



Mosaic's Water Quality Monitoring Programs and Practices

DeSoto County Workshop – June 29, 2021



Phosphate Mining Water Quality Monitoring Programs

Beth Niec/ Senior Manager Environmental - Minerals



Presentation Outline

NAME	BUSINESS INFORMATION	PRESENTATION TITLE
Beth Niec, P.E.	Senior Environmental Manager - Minerals Mosaic Fertilizer, LLC	Phosphate Mining Water Quality Monitoring Programs
Scott Lehr	Senior Environmental Manager - Compliance Mosaic Fertilizer, LLC	Water Monitoring Programs, Permitting and Compliance
Devin Lawrence	Environmental Supervisor Mosaic Fertilizer, LLC	Environmental Monitoring/ Water Quality
Josh Lipham	Technical Director Mosaic Fertilizer, LLC	Laboratory Analysis
Keith Alam	Senior Manager - Engineering Mosaic Fertilizer, LLC	Beneficiation Process
Vinette Godelia, Esq.	Partner Hopping, Green & Sams	Mosaic Water Monitoring Programs: Self-Monitoring Enforcement

Mosaic's Environmental Team



Site
Environmental
Specialists



Environmental
Permitting &
Compliance
Team



Environmental
Field Services



Environmental
Lab



Mosaic's Environmental Team

Why does
Mosaic
Monitor
Water
Quality?



It's the right thing to do.
We live here too.



Agency and
Permit
Requirements



Baseline,
During and
Post
Comparison



Other
Agreements
(i.e. PRMRWSA)



Agency Monitoring Requirements

- County Approvals
 - County Mining Ordinance
 - Development Order, Master Mining Plan, Operating Permit
- Florida Department of Environmental Protection (FDEP)
 - Environmental Resource Permit (ERP)
 - NPDES Outfall Monitoring
- Federal 404 Permit
- SWFWMD Water Use Permit

Activities shall be conducted in a manner that does not cause or contribute to violations of state water quality standards.

Agency Monitoring Requirements

DeSoto County Requirements

Mosaic Fertilizer, L.L.C.
DeSoto Mine
Mining Master Plan and Operating Permit Applications
December, 2016



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Conn & Buenaventura P.A.
ATTORNEYS AT LAW

PHOSPHATE MINING ORDINANCE

3. OPERATING PERMIT

C. Criteria for Issuance (Continued)

- Environmental monitoring program to establish baseline conditions and evaluate compliance with standards
 - Surface water quality
 - Surface water Setbacks for excavation activities
 - Ground water quality
 - Ground water quantity
 - Rainfall
 - Air quality
- Radiation standards to ensure state requirements will not be exceeded
- Reclamation criteria
 - Revegetation site plans and monitoring
 - Lake design including littoral zones, perimeter berms and swales
 - Sequence and schedule on a yearly basis



