	686.40	706.70	727.90	516.70	**669.20**	250	250	250
设备二 equipment two	总悬浮物 TSS	37.01	46.72	50.34	36.19	38.44	37.37	**41.81**			
	NO3-N	14.55	10.20	10.25	10.26	10.24	10.26	**10.24**	10	10	10
	COD	60.70	54.26	55.91	51.66	52.50	52.27	**53.32**	20	30	40
	BOD	13.10	3.34	3.51	3.58	3.58	3.64	**3.53**	4	6	10
	TOCeq	18.94	16.36	17.02	15.32	15.66	15.57	**15.99**			
	DOCeq	9.84	6.77	6.85	6.88	6.89	6.91	**6.86**			
	FTUeq	33.27	41.34	44.39	32.47	34.41	33.50	**37.22**			
	氟化物(F-)	0.02	0.61	0.60	0.58	0.55	0.54	**0.58**	1	1.5	1.5

E Test area water quality testing at the observation point

2016/8/10 F试验区试验数据
Test Data of the New Site

	指标 index	小试罐中 In the tank	F中试池中 In the pond						地表水环境质量标准（GB 3838-2002） Environmental Quality Standard for Surface Water		
			①	②	③	④	⑤	Average	III类 classIII	IV类 classIV	V类 class V
设备一 equipment one	温度 temperature		31.69	30.71	29.69	30.59		**30.67**			
	溶解氧 DO		3.61	3.39	4.11	4.25		**3.84**	5	3	2
	PH		8.81	8.82	8.83	8.85		**8.83**		6~9	
	NH4-		4.20	4.16	4.16	4.15		**4.17**			
	硝酸盐 NO3-		15.13	15.21	14.72	14.56		**14.91**			
	浊度 NTU		17.90	15.70	30.90	22.80		**21.83**			
	Cl-		522.10	549.60	554.80	548.50		**543.75**	250	250	250
设备二 equipment two	总悬浮物 TSS		42.87	40.77	47.29	47.22		**44.54**			
	NO3-N		9.96	10.32	9.94	9.94		**10.04**	10	10	10
	COD		54.02	54.36	55.84	55.82		**55.01**	20	30	40
	BOD		1.56	1.70	1.45	1.60		**1.58**	4	6	10
	TOCeq		16.27	16.40	16.99	16.99		**16.66**			
	DOCeq		5.98	6.95	5.92	5.97		**6.21**			
	FTUeq		38.71	36.55	42.55	42.49		**40.08**			
	氟化物(F-)		1.28	0.69	1.38	1.03		**1.10**	1	1.5	1.5

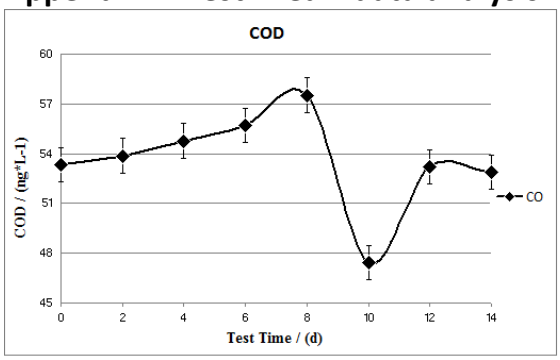
F Test area water quality testing at the observation point

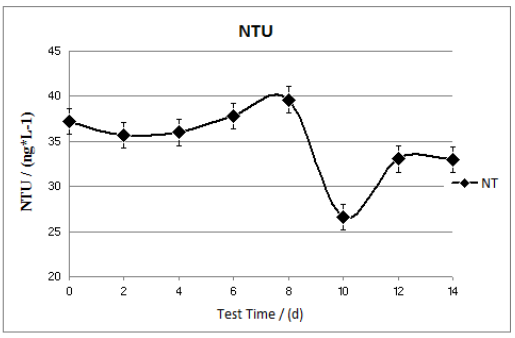
The drawings 2: 8 Month 20 E Lake water quality conditions outside the test area

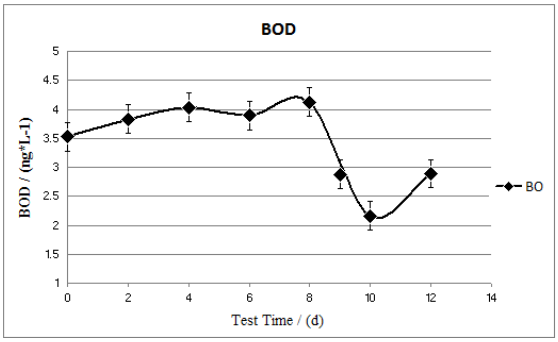
The drawings 3: Pilot implementation process in photo

