

Automated Car Wash Water System



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Project Background

- Brosnan Rail Yard in Macon, GA
- Car wash facility on-site
 - Washes interior of hopper cars
 - Cars carry variety of materials (fertilizer, clays, grain, etc.)
- Wash water containing fertilizer materials
 - High in ammonia
 - Disruption of the existing downstream biological process at the wastewater treatment plant (WWTP)
- Previous work included:
 - Holding tank and pump station to divert disruptive wash water to slowly feed the water to the WWTP
 - All flow continued to be routed through pump station

Project Objective

- Fully segregate wash water
 - Ammonia containing wash water to divert through separate piping/pump station area
 - Non-ammonia wash water to flow by gravity using separate piping system to WWTP
- Automate the diversion process
 - Simplify operation of the facility for operators
 - Allow for manual control if needed
- Use the existing grit chamber for diversion to minimize construction costs

Hopper Car Wash Facility



Existing Grit Chamber

Ammonia Water Holding Tank and Pump Station



Hopper Car Wash Facility



Investigation

- Operator logs materials and frequency:
 - Clay
 - Animal Feed (corn)
 - Fertilizers
- Wash water diverted by car contents
 - Wash water was diverted at the pump station
 - Residual ammonia wash water remained inside pump station manhole
 - Clean wash water would route through the pump station, mixing with ammonia wash water, creating WWTP disruptions

Investigation (cont'd)

Car Wash Sampling Results: Clay Car and Ammonia Car

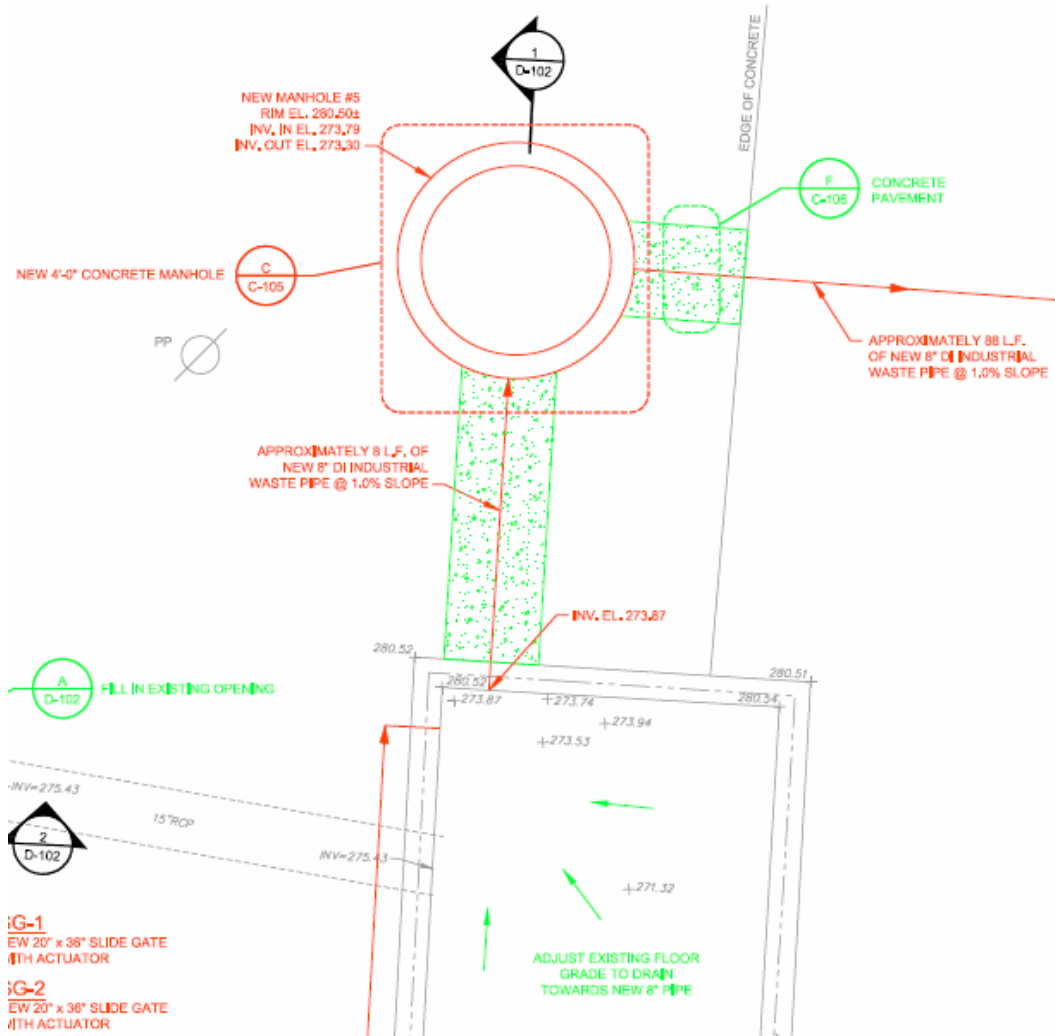
	pH	Temperature	Specific Conductance	Orthophosphate	Nitrate as N	Turbidity	TSS	Phosphorus (Total)	Nitrogen Ammonia
	SU	Deg C	uS/cm	mg/L	mg/L	NTU	mg/L	mg/L	mg/L
Clay Car	5.32	23.5	155	0.038	<0.5	169,000	104,000	9.28	3.5
Ammonia Car	5.01	23.4	113,000	<0.02	<0.5	804	744	6.6	1,160