Agency Monitoring Requirements



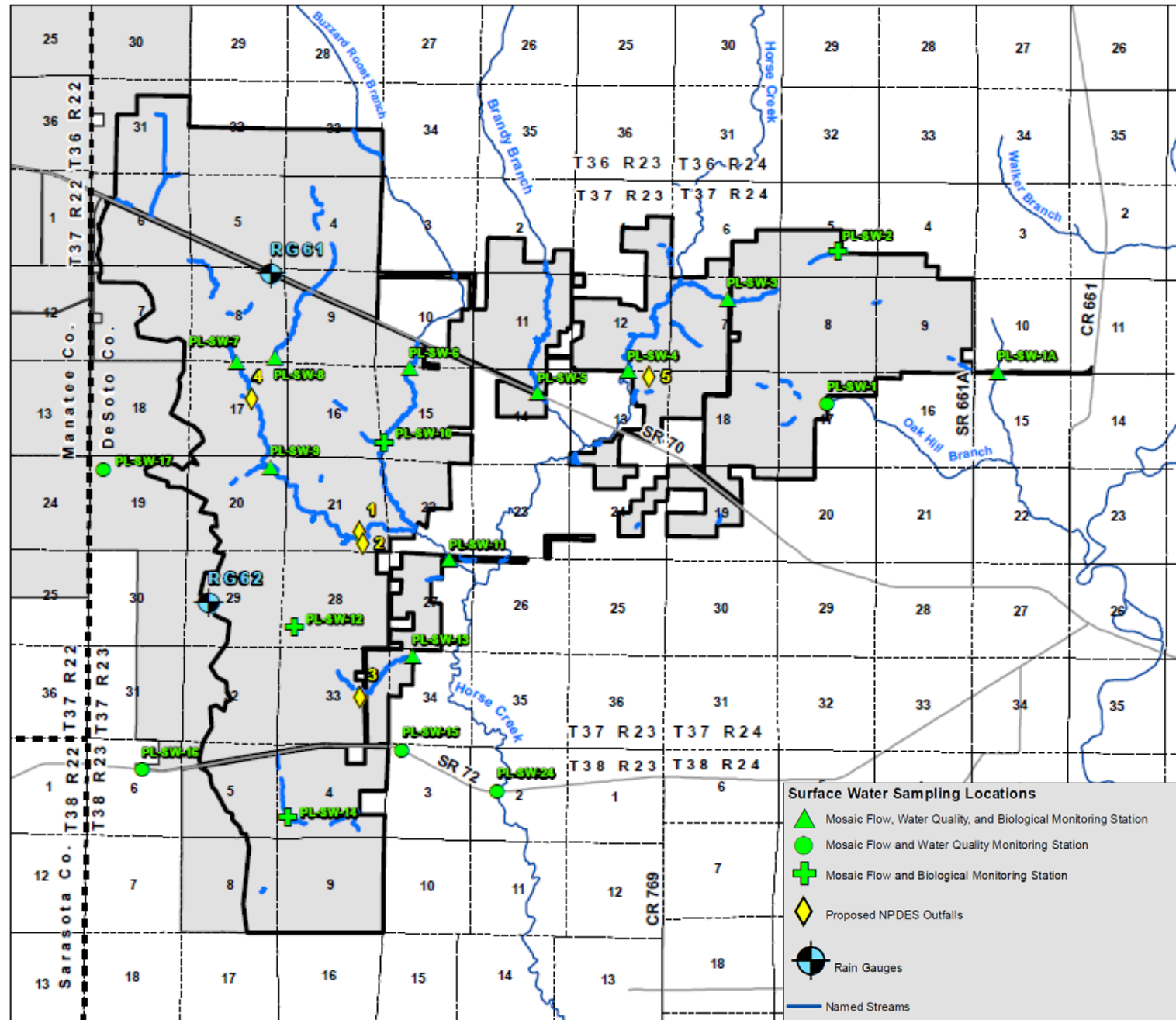
Florida DEP Environmental Resource Permit (ERP)

- Monitoring locations are established in/through consultation with FDEP
 - ✓ Surface Water
 - ✓ Ground Water
 - ✓ Rain Gauges
 - ✓ Biological Monitoring
- Baseline data submitted with application
- Annual Reports submitted throughout the life of the mine