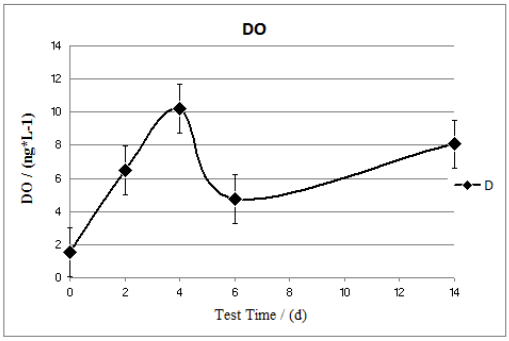
Data Appendices

Appendix 1: Test Area E data analysis

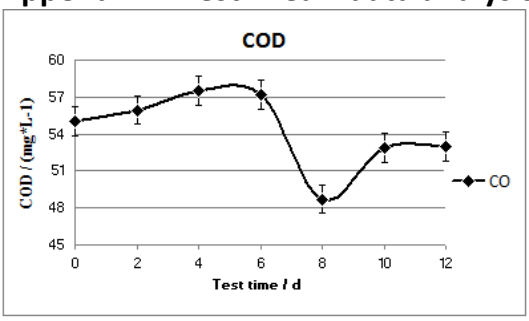


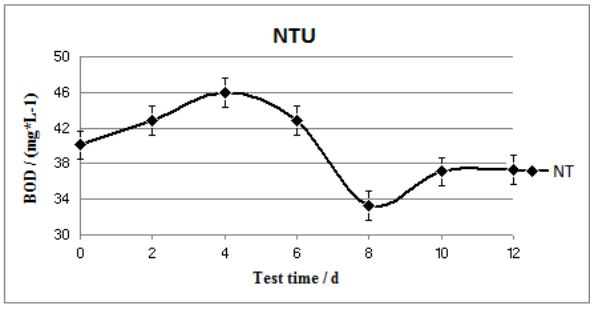


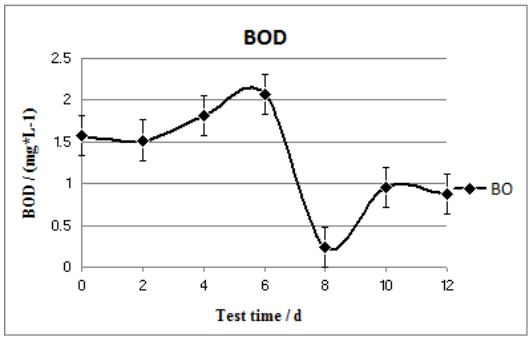


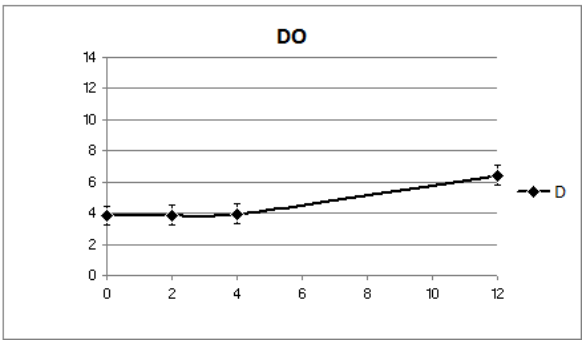


Appendix 2: Test Area F data analysis

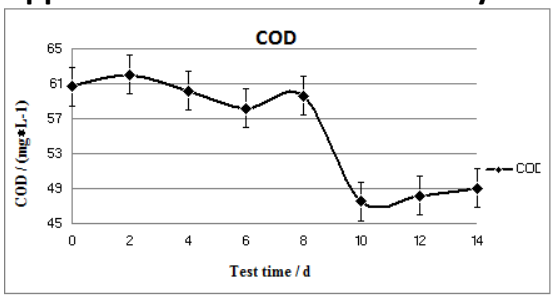


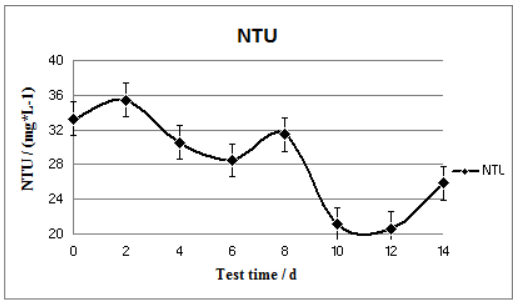


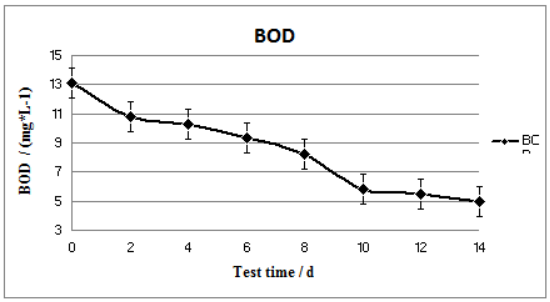


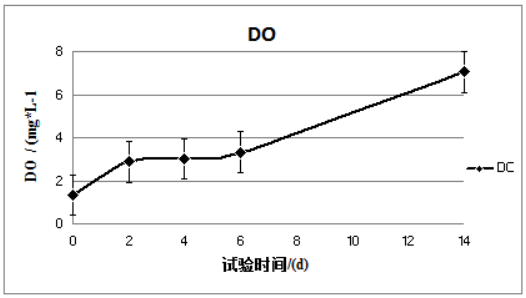


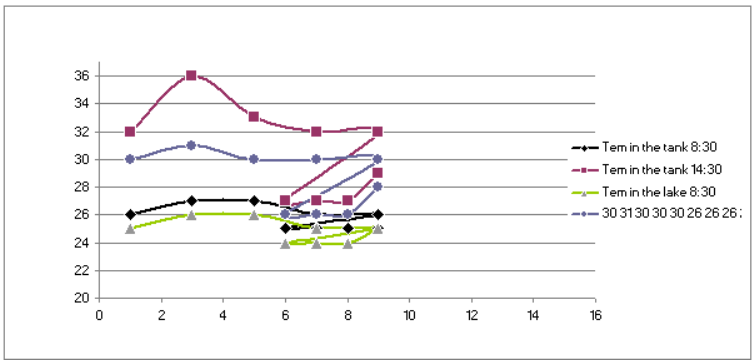
Appendix 3: Small Pilot Test analysis











Appendix 4: Complex data analysis