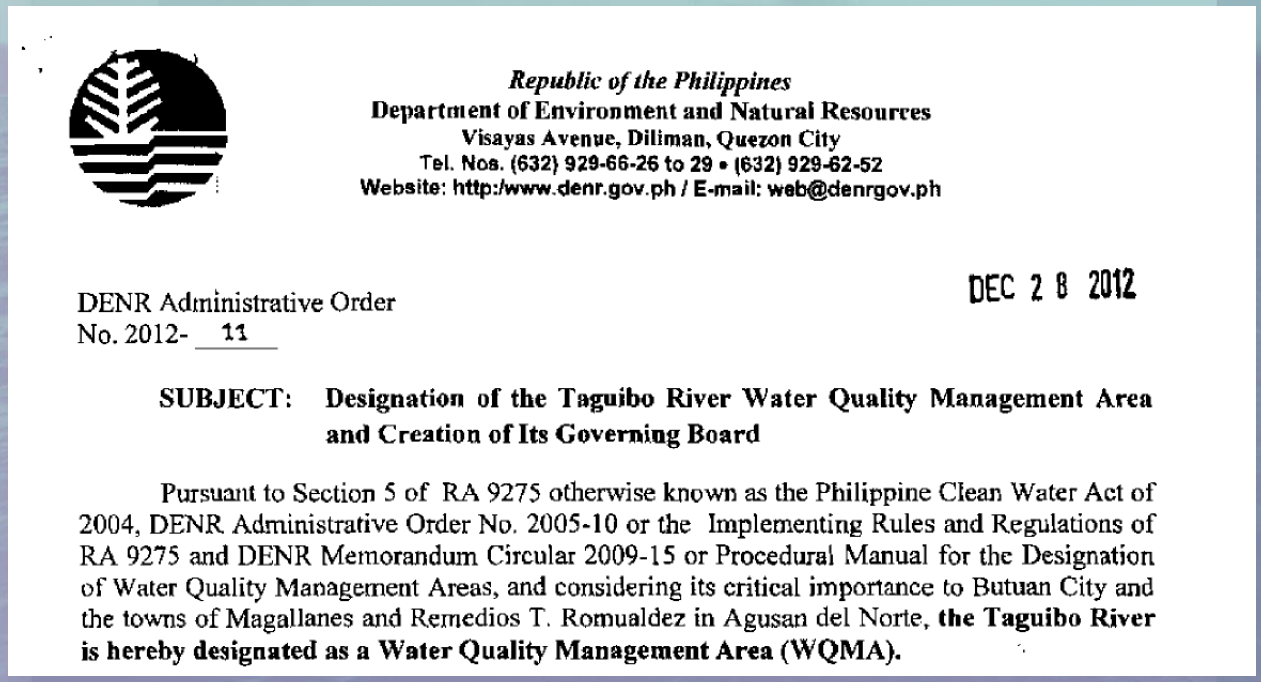
TAGUIBO RIVER WATER QUALITY MONITORING REPORT

(CY 2018 WATER QUALITY MONITORING)

EMB CARAGA WQMA Team

DENR Administrative Order No. 2012-11

- Designating Taguibo River Water Quality Management Area and Creating its Governing Board



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DENR Administrative Order
No. 2012- 11

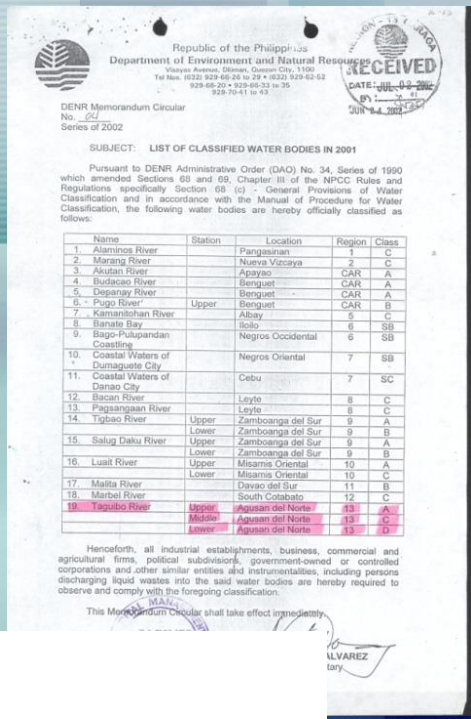
DEC 2 8 2012

SUBJECT: Designation of the Taguibo River Water Quality Management Area and Creation of Its Governing Board

Pursuant to Section 5 of RA 9275 otherwise known as the Philippine Clean Water Act of 2004, DENR Administrative Order No. 2005-10 or the Implementing Rules and Regulations of RA 9275 and DENR Memorandum Circular 2009-15 or Procedural Manual for the Designation of Water Quality Management Areas, and considering its critical importance to Butuan City and the towns of Magallanes and Remedios T. Romualdez in Agusan del Norte, **the Taguibo River is hereby designated as a Water Quality Management Area (WQMA).**

Significance of Taguibo River

- Taguibo River was officially classified in June 24, 2002 (per DENR Memorandum Circular no. 04 Series of 2002) as :



Republic of the Philippines
Department of Environment and Natural Resources

DENR Memorandum Circular
No. 04
Series of 2002

SUBJECT: LIST OF CLASSIFIED WATER BODIES IN 2001

Pursuant to DENR Administrative Order (DAO) No. 34, Series of 1990 which amended Sections 68 and 69, Chapter III of the NPCC Rules and Regulations specifically Section 68 (c) - General Provisions of Water Classification and in accordance with the Manual of Procedure for Water Classification, the following water bodies are hereby officially classified as follows:

	Name	Station	Location	Region	Class
1.	Alaminos River		Pangasinan	1	C
2.	Marang River		Nueva Vizcaya	2	C
3.	Akutan River		Apayao	CAR	A
4.	Budacao River		Benguet	CAR	A
5.	Deparay River		Benguet	CAR	A
6.	Pugo River	Upper	Benguet	CAR	B
7.	Kamanitohan River		Albay	5	C
8.	Banate Bay		Iloilo	6	SB
9.	Bago-Pulupandan Coastline		Negros Occidental	6	SB
10.	Coastal Waters of Dumaguete City		Negros Oriental	7	SB
11.	Coastal Waters of Danao City		Cebu	7	SC
12.	Bacan River		Leyte	8	C
13.	Pagsangaan River		Leyte	8	C
14.	Tigbao River	Upper	Zamboanga del Sur	9	A
		Lower	Zamboanga del Sur	9	B
15.	Salug Daku River	Upper	Zamboanga del Sur	9	A
		Lower	Zamboanga del Sur	9	B
16.	Luait River	Upper	Misamis Oriental	10	A
		Lower	Misamis Oriental	10	C
17.	Malita River		Davao del Sur	11	B
18.	Marbel River		South Cotabato	12	C
19.	Taguibo River	Upper	Agusan del Norte	13	A
		Middle	Agusan del Norte	13	C
		Lower	Agusan del Norte	13	D

Henceforth, all industrial establishments, business, commercial and agricultural firms, political subdivisions, government-owned or controlled corporations and other similar entities and instrumentalities, including persons discharging liquid wastes into the said water bodies are hereby required to observe and comply with the foregoing classification.

This Memorandum Circular shall take effect immediately.

ALVAREZ
Secretary

- ❑ **Class A in Upstream Section**

  (Public Water Supply Class II. For sources of water supply that will require complete treatment)

- ❑ **Class C in Midstream Section**

  (For fishery, recreational and industrial water supply Class I e.g. manufacturing process)

- ❑ **Class D in Downstream Section**

  (For irrigation, agriculture, livestock watering and industrial water supply class II e.g. cooling)

Water Quality Guidelines and General Effluent Standards of 2016
DAO No. 2016-08

(Signed: May 24, 2016)

