

(Enter Water System Name)

Nitrification Action Plan (NAP)

What is a NAP?

A NAP is a plan for detecting and correcting nitrification, which can destroy total chlorine residuals.

Purpose of NAP: The purpose of a Nitrification Action Plan (NAP) is to ensure that chloramine disinfection is successful by preventing and/or responding to nitrification.

NAP Sampling: The rule gives the minimum requirements. It may be necessary for PWSs to perform additional sampling to characterize the adequacy of disinfection in their distribution system.

A NAP Includes:

1. A map and list of NAP sample sites representing all sources, entry points, and average and high water age sites within the distribution system;
2. A sampling schedule;
3. Analytical methods and standard operating procedures (SOPs) for sample collection;
4. A table of goals, baselines, and triggers for chemical levels, including 'yellow alert' triggers for when water is slightly off-spec and 'red alert' triggers for when nitrification is bad-based on historical data;
5. A list of actions to take in response to yellow or red triggers; and
6. Communication strategies that will allow your system to take needed actions in a timely manner

Table 1. Sample Sites: (Map- Appendix A)

Site # From Map	Address	Sample Tap Location	Water Age	Flush Time (min)*

***Flush time will be for 5 minutes unless calculated and stated otherwise.**

Water Age Examples: Low, Average, High, or Storage

Table 2. Sample Schedule:

Analyte	Entry Point	Distribution System
Total Chlorine	Daily	Daily
Mono-Chloramine	Daily	Weekly
Di-Chloramine*	Monthly	Monthly
Free Ammonia	Daily	Weekly
Total Ammonia	Daily	Weekly
Nitrate **	**Weekly	Monthly
Nitrite **	**Weekly	Monthly

* dichloramine can be determined using amperometric titration procedures or can be calculated as the difference between the total chlorine and monochloramine residual.

** nitrate and nitrite monitoring can be reduced to monthly if source and treatment variations indicate minimal variations.

Table 3. Analytical Methods:

Analyte	Method: (Analyzer)	Range
	Hach SL 1000	
pH	Probe	
Disinfectant		
Total Chlorine	10260 Hach Chemkey	.004-10 mg/L Cl ₂ (Example)
Monochloramine		
Di-Chloramine		
Free Ammonia		
Nitrification		
Total Ammonia		
Nitrate		
Nitrite		

The sample collection method should ensure that the sample is of water in the main. We will use a method of flushing for 5 minutes at each sample location, if calculated flush are unavailable. This should ensure that the water is from the main. If you don't flush long enough, you could get stagnant water from the service line, and think your main water is worse than it is.

Table 4. Action Plan Template: See attached sheet

Table 5. List of Actions to take in response to yellow and red triggers.

Normal Operations: Disinfection practices are optimized and nitrification does not appear to be evident based on monitoring results. However, proactive and preventive actions may be appropriate for maintaining disinfection optimization.

Yellow Flag Alert: Occurs when monitoring data indicates that nitrification may be occurring in the system and corrective actions are required. Yellow flag levels are somewhat out of the norm, indicating, that nitrification may have started. Some action to get back to normal is needed - but is probably a routine type of action like flushing.

Red Flag Alert: When monitoring data conclusively indicates that nitrification has progressed in the system resulting in depressed disinfectant residuals, elevated nitrite and/or nitrate levels, reduced pH levels and potential taste and odor concern. Red Flag Alerts require immediate remedial actions and the issuance of a precautionary boil order when minimum disinfectant levels are not met. Red flag levels happen when it becomes difficult to maintain a compliant total chlorine residual, and there is a strong possibility that nitrification is the culprit. If routine actions don't get the water back to normal, more intense action will be needed. Like a change from total chlorine to a free chlorine burn. Any water chemistry changes should only be undertaken after consultation with your IEPA Regional office.

Total Chlorine/Monochloramine: Ideally, 100% of total chlorine should be present as monochloramine.

Free Ammonia: Ammonia naturally increases with water age.