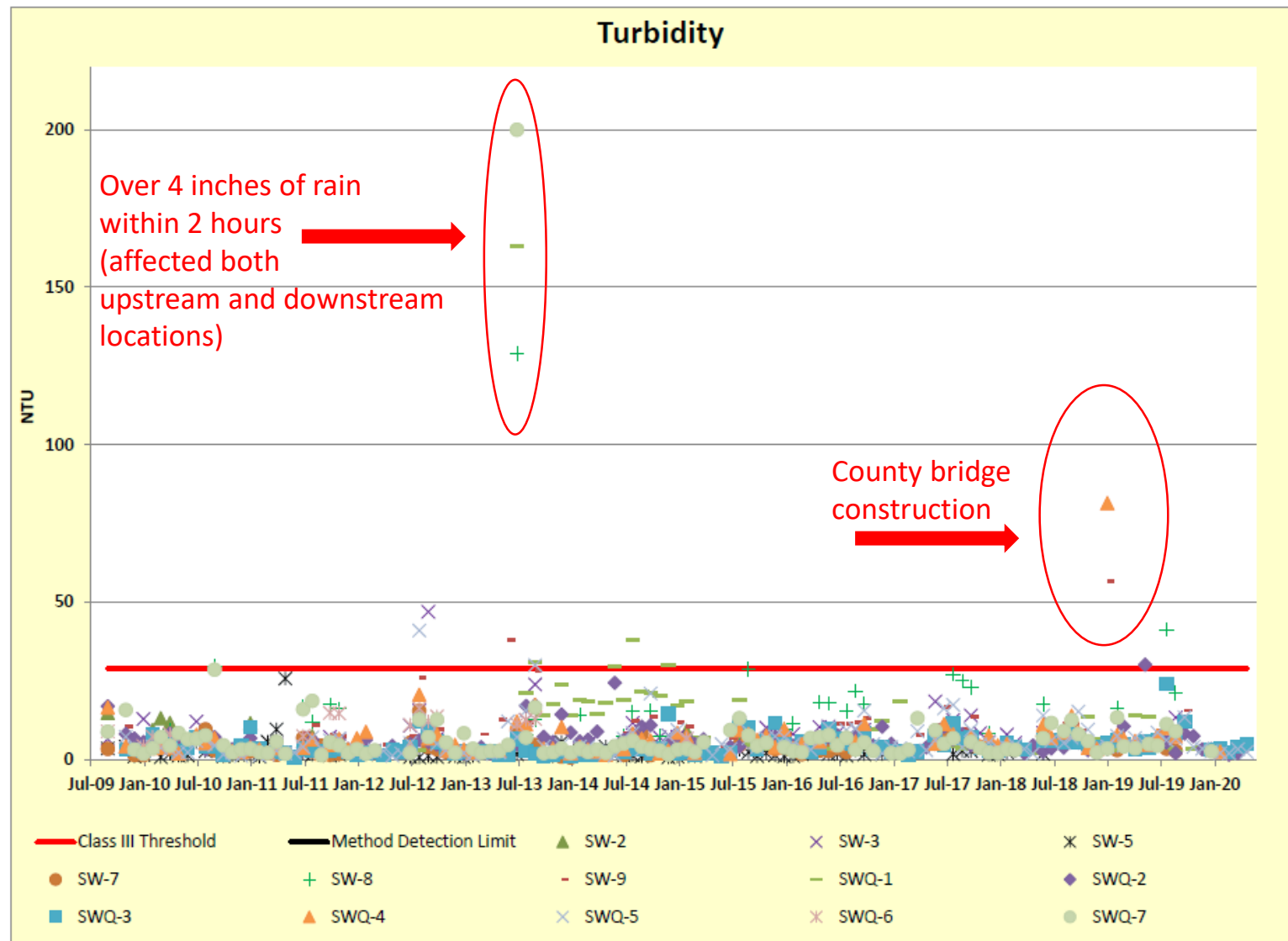
Surface Water Quality

Monitored Quarterly

- ✓ pH
- ✓ Temperature
- ✓ Dissolved Oxygen
- ✓ Conductivity
- ✓ Turbidity
- ✓ Alkalinity
- ✓ Hardness
- ✓ Total Suspended Solids
- ✓ Total Phosphorous
- ✓ Ammonia
- ✓ Ortho Phosphate
- ✓ Total Nitrogen
- ✓ TKN
- ✓ Nitrate/Nitrite
- ✓ Fluoride
- ✓ Sulfate
- ✓ Total Organic Carbon
- ✓ Chloride
- ✓ Chlorophyll-a
- ✓ Aluminum
- ✓ Selenium
- ✓ Calcium
- ✓ Magnesium
- ✓ Arsenic
- ✓ Cadmium
- ✓ Chromium
- ✓ Iron
- ✓ Lead
- ✓ Nickel
- ✓ Zinc