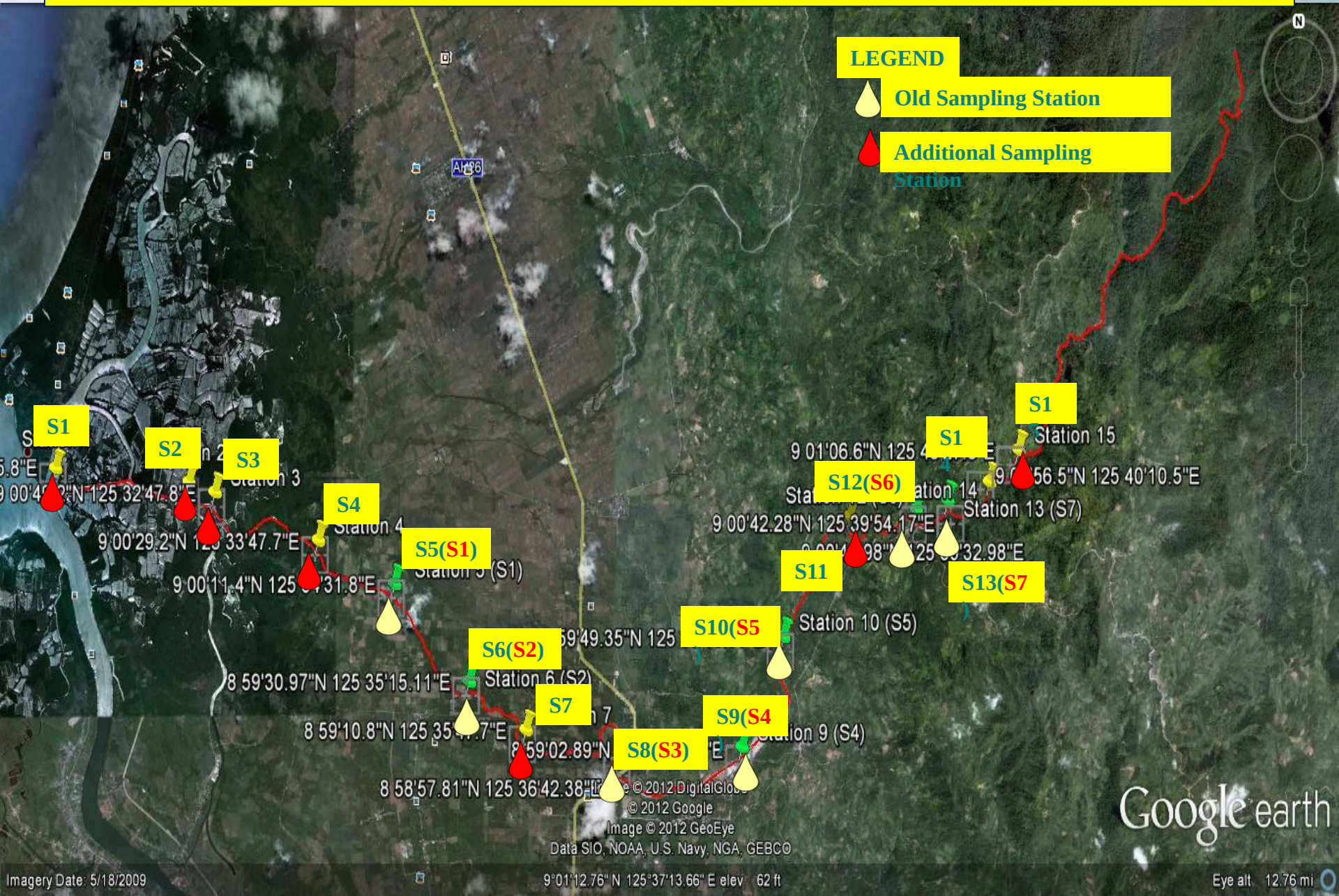
TABLE 3. WATER QUALITY GUIDELINES FOR PRIMARY PARAMETERS

Parameter	Unit	Water Body Classification								
		AA	**A**	B	**C**	**D**	SA	SB	SC	SD
BOD	mg/L	1	3	5	7	15	n/a	n/a	n/a	n/a
Chloride	mg/L	250	250	250	350	400	n/a	n/a	n/a	n/a
Color	TCU	5	50	50	75	150	5	50	75	150
Dissolved Oxygen [(a)] (Minimum)	mg/L	5	5	5	5	2	6	6	5	2
Fecal Coliform	MPN/100mL	<1.1	<1.1	100	200	400	<1.1	100	200	400
Nitrate as NO_3-N	mg/L	7	7	7	7	15	10	10	10	15
pH (Range)		6.5-8.5	6.5-8.5	6.5-8.5	6.5-9.0	6.0-9.0	7.0-8.5	7.0-8.5	6.5-8.5	6.0-9.0
Phosphate	mg/L	<0.003	0.5	0.5	0.5	5	0.1	0.5	0.5	5
Temperature	^{0}C	26-30	26-30	26-30	25-31	25-32	26-30	26-30	25-31	25-32
Total Suspended Solids	mg/L	25	50	65	80	110	25	50	80	110

Notes:
MPN/100mL – Most Probable Number per 100 milliliter
n/a – Not Applicable
TCU – True Color Unit
(a) Samples shall be taken from 9:00 AM to 4:00 PM.
(b) The natural background temperature as determined by EMB shall prevail if the temperature is lower or higher than the WQG; provided that the maximum increase is only up to 10 percent and that it will not cause any risk to human health and the environment.

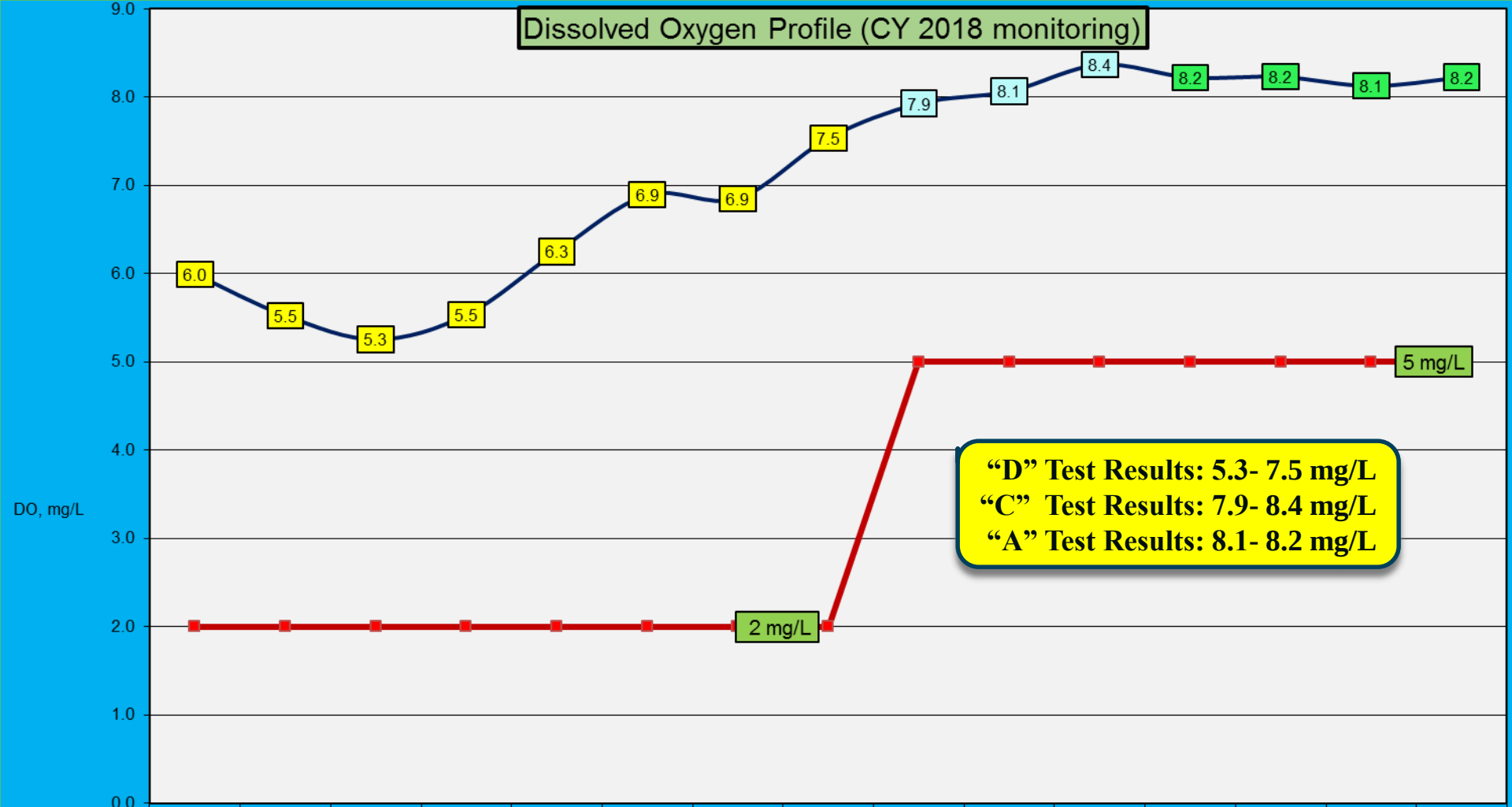
Station No.	Station Identification	Longitude	Latitude	Water Class	Distance from Station 1(Km)
S1	Mouth of Taguibo River, Magallanes, Agusan del Norte	125°31'15.8"	09°00'59.8"	"D"	0.0
S2	Junction of Banza River and Taguibo River, P-1 Brgy. Guiasan, Magallanes, Agusan del Norte	125°32'32.7"	09°00'53.7"	"D"	2.3
S3	Junction of Taod-oy Creek and Taguibo River, Brgy. Taod-oy, Magallanes, Agusan del Norte	125°32'47.8"	09°00'49.2"	"D"	2.8
S4	P-4 Sitio Basca, Brgy. Guiasan, Magallanes, Agusan del Norte	125°33'47.7"	09'00'29.2"	"D"	5.0
S5(S1)	P-7, Brgy. Cabcabon, Butuan City	125°34'31.82"	09'00'11.4"	"D"	6.5
S6(S2)	Approx. 100 meters upstream from Marson Piggery, Brgy. Taguibo, Butuan City	125°35'15.11"	08'59'30.97"	"D"	8.4
S7	Approx. 50 meters downstream from outfall of The New South Star Manufacturing Corporation, Brgy. Taguibo, Butuan City	125°35'47.7"	08'59'10.8"	"D"	9.9
S8(S3)	Underneath Taguibo Bridge, Brgy. Taguibo, Butuan City	125°36'42.38"	08'58'57.81"	"D"	12.6
S9(S4)	Along Sand and Gravel Quarry Area, Brgy. Taguibo, Butuan City	125°37'52.8"	08'59'02.89"	"C"	14.9
S10(S5)	Along NIA Dam, Brgy. Taguibo, Butuan City	125°38'16.79"	08'59'49.35"	"C"	16.8
S11	P-3, Brgy. Anticala (Suong), Butuan City	125°38'55.1"	09'00'39.3"	"C"	19.3
S12(S6)	Underneath the Steel Hanging Bridge (Approx.10 meters downstream from BCWD Infiltration Gallery)	125°39'32.98"	09'00'41.98"	"A"	21.0
S13(S7)	Along Sitio Iyao, Brgy. Anticala, Butuan City	125°39'54.17"	09'00'42.28"	"A"	21.6
S14	Approx. 1 km. upstream from Station 13, Sitio Binaboy, Anticala, Butuan City	125°40'10.5"	09'00'56.5"	"A"	22.5
S15	Approx. 1 km. upstream from Station 14, (Laksohan), Brgy. Anticala, Butuan City	125°40'27.8"	09'01'06.6"	"A"	23.1