Total Ammonia: The amount of total ammonia at the entry point should mirror the total ammonia in the distribution system.

Nitrite/Nitrate: The nitrate and nitrite levels at the entry point and the distribution system should always be the same as in the source water. The only thing that can change them is either nitrification, backflow, or cross connection, or source water changes.

NITRIFICATION ACTION PLAN

Facility Name: _____

PWS ID #: IL _____

YELLOW AND RED FLAG TRIGGERS & ACTIONS

Chloramine Effectiveness Sample Suite (adapted from Texas Commission on Environmental Quality)

Site	Parameter	Goal	Yellow Flag		Red Flag	
			Trigger	Actions	Trigger	Actions
Entry Point	Total Cl			1)Verify Results		1)Verify Results
	Monochloramine			2)Check & Adjust		2)Check & adjust dose
	Dichloramine			→ Until Returned to Normal		→Until return to normal
	Total NH3-N					
	Free NH3-N					
Ave. Water Age	Total Cl					
	Monochloramine			1)Verify Results		1)Verify Results
	Dichloramine			2)Measure nitrite and nitrate		2)Measure nitrite and nitrate
	Total NH3-N	A	B	3)Adjust dose	C	3)Adjust dose
	Free NH3-N			4)Identify affected area (check upstream and downstream)		4)Identify affected area (check upstream and downstream)
High Water Age	Total Cl			5)Flush area		5)Flush area
	Monochloramine			6)Flush dead ends		6)Flush dead ends
	Dichloramine			→Till levels return to normal		7)Convert to Free Chlorine
	Total NH3-N	A	B		C	→Till levels return to normal
	Free NH3-N					

(A) Not to exceed mg/L monochloramine/5.06.

(B) Not to exceed (mg/L monochloramine/5.06) +0.2.

(C) Not to exceed (mg/L monochloramine/5.06) +0.4.

Nitrite-N (MCL = 1.0 mg/L and Nitrate-N(MCL = 10.0 mg/L)

Site	Parameter	Baseline	Yellow Flag		Red Flag	
			Trigger	Actions	Trigger	Actions
Source Water*	Free NH3-N			1)Verify results		1)Verify results
	Nitrite NO2-N			2)Evaluate cause for source		2)Identify affected area
	Nitrate NO3-N			change.		3)Flush
Entry Point	Nitrite NO2-N			3)Identify Area		4)Perform free chlorine burn
	Nitrate NO3-N			4)Flush Area		→Till levels return to normal
Ave. Water Age	Nitrite NO2-N			5)Flush dead-ends		
	Nitrate NO3-N			→Until return to normal		
High Water Age	Nitrite NO2-N					
	Nitrate NO3-N					

* If source waters have different water chemistry, additional criteria may be needed and should be differentiated in this table. (Modified from Texas Commission of Environmental Quality Form)

NITRIFICATION ACTION PLAN

Facility Name: _____

PWS ID #: IL _____

YELLOW AND RED FLAG TRIGGERS & ACTIONS

Chloramine Effectiveness Sample Suite (adapted from Texas Commission on Environmental Quality)

Site	Parameter	Goal	Yellow Flag		Red Flag	
			Trigger	Actions	Trigger	Actions
Entry Point	Total Cl	3.5	3.0	1)Verify Results 2)Check & Adjust → Until Returned to Normal	2.8	1)Verify Results 2)Check & adjust dose →Until return to normal
	Monochloramine	3.5	3.0		2.8	
	Dichloramine	0.05	0.1		0.2	
	Total NH3-N	0.69	0.8		0.9	
	Free NH3-N	0.01	0.2		0.3	
Ave. Water Age	Total Cl	2.5	2.0	1)Verify Results 2)Measure nitrite and nitrate 3)Adjust dose 4)Identify affected area (check upstream and downstream)	2.0	1)Verify Results 2)Measure nitrite and nitrate 3)Adjust dose 4)Identify affected area (check upstream and downstream)
	Monochloramine	5.5	2.0		2.0	
	Dichloramine	0.1	0.2		0.2	
	Total NH3-N	(A)	(B)		(C)	
	Free NH3-N	0.1	0.2		0.3	
High Water Age	Total Cl	1.5	1.2	5)Flush area 6)Flush dead ends →Till levels return to normal	1.1	5)Flush area 6)Flush dead ends 7)Convert to Free Chlorine →Till levels return to normal
	Monochloramine	1.5	1.2		1.1	
	Dichloramine	0.1	0.2		0.2	
	Total NH3-N	(A)	(B)		(C)	
	Free NH3-N	0.2	0.3		0.4	