Municipality Sewer Industrial User Permit Limits

Parameter	Limit	Monitoring Frequency	Sample Type
Flow	50,500 gpd	Continuous	Continuous
Biochemical Oxygen Demand (BOD5)	330 mg/l	2 days per quarter	24 hour flow or time proportion composite
Total Suspended Solids (TSS)	250 mg/l	2 days per quarter	24 hour flow or time proportion composite
Oil & Grease (O&G) as per EPA 1664 HEM	150 mg/l	2 days per quarter	Grab
Ammonia Nitrogen (NH3:N)	20 mg/l	2 days per quarter	24 hour flow or time proportion composite
Total Kjeldahl Nitrogen (TKN)	mg/L – Monitor Only	2 days per quarter	24 hour flow or time proportion composite
Organic Nitrogen (calculation, TKN – NH3:N)	mg/L – Monitor Only	2 days per quarter	24 hour flow or time proportion composite



Proposed Layout (cont'd)



Proposed Layout (cont'd)

SLUICE GATE SCHEDULE				
TAG NO.	GATE SIZE W (IN) X H(IN)	MOTOR DATA		MOUNTING TYPE
		HP	ENCL. TYPE	
SG-1	20 x 36	1	NEMA 4X	CONCRETE L/R CONCRETE (SIDES)
SG-2	20 x 36	1	NEMA 4X	BRACKET L/R BRACKET (SIDES)



Automated Gate System

- Automatic detection of ammonia in wash water
- Direct water to either:
 - Ammonia Holding Tank piping system
 - Direct to WWTP
- Stainless steel gates
 - Longer life in corrosive environment
- Gates are automated
 - No manual changes from operators
 - Power loss or failure/emergency operation will require manual changes to open/close gates

System Plan

- Gate System includes the following features:
 - Actuated Gates
 - Oxidation-Reduction Potential (ORP) probe
 - Control Panel
 - Alarm System
 - Auto-dialer in case of alarm
 - No need for manual monitoring