Map of the Location of the 15 Monitoring Stations of Taguibo River



Dissolved Oxygen (DO)

- **required for the respiration of aerobic microorganisms, fishes and some aquatic animals**
- **its presence in wastewater is desirable because it prevents the formation of noxious odors**
- **affected by temperature and salinity**

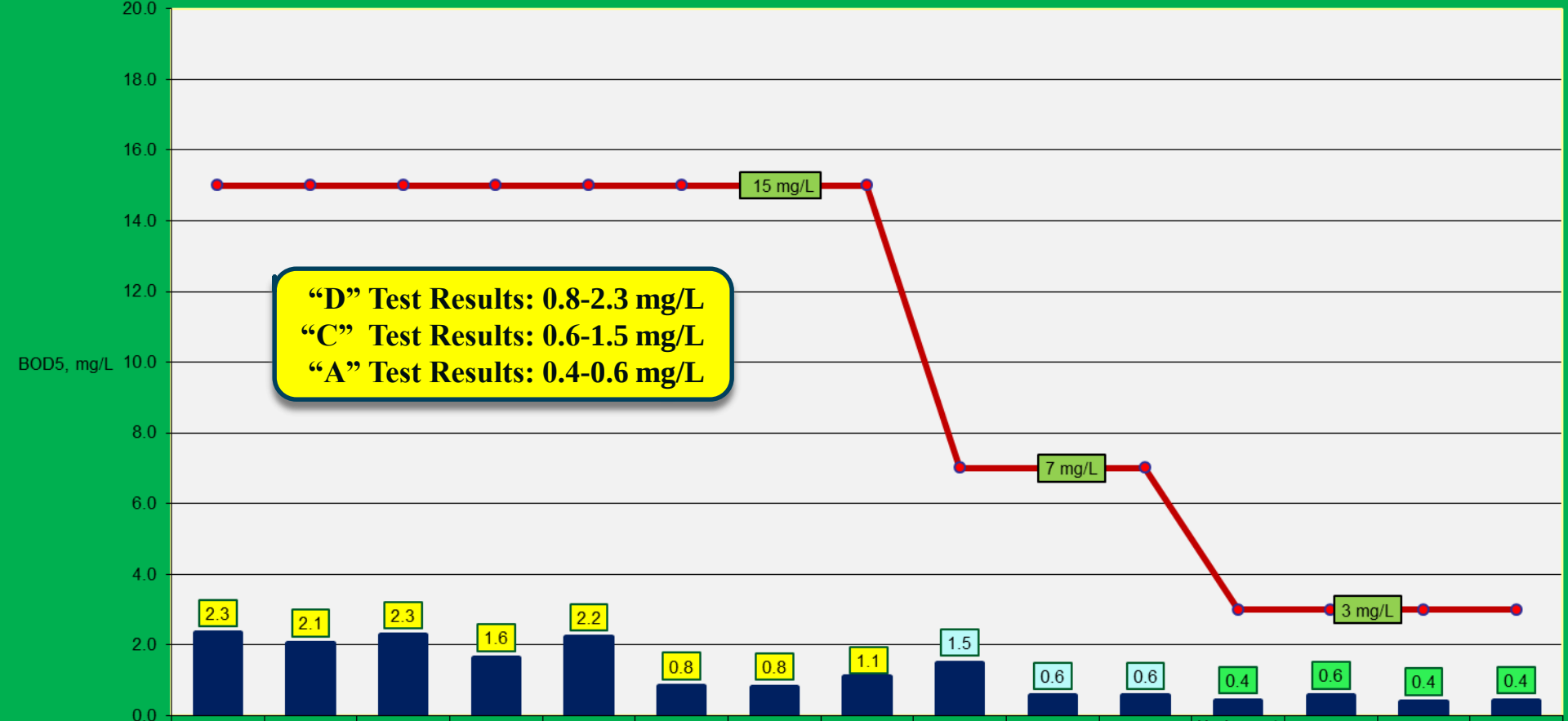


	Mouth of Taguibo River, Magallanes, Agusan del Norte	Along the junction of Taguibo River & Banza River, P-1, Brgy. Guiasan, Magallanes, A.d.N	Along the junction Taguibo River and Taud-oy Creek, Brgy. Taud-oy, Magallanes, A.d.N	Taguibo River, Sitio Basca, Brgy. Guiasan, Magallanes, A.d.N	Taguibo River, Purok 7, Brgy. Cabcabon, Butuan City	Approx. 100 meters upstream from Marson Piggery, Brgy. Taguibo, Butuan City	Approx. 50 meters downstream from outfall of The New Southstar Mfg. Corp., Brgy. Taguibo, Butuan City	Taguibo River- Underneath of the Taguibo Bridge, Brgy. Taguibo, Butuan City	Taguibo River along Sand and Gravel Quarry Area, Brgy. Taguibo, Butuan City	Taguibo River Approx. 10 meters downstream from NIA Dam Brgy. Taguibo, Butuan City	Taguibo River, Brgy. Anticala (Suong Area), Butuan City	Underneath the Steel Hanging Bridge - Approx. 10 meters downstream from BCWD Infiltration Gallery, Anticala, Butuan City	Upstream of Taguibo River, Sitio Iyao, Brgy. Anticala, Butuan City	Approx 1.5 kilometers upstream from Station No. 13, Sitio, Binaboy, Brgy. Anticala, Butuan City	Approx. 1.5 kilometers upstream from Station No. 14, (Laksohon Area), Brgy. Anticala, Butuan City
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
DO	6.0	5.5	5.3	5.5	6.3	6.9	6.9	7.5	7.9	8.1	8.4	8.2	8.2	8.1	8.2
Standard	2	2	2	2	2	2	2	2	5	5	5	5	5	5	5

Biochemical Oxygen Demand (BOD5)

- A measure of approximate quantity of dissolved oxygen required by bacteria to stabilize organic matter in wastewater or surface waters;
- Semi-quantitative measure of wastewater organics that are oxidizable by bacteria.
- It is a standard test in assessing wastewater strength.

Biochemical Oxygen Demand Profile (CY 2018 Monitoring)



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BOD	2.3	2.1	2.3	1.6	2.2	0.8	0.8	1.1	1.5	0.6	0.6	0.4	0.6	0.4	0.4
Standard	15	15	15	15	15	15	15	15	7	7	7	3	3	3	3