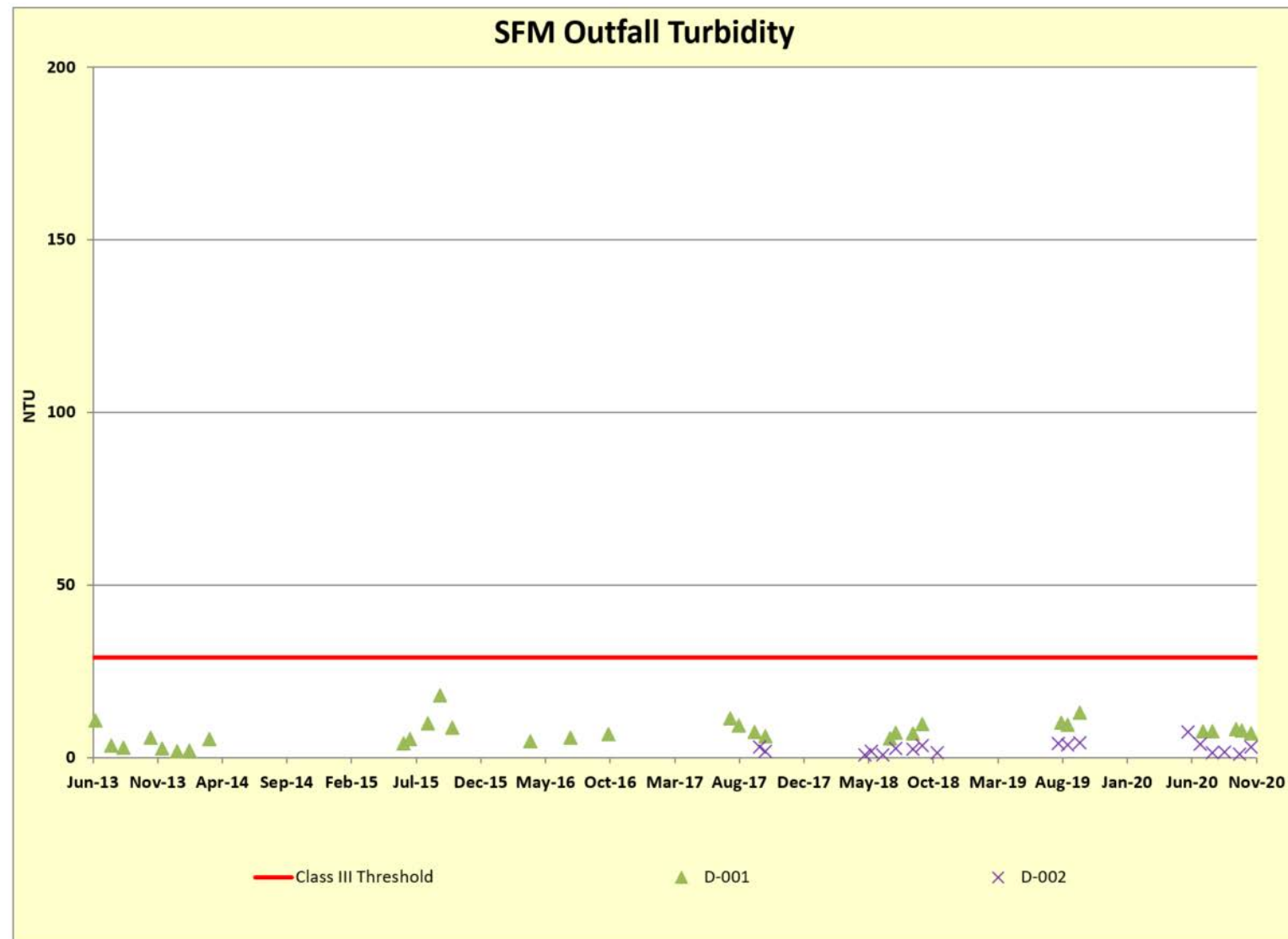
South Ft. Meade Example



- Mosaic's South Fort Meade Mine
- Upstream and downstream monitoring results
- Overall, results show there is no decrease in water quality compared to baseline conditions across the site.