ORP Probe

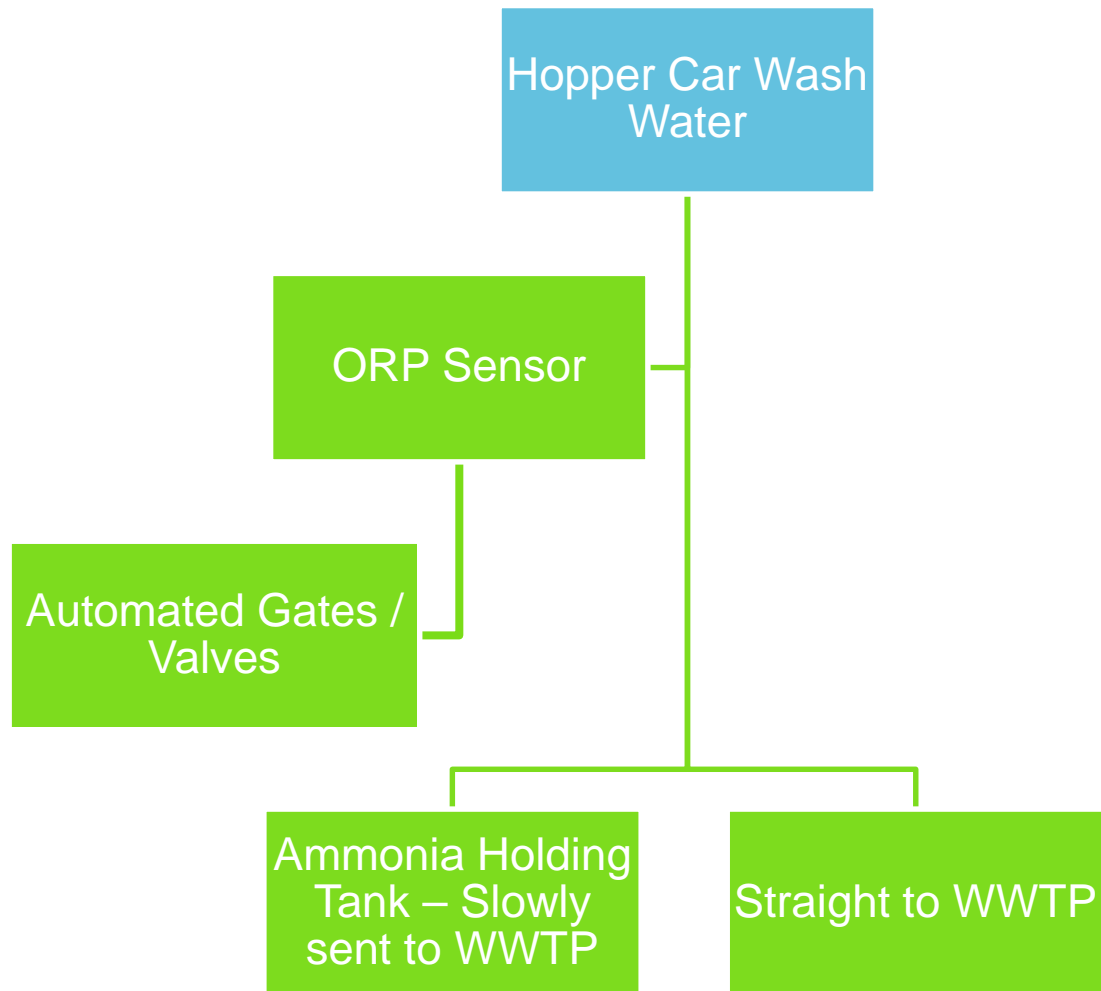
– Oxidation-Reduction Potential (ORP) probe

- Chosen as surrogate to the more expensive, reagent based monitoring probe for ammonia which has limited use in non-continuously submerged flow conditions such as this location
- Rugged enough to remain in the flow channel
- Valid over a wide pH range
- Ability to operate in non-continuous flows (i.e. batch washing process)

Automated Gate System



System Flow Diagram



Automated Gate System



Automated Gate System



Conclusions

- Residual ammonia wash water caused problems with the biological WWTP
- Provided separate piping systems for ammonia wash water
- Used an ORP probe to control gate configuration
- Automated gates direct water
 - limited operational requirements for car wash facility personnel
- Assists hopper car wash operators and WWTP operators
- System improves compliance with discharge limitation

Questions?