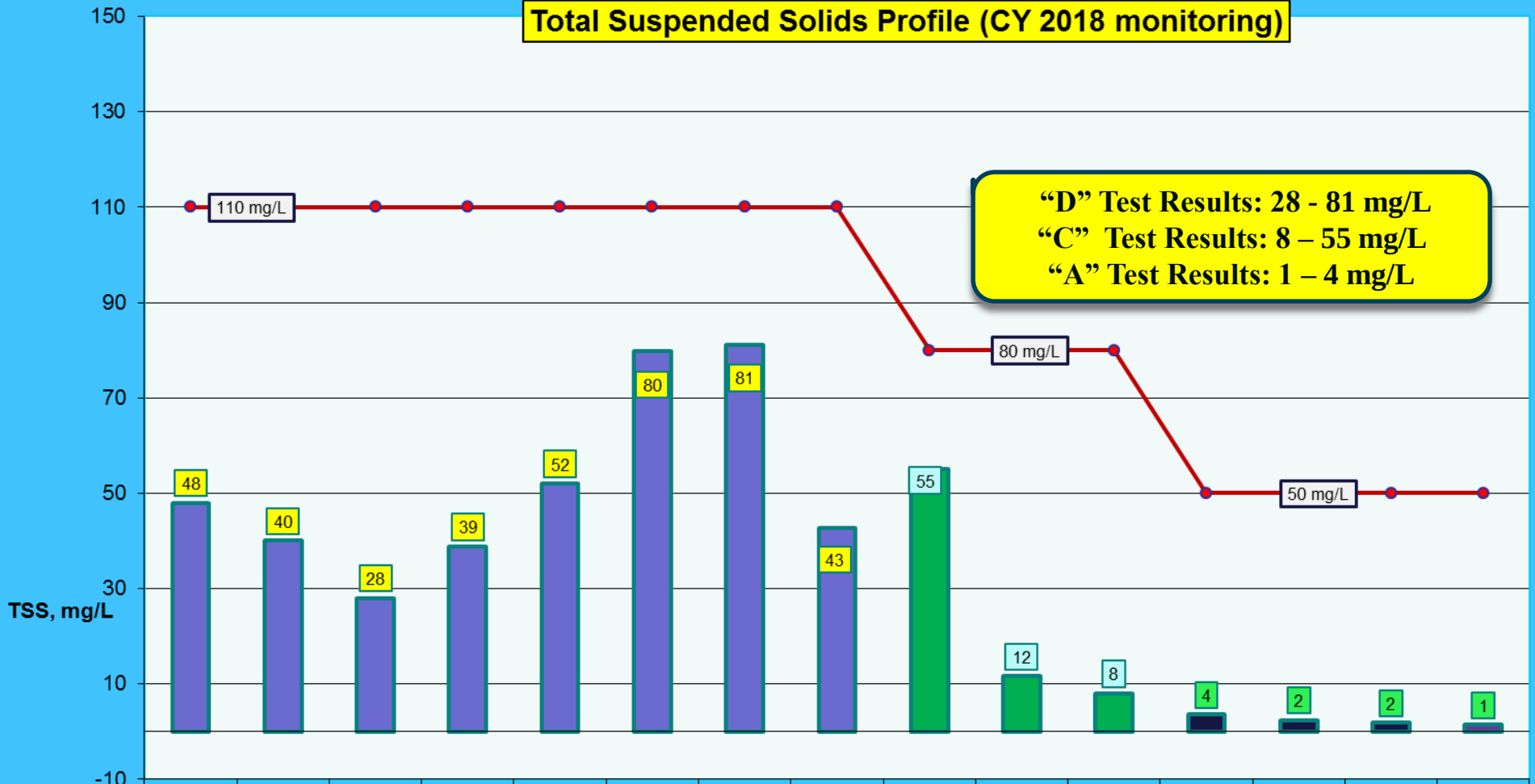
TOTAL SUSPENDED SOLIDS

- Organic and inorganic particles that are carried by wastewaters/ run-offs into a receiving water.

Total Suspended Solids:

- Can reduce the amount of sunlight available to aquatic plants
- Cover spawning areas and food supplies
- Smother coral reefs
- Clog and harm the gills of fish

Total Suspended Solids Profile (CY 2018 monitoring)



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	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TSS	48	40	28	39	52	80	81	43	55	12	8	4	2	2	1
Standard	110	110	110	110	110	110	110	110	80	80	80	50	50	50	50

pH - a measure of hydrogen ion concentration

defined as negative logarithm of hydrogen ion concentration

$pH = -\log_{10}[H^+]$

$pH + pOH = 14$

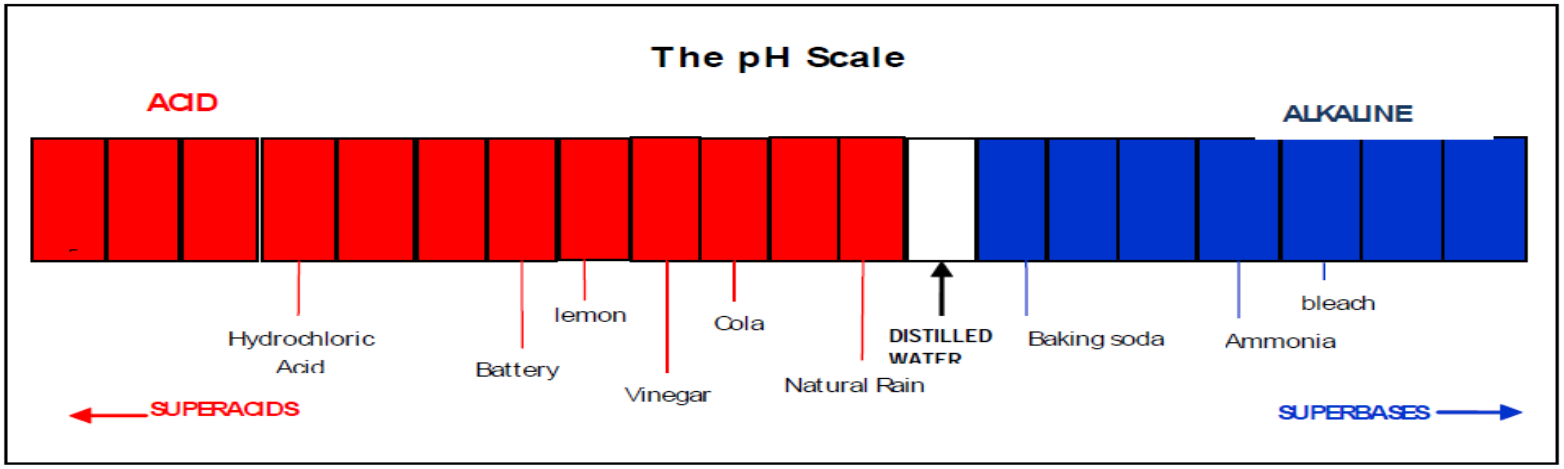


Fig. A.1 pH Scale Showing the Value for Some Common Substances

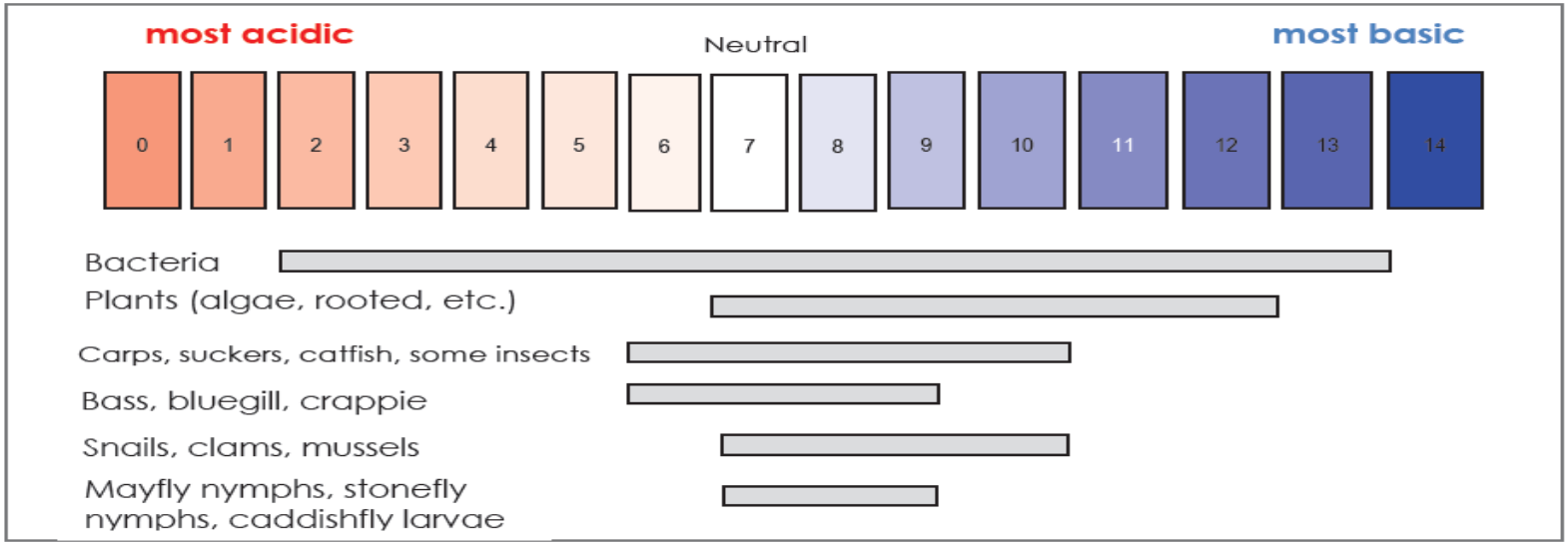
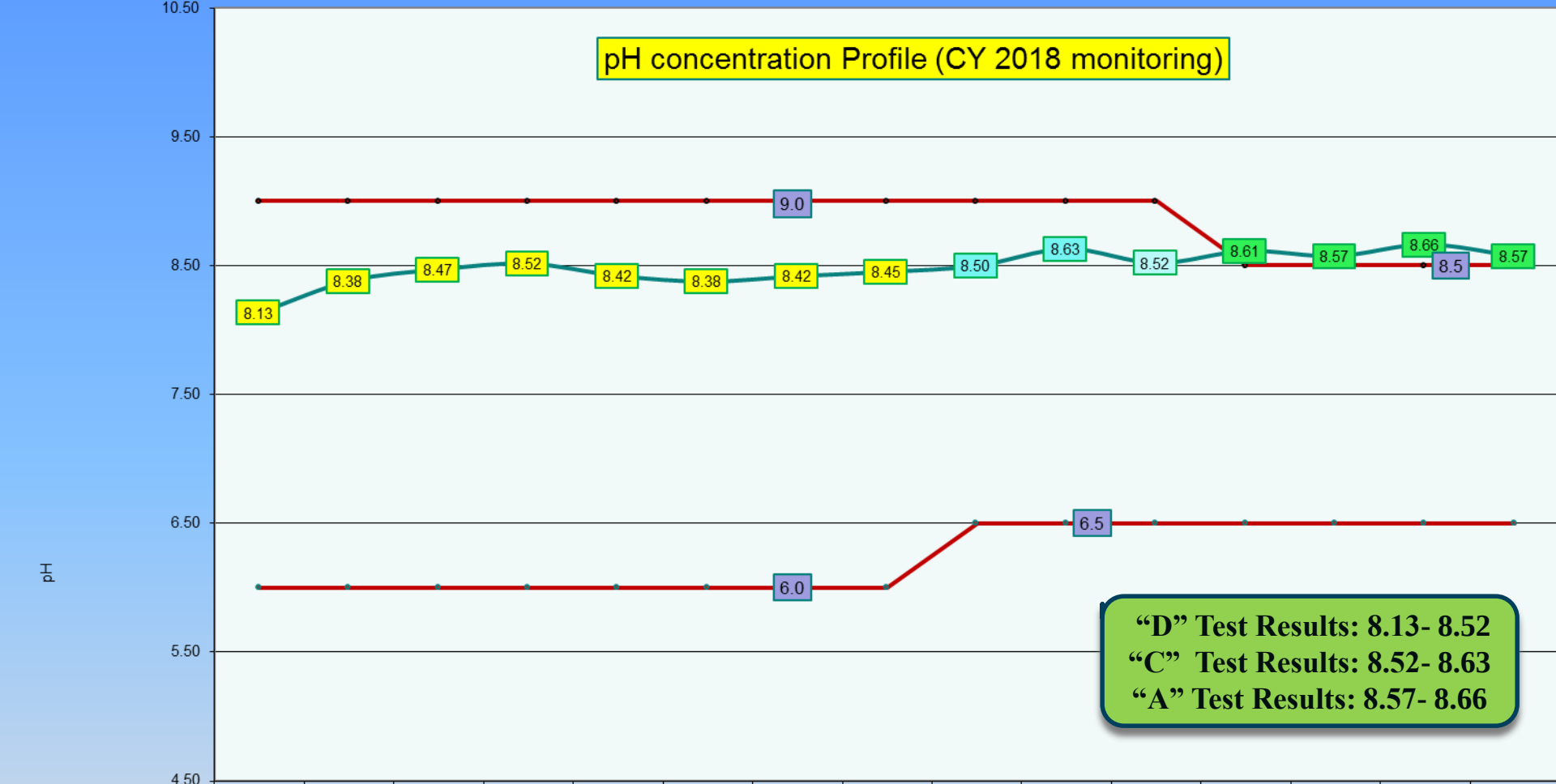