South Ft. Meade Example

- Mosaic's South Fort Meade Mine
- NPDES Outfalls 001 and 002

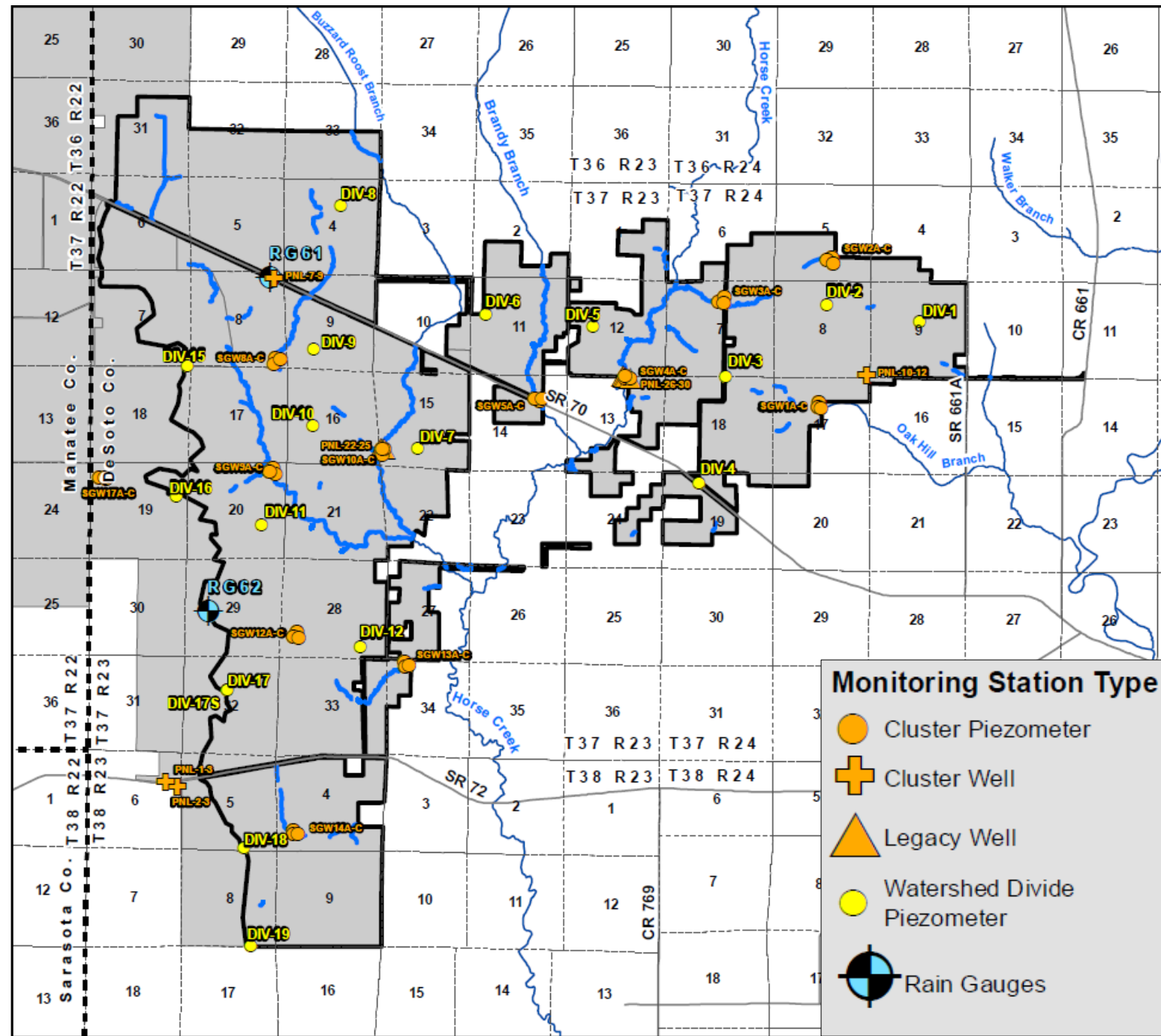


Note: Outfall 002 began flowing in 2017

Ground Water Quality

Monitored Semi-Annually