(A) Not to exceed mg/L monochloramine/5.06.

(B) Not to exceed (mg/L monochloramine/5.06) +0.2.

(C) Not to exceed (mg/L monochloramine/5.06) +0.4.

Nitrite-N (MCL = 1.0 mg/L and Nitrate-N(MCL = 10.0 mg/L)

(adapted from Texas Commission on Environmental Quality)

Site	Parameter	Baseline	Yellow Flag		Red Flag	
			Trigger	Actions	Trigger	Actions
Source Water	Free NH3-N			1)Verify results 2)Evaluate cause for source change.		1)Verify results 2)Identify affected area 3)Flush 4)Perform free chlorine burn →Till levels return to normal
	Nitrite NO2-N					
	Nitrate NO3-N					
Entry Point	Nitrite NO2-N			3)Identify Area 4)Flush Area 5)Flush dead-ends →Until return to normal		
	Nitrate NO3-N					
Ave. Water Age	Nitrite NO2-N					
	Nitrate NO3-N					
High Water Age	Nitrite NO2-N					
	Nitrate NO3-N					

* If source waters have different water chemistry, additional criteria may be needed and should be differentiated in this table. (Modified from Texas Commission of Environmental Quality Form)

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NITRIFICATION ACTION PLAN

City of _____ County, Illinois PWS ID NO. IL _____

YELLOW AND RED FLAG TRIGGERS & ACTIONS

Chloramine Effectiveness Sample Suite (adapted from Texas Commission on Environmental Quality)

Site	Parameter	Goal	Yellow Flag		Red Flag	
			Trigger	Actions	Trigger	Actions
Entry Point	Total Cl	3.5	3.0	1)Verify Results 2)Check & Adjust → Until Returned to Normal	2.8	1)Verify Results 2)Check & adjust dose →Until return to normal
	Monochloramine	3.5	3.0		2.8	
	Dichloramine	0.05	0.1		0.2	
	Total NH3-N	0.69	0.8		0.9	
	Free NH3-N	0.01	0.2		0.3	
Ave. Water Age	Total Cl	2.5	2.0	1)Verify Results 2)Measure nitrite and nitrate 3)Adjust dose 4)Identify affected area (check upstream and downstream)	2.0	1)Verify Results 2)Measure nitrite and nitrate 3)Adjust dose 4)Identify affected area (check upstream and downstream)
	Monochloramine	5.5	2.0		2.0	
	Dichloramine	0.1	0.2		0.2	
	Total NH3-N	(A)	(B)		(C)	
	Free NH3-N	0.1	0.2		0.3	
High Water Age	Total Cl	1.5	1.2	5)Flush area 6)Flush dead ends →Till levels return to normal	1.1	5)Flush area 6)Flush dead ends 7)Convert to Free Chlorine →Till levels return to normal
	Monochloramine	1.5	1.2		1.1	
	Dichloramine	0.1	0.2		0.2	
	Total NH3-N	(A)	(B)		(C)	
	Free NH3-N	0.2	0.3		0.4	

(A) Not to exceed mg/L monochloramine/5.06.

(B) Not to exceed (mg/L monochloramine/5.06) +0.2.

(C) Not to exceed (mg/L monochloramine/5.06) +0.4.

Nitrite-N (MCL = 1.0 mg/L and Nitrate-N(MCL = 10.0 mg/L)

(adapted from Texas Commission on Environmental Quality)

Site	Parameter	Baseline	Yellow Flag		Red Flag	
			Trigger	Actions	Trigger	Actions
Source Water	Free NH3-N			1)Verify results 2)Evaluate cause for source change.		1)Verify results 2)Identify affected area 3)Flush
	Nitrite NO2-N					
	Nitrate NO3-N					
Entry Point	Nitrite NO2-N		0.02	3)Identify Area 4)Flush Area 5)Flush dead-ends	0.03	4)Perform free chlorine burn →Till levels return to normal
	Nitrate NO3-N		?		?	
Ave. Water Age	Nitrite NO2-N		0.15	→Until return to normal	0.25	
	Nitrate NO3-N		?		?	
High Water Age	Nitrite NO2-N		0.2		0.3	
	Nitrate NO3-N		?		?	

* If source waters have different water chemistry, additional criteria may be needed and should be differentiated in this table. (Modified from Texas Commission of Environmental Quality Form)

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Point of Entry NAP Monitoring Record

Nitrification Action Plan For:

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7-Digit ID Number

IL

7-Digit ID Number

Description of Sample Location:

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TAP Number

Local Description of Sample Location

	Total Cl (mg/l)	Free Cl* (mg/l)	Mono- Chloramine (mg/l)	Di- Chloramine (mg/l)	Total NH3- N (mg/l)	Free NH3- N (mg/l)	Nitrite-N (mg/l)	Nitrate-N (mg/l)
Sample Frequency	Daily	Daily (during burn)	Daily	Monthly	Daily	Daily	Weekly	Weekly
Goal.mg/L					A**			
Yellow Alert Trigger, mg/L					B**			
Action Code								
Red Alert Trigger, mg/L					C**			
Action Code								
Date	By							
12/31/2019	WBB	4.00	0.00	3.50	0.50	0.00	0.00	0.00
					0.00			
					0.00			
					0.00			
					0.00			
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* Measurement of Free Chlorine need only be completed Daily during a free chlorine burn. Chloraminated water will not contain free chlorine.

** (A) Not to exceed mg/L monochloramine/5.06. (B) Not to exceed (mg/L monochloramine/5.06) +0.2. (C) Not to exceed (mg/L monochloramine/5.06) +0.4.

(Modified from Texas Commission of Environmental Quality Form)

Date	By	Total Cl	Free Cl	Mono-Cl	Di-Cl	Total NH3	Free NH3	Nitrite	Nitrate
					0.00				
					0.00				
					0.00				
					0.00				
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 (Modified from Texas Commission of Environmental Quality Form)

Point of Entry NAP Monitoring Record

Nitrification Action Plan For:

	7-Digit ID Number	IL	
7-Digit ID Number			

Description of Sample Location:

TAP Number	Local Description of Sample Location

	Total Cl (mg/l)	Free Cl* (mg/l)	Mono- Chloramine (mg/l)	Di- Chloramine (mg/l)	Total NH3- N (mg/l)	Free NH3- N (mg/l)	Nitrite-N (mg/l)	Nitrate-N (mg/l)
Sample Frequency	Daily	Daily (during burn)	Daily	Monthly	Daily	Daily	Weekly	Weekly
Goal.mg/L					A**			
Yellow Alert Trigger, mg/L					B**			
Action Code								
Red Alert Trigger, mg/L					C**			
Action Code								
Date	By							
12/31/2020	WBB	4.00	0.00	3.50	0.50	0.00	0.00	0.00
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* Measurement of Free Chlorine need only be completed Daily during a free chlorine burn. Chloraminated water will not contain free chlorine.
 **(A) Not to exceed mg/L monochloramine/5.06. (B) Not to exceed (mg/L monochloramine/5.06) +0.2. (C) Not to exceed (mg/L monochloramine/5.06) +0.4.
 (Modified from Texas Commission of Environmental Quality Form)

Date	By	Total Cl	Free Cl	Mono-Cl	Di-Cl	Total NH3	Free NH3	Nitrite	Nitrate
					0.00				
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* Measurement of Free Chlorine need only be completed Daily during a free chlorine burn. Chloraminated water will not contain free chlorine.