Fig. A.2 pH Ranges that Support Aquatic Life



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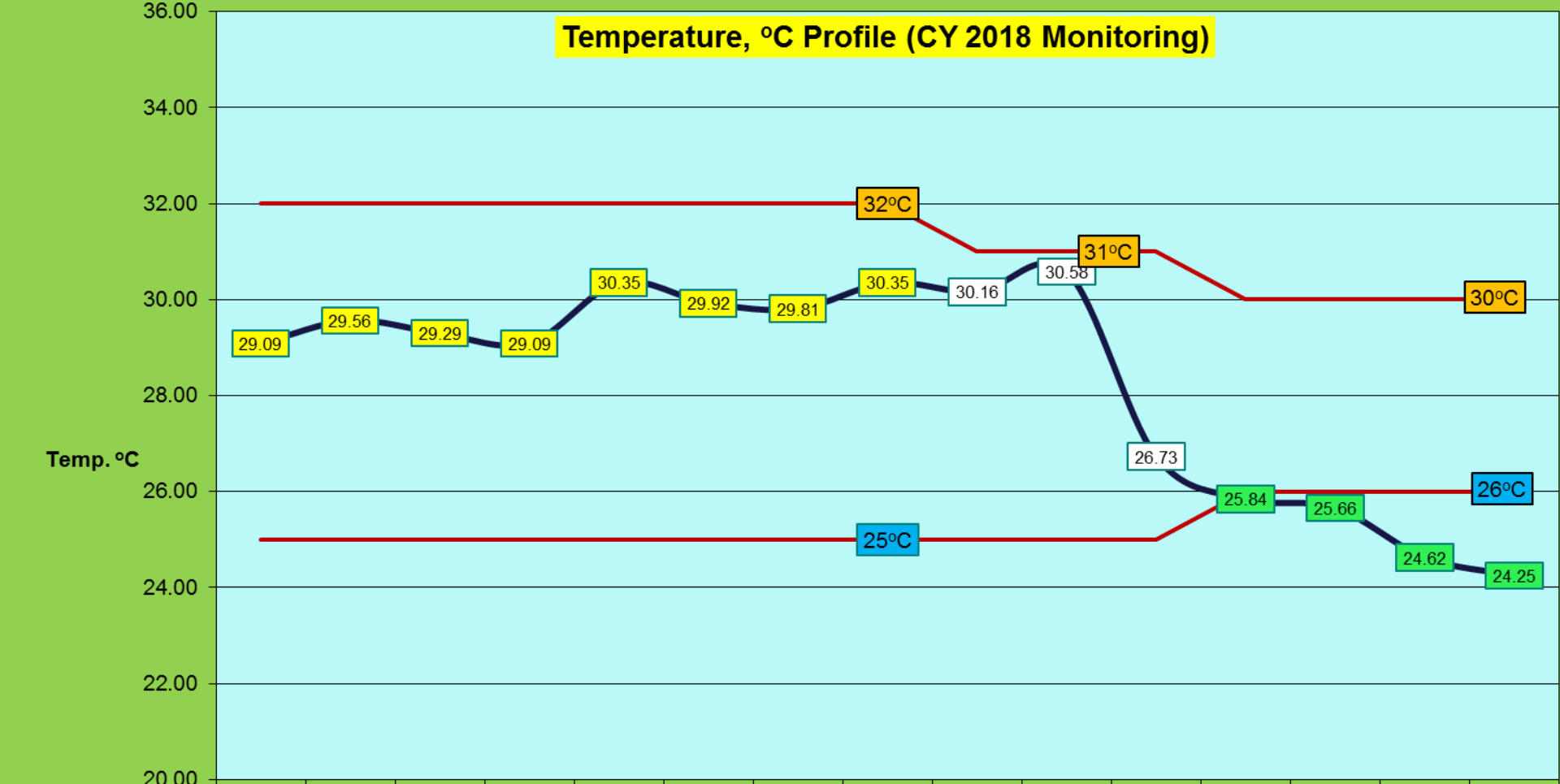
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
pH	8.13	8.38	8.47	8.52	8.42	8.38	8.42	8.45	8.50	8.63	8.52	8.61	8.57	8.66	8.57
Std (Basic conc)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Std (Basic Conc.)	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	8.5	8.5	8.5	8.5

Temperature - is a measure of hotness or coldness of a certain matter.

- It is very important water quality parameter for water bodies as many of the physical, biological and chemical characteristics of that water body is directly affected by temperature.
- It influences the amount of oxygen that can be dissolved in water (cool water can hold more oxygen than warm water). It also influences the rate of photosynthesis by algae and other aquatic plants.
- influences the metabolic rates of aquatic organisms and the sensitivity of organisms to toxic wastes, parasites and diseases. Few aquatic animals/organisms can tolerate extremes of heat or coldness, or rapid changes in water temperatures.
- Water temperature is greatly influenced by the temperature of the atmosphere or the weather condition.



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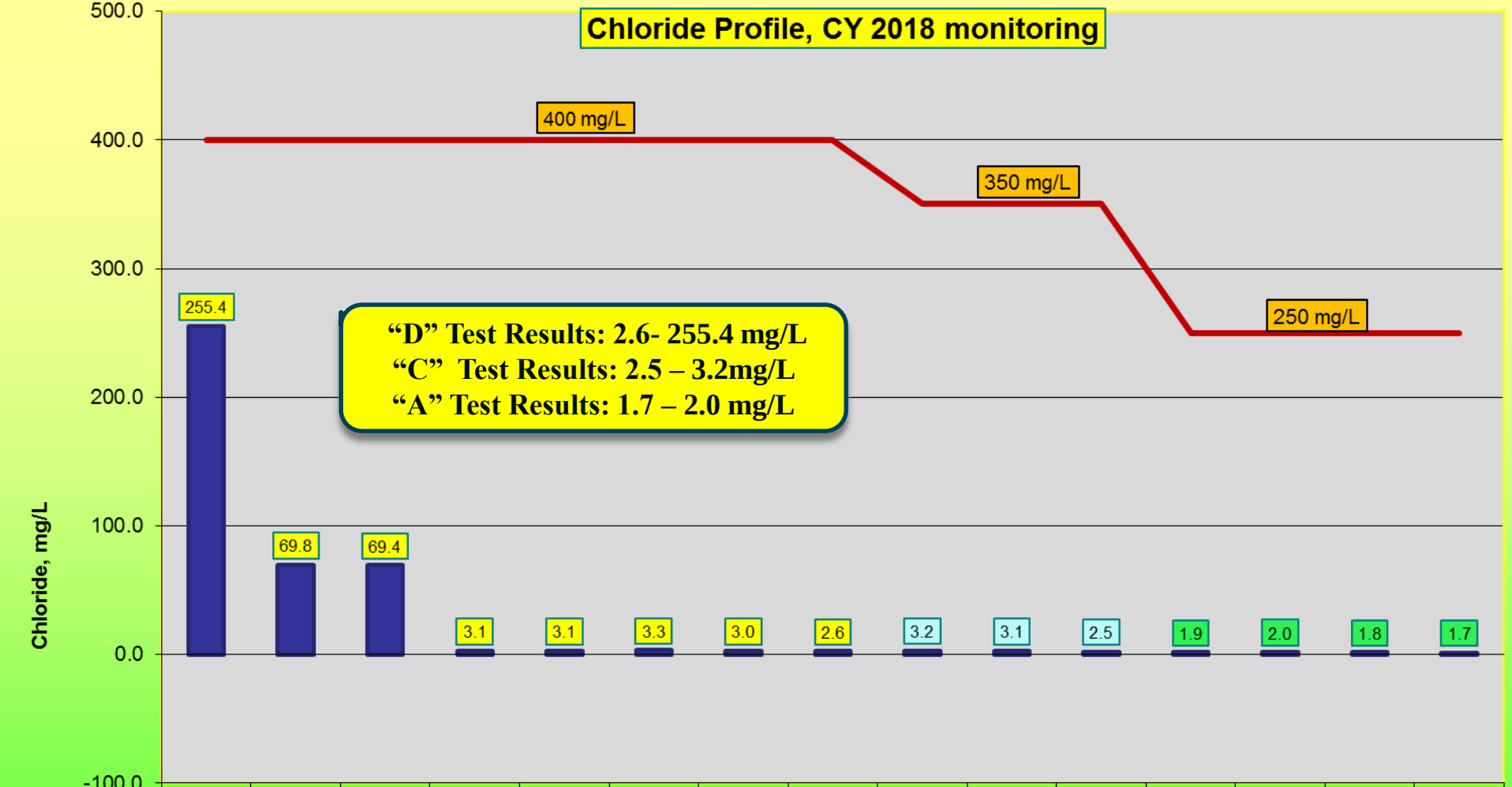
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
temp	29.09	29.56	29.29	29.09	30.35	29.92	29.81	30.35	30.16	30.58	26.73	25.84	25.66	24.62	24.25
temp, lower limit	25	25	25	25	25	25	25	25	25	25	25	26	26	26	26
temp, higher limit	32	32	32	32	32	32	32	32	31	31	31	30	30	30	30

Chloride

- Chlorides are widely distributed in nature as salts of sodium (NaCl), potassium (KCl), and calcium (CaCl2). Sodium chloride is widely used in the production of industrial chemicals such as caustic soda, chlorine, sodium chlorite, and sodium hypochlorite. Potassium chloride is used in the production of fertilizers
- Chlorides are leached from various rocks into soil and water by weathering. Chloride in surface and groundwater from both natural and anthropogenic sources, such as run-off, the use of inorganic fertilizers, landfill leachates, septic tank effluents, animal feeds, industrial effluents, irrigation drainage, and seawater intrusion in coastal areas .
- The toxicity of chloride salts depends on the cation present; that of chloride itself is unknown. Although excessive intake of drinking-water containing sodium chloride at concentrations above 2.5 g/liter has been reported to produce hypertension, this effect is believed to be related to the sodium ion concentration.
- Chloride increases the electrical conductivity of water and thus increases its corosivity. In metal pipes, chloride reacts with metal ions to form soluble salts, thus increasing levels of metals in drinking-water. In lead pipes, a protective oxide layer is built up, but chloride enhances galvanic corrosion . It can also increase the rate of pitting corrosion of metal pipes.



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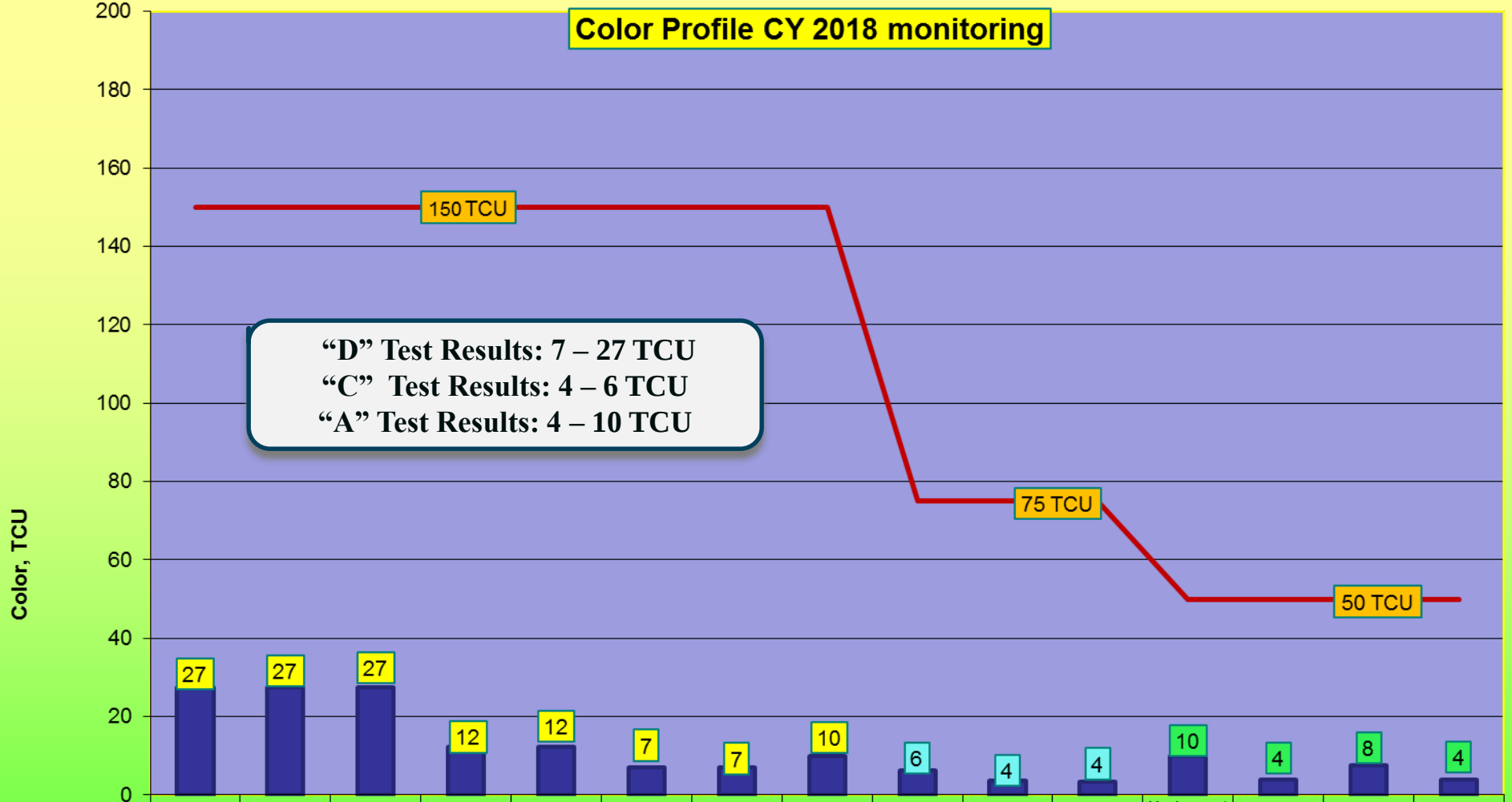
Chloride	255.4	69.8	69.4	3.1	3.1	3.3	3.0	2.6	3.2	3.1	2.5	1.9	2.0	1.8	1.7
Standard	400	400	400	400	400	400	400	400	350	350	350	250	250	250	250

Color

- True color is caused by dissolved compounds in water. It can be natural or caused by human activities. Dissolved and suspended solids (together) cause apparent color. For example, brown colored water could be the result of dissolved by products of plant biodegradation (true color) or suspended clay particles (apparent color) or both (also apparent color). Color is measured in Platinum-Cobalt units. Color can be measured using light with a wavelength of 455 nm.

Color Profile CY 2018 monitoring

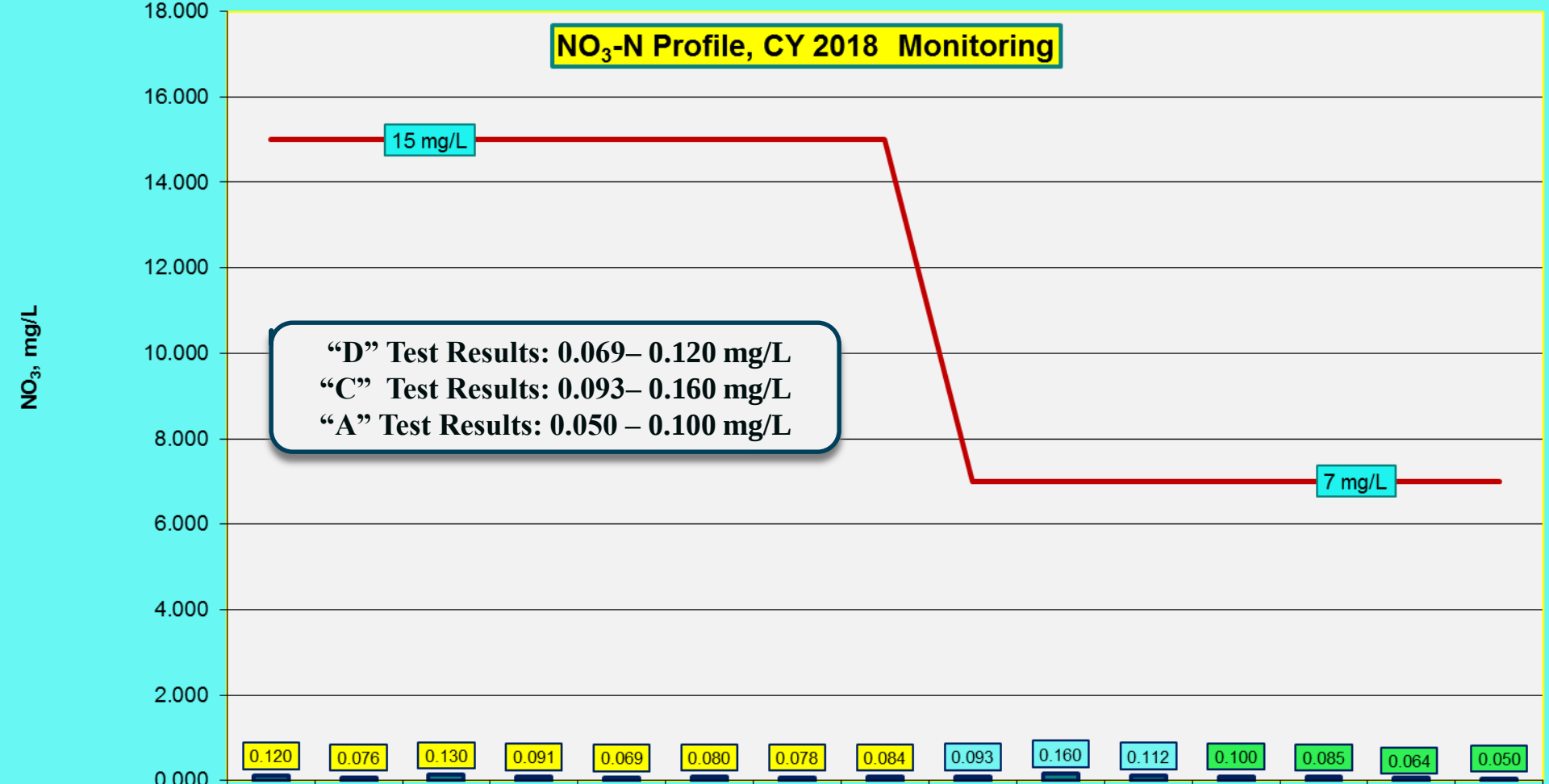


"D" Test Results: 7 – 27 TCU
"C" Test Results: 4 – 6 TCU
"A" Test Results: 4 – 10 TCU

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Mouth of Taguibo River, Magallanes, Agusan del Norte	Along the junction of Taguibo River & Banza River, P-1, Brgy. Guiasan, Magallanes, A.d.N	Along the junction Taguibo River and Taud-oy Creek, Brgy. Taud-oy, Magallanes, A.d.N	Taguibo River, Sitio Basca, Brgy. Guiasan, Magallanes, A.d.N	Taguibo River, Purok 7, Brgy. Cabcabon, Butuan City	Approx. 100 meters upstream from Marson Piggery, Brgy. Taguibo, Butuan City	Approx. 50 meters downstream from outfall of The New Southstar Mfg. Corp., Brgy. Taguibo, Butuan City	Taguibo River-Underneath of the Taguibo Bridge, Brgy. Taguibo, Butuan City	Taguibo River along Sand and Gravel Quarry Area, Brgy. Taguibo, Butuan City	Taguibo River Approx. 10 meters downstream from NIA Dam Brgy. Taguibo, Butuan City	Taguibo River, Brgy. Anticala (Suong Area), Butuan City	Underneath the Steel Hanging Bridge - Approx. 10 meters downstream from BCWD Infiltration Gallery, Anticala, Butuan City	Upstream of Taguibo River, Sitio Iyao, Brgy. Anticala, Butuan City	Approx 1.5 kilometers upstream from Station No. 13, Sitio, Binaboy, Brgy. Anticala, Butuan City	Approx. 1.5 kilometers upstream from Station No. 14, (Laksohon Area), Brgy. Anticala, Butuan City
Color	27	27	27	12	12	7	7	10	6	4	4	10	4	8	4
Standard	150	150	150	150	150	150	150	150	75	75	75	50	50	50	50

Nitrates as NO_3-N and Phosphate

- Sources of nitrates include fertilizers and domestic and industrial wastes;
- Phosphates are nutrients that come from both natural sources and human activities (fertilizers, detergents, wastewater, etc.). Sources of phosphate include polyphosphates in detergents, raw sewage, andrun off from farms that use phosphate fertilizers.



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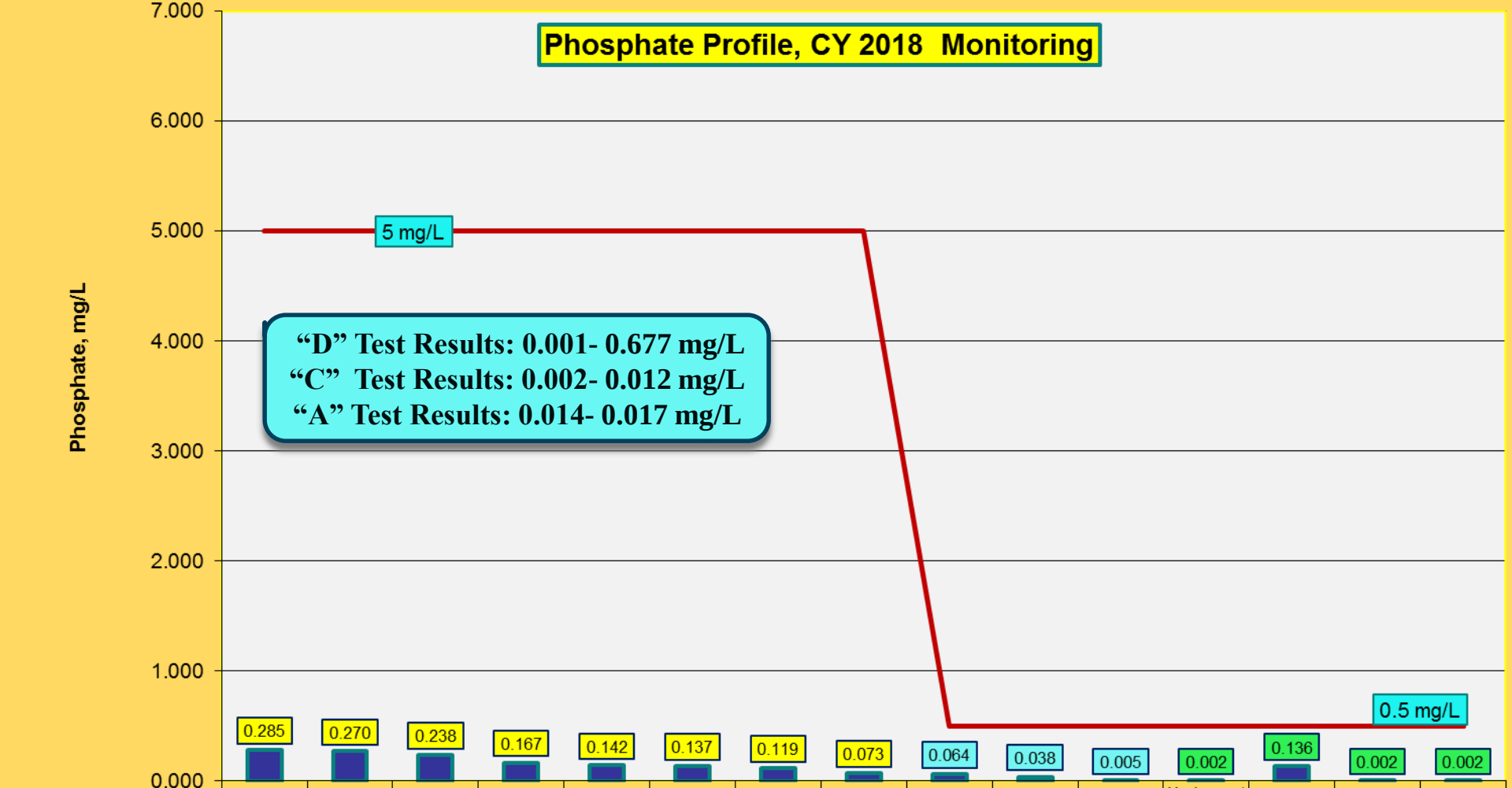
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Nitrate as N	0.120	0.076	0.130	0.091	0.069	0.080	0.078	0.084	0.093	0.160	0.112	0.100	0.085	0.064	0.050
Standard	15	15	15	15	15	15	15	15	7	7	7	7	7	7	7



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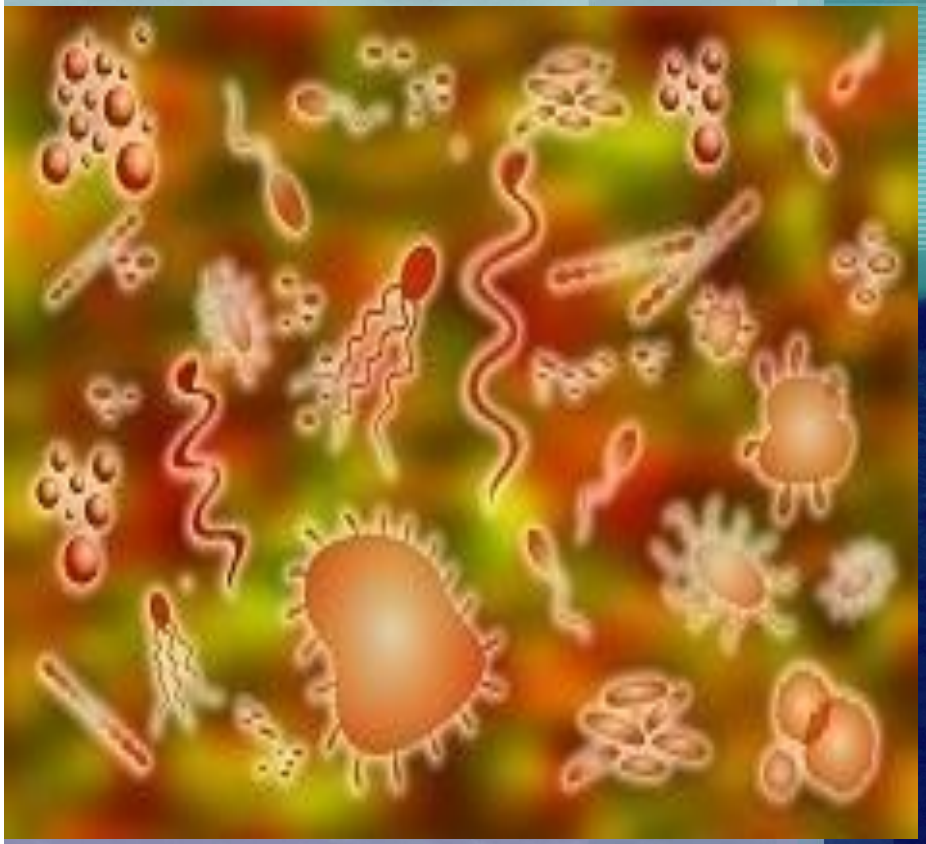
Phosphate	0.285	0.270	0.238	0.167	0.142	0.137	0.119	0.073	0.064	0.038	0.005	0.002	0.136	0.002	0.002
Standard	5	5	5	5	5	5	5	5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

PATHOGENS

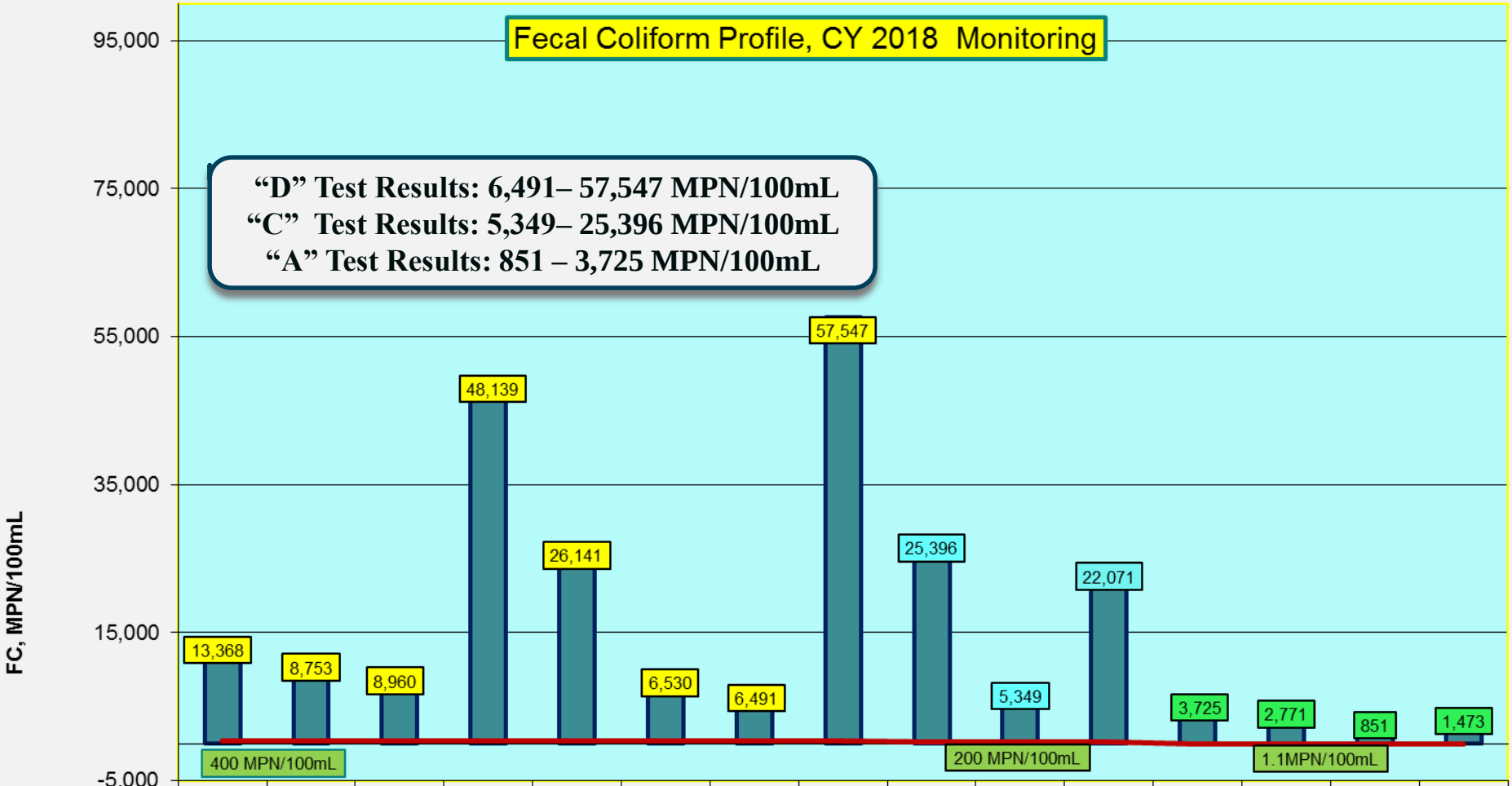
- **BACTERIA** ***(e.g. salmonella typhi, vibrio cholerae, mycobacterium)***
- **VIRUSES*(e.g. hepatitis A, poliovirus)***
- **PROTOZOA** ***(e.g. entamoeba histolytica, plasmodium)***



Use of Indicator Organisms

- Pathogenic organisms present in wastes are difficult to isolate and identify
- Coliform organism is more numerous and easily tested
- **Total coliform and fecal coliform are common indicators**
- Intestinal tract of man contains coliform organism (100 to 400 billion coliform/person per day)

Fecal Coliform Profile, CY 2018 Monitoring



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Fecal coli	13,368	8,753	8,960	48,139	26,141	6,530	6,491	57,547	25,396	5,349	22,071	3,725	2,771	851	1,473
Standard	400	400	400	400	400	400	400	400	200	200	200	1.1	1.1	1.1	1.1

Summary of Findings

- Water quality parameters dissolved oxygen (DO), biochemical oxygen demand (BOD), total suspended solids (TSS), potential for Hydrogen (pH), temperature, chloride, color, nitrate, and phosphate – All classifications met respective standards;

- **For Fecal Coliform :**

- Class "A" portion: all stations are beyond the standard
  Standard : <1.1 MPN/100mL

- Class "C" Portion: all stations are beyond the standard
  Standard : 200 MPN/100mL

- Class "D" Portion: all stations are beyond the standard
  Standard : 400 MPN/100mL

Challenges

- ✓ To bring to standard the Fecal Coliform at the Class “A” portion of the Taguibo River considering that it is the source of Water Supply for Butuan City;

- ✓ To bring to standard the Fecal Coliform at the Class “C” and “D” portions of the Taguibo River;

- ✓ To improve the water quality at the Class “D” Portion of the Taguibo River, with preference to reclassify as Class “C” body of water considering that aquaculture projects were located at the downstream portion.

Challenges

- Improvement of sanitation in the locality, proper disposal of excreta, use of prescribed sanitary facilities, provision of treatment system for wastes generated by backyard farming to prevent total/fecal contamination of the river
- Prohibition of informal settlers along the easement area of the Taguibo River, so that open defecation and improper solid waste and other pollutants generation can be prevented;

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Thank You