** (A) Not to exceed mg/L monochloramine/5.06. (B) Not to exceed (mg/L monochloramine/5.06) +0.2. (C) Not to exceed (mg/L monochloramine/5.06) +0.4.

(Modified from Texas Commission of Environmental Quality Form)

Average Water Age NAP Monitoring Record

Nitrification Action Plan For:

7-Digit ID Number	IL	
7-Digit ID Number		

Description of Sample Location:

Site I.D.	Local Description of Sample Location

	Total Cl (mg/l)	Free Cl* (mg/l)	Mono- Chloramine (mg/l)	Di- Chloramine (mg/l)	Total NH3- N (mg/l)	Free NH3- N (mg/l)	Nitrite-N (mg/l)	Nitrate-N (mg/l)	
Sample Frequency	Daily	Daily (during burn)	Weekly	Monthly	Weekly	Weekly	Monthly	Monthly	
Goal.mg/L					A**				
Yellow Alert Trigger, mg/L					B**				
Action Code									
Red Alert Trigger, mg/L					C**				
Action Code									
Date	By								
12/31/2019	WBB	4.00	0.00	3.50	0.50	0.00	0.00	0.00	0.00
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 **(A) Not to exceed mg/L monochloramine/5.06. (B) Not to exceed (mg/L monochloramine/5.06) +0.2. (C) Not to exceed (mg/L monochloramine/5.06) +0.4.

Date	By	Total Cl	Free Cl	Mono-Cl	Di-Cl	Total NH ₃	Free NH ₃	Nitrite	Nitrate
					0.00				
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* Measurement of Free Chlorine need only be completed Daily during a free chlorine burn. Chloraminated water will not contain free chlorine.
 **(A) Not to exceed mg/L monochloramine/5.06. (B) Not to exceed (mg/L monochloramine/5.06) +0.2. (C) Not to exceed (mg/L monochloramine/5.06) +0.4.
 (Modified from Texas Commission of Environmental Quality Form)

Average Water Age NAP Monitoring Record

Nitrification Action Plan For:

7-Digit ID Number

IL

7-Digit ID Number

Description of Sample Location:

Site I.D.

Local Description of Sample Location

	Total Cl (mg/l)	Free Cl* (mg/l)	Mono- Chloramine (mg/l)	Di- Chloramine (mg/l)	Total NH3- N (mg/l)	Free NH3- N (mg/l)	Nitrite-N (mg/l)	Nitrate-N (mg/l)
Sample Frequency	Daily	Daily (during burn)	Weekly	Monthly	Weekly	Weekly	Monthly	Monthly
Goal.mg/L					A**			
Yellow Alert Trigger, mg/L					B**			
Action Code								
Red Alert Trigger, mg/L					C**			
Action Code								
Date	By							
12/31/2019	WBB	4.00	0.00	3.50	0.50	0.00	0.00	0.00
					0.00			
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 **(A) Not to exceed mg/L monochloramine/5.06. (B) Not to exceed (mg/L monochloramine/5.06) +0.2. (C) Not to exceed (mg/L monochloramine/5.06) +0.4.

Date	By	Total Cl	Free Cl	Mono-Cl	Di-Cl	Total NH3	Free NH3	Nitrite	Nitrate
					0.00				
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* Measurement of Free Chlorine need only be completed Daily during a free chlorine burn. Chloraminated water will not contain free chlorine.

** (A) Not to exceed mg/L monochloramine/5.06. (B) Not to exceed (mg/L monochloramine/5.06) +0.2. (C) Not to exceed (mg/L monochloramine/5.06) +0.4.

Distal Point (Oldest Water) NAP Monitoring Record

Nitrification Action Plan For: _____

	7-Digit ID Number	IL	7-Digit ID Number
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Description of Sample Location: _____

<i>Site I.D.</i>	<i>Local Description of Sample Location</i>
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		Total Cl (mg/l)	Free Cl* (mg/l)	Mono- Chloramine (mg/l)	Di- Chloramine (mg/l)	Total NH3- N (mg/l)	Free NH3- N (mg/l)	Nitrite-N (mg/l)	Nitrate-N (mg/l)
Sample Frequency		Daily	Daily (during burn)	Weekly	Monthly	Weekly	Weekly	Monthly	Monthly
Goal.mg/L						A**			
Yellow Alert Trigger, mg/L						B**			
Action Code									
Red Alert Trigger, mg/L						C**			
Action Code									
Date									
By									
12/31/2020	WBB	4.00	0.00	3.50	0.50	0.00	0.00	0.00	0.00
					0.00				
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 (Modified from Texas Commission of Environmental Quality Form)

Date	By	Total Cl	Free Cl	Mono-Cl	Di-Cl	Total NH3	Free NH3	Nitrite	Nitrate
					0.00				
					0.00				
					0.00				
					0.00				
					0.00				
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 (Modified from Texas Commission of Environmental Quality Form)

Distal Point (Oldest Water) NAP Monitoring Record

Nitrification Action Plan For:

	7-Digit ID Number	IL

7-Digit ID Number

Description of Sample Location:

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Site I.D. Local Description of Sample Location

	Total Cl (mg/l)	Free Cl* (mg/l)	Mono- Chloramine (mg/l)	Di- Chloramine (mg/l)	Total NH3- N (mg/l)	Free NH3- N (mg/l)	Nitrite-N (mg/l)	Nitrate-N (mg/l)
Sample Frequency	Daily	Daily (during burn)	Weekly	Monthly	Weekly	Weekly	Monthly	Monthly
Goal.mg/L					A**			
Yellow Alert Trigger, mg/L					B**			
Action Code								
Red Alert Trigger, mg/L					C**			
Action Code								

Date	By	Total Cl (mg/l)	Free Cl* (mg/l)	Mono- Chloramine (mg/l)	Di- Chloramine (mg/l)	Total NH3- N (mg/l)	Free NH3- N (mg/l)	Nitrite-N (mg/l)	Nitrate-N (mg/l)
12/31/2019	WBB	4.00	0.00	3.50	0.50	0.00	0.00	0.00	0.00
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 (Modified from Texas Commission of Environmental Quality Form)

Date	By	Total Cl	Free Cl	Mono-Cl	Di-Cl	Total NH3	Free NH3	Nitrite	Nitrate
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(Modified from Texas Commission of Environmental Quality Form)

Distal Point (Oldest Water) NAP Monitoring Record

Nitrification Action Plan For:

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7-Digit ID Number

IL

7-Digit ID Number

Description of Sample Location:

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Site I.D.

Local Description of Sample Location

	Total Cl (mg/l)	Free Cl* (mg/l)	Mono- Chloramine (mg/l)	Di- Chloramine (mg/l)	Total NH3- N (mg/l)	Free NH3- N (mg/l)	Nitrite-N (mg/l)	Nitrate-N (mg/l)
Sample Frequency	Daily	Daily (during burn)	Weekly	Monthly	Weekly	Weekly	Monthly	Monthly
Goal.mg/L					A**			
Yellow Alert Trigger, mg/L					B**			
Action Code								
Red Alert Trigger, mg/L					C**			
Action Code								
Date								
Date		By						
12/31/2019	WBB	4.00	0.00	3.50	0.50	0.00	0.00	0.00
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 (Modified from Texas Commission of Environmental Quality Form)

Date	By	Total Cl	Free Cl	Mono-Cl	Di-Cl	Total NH3	Free NH3	Nitrite	Nitrate
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 (Modified from Texas Commission of Environmental Quality Form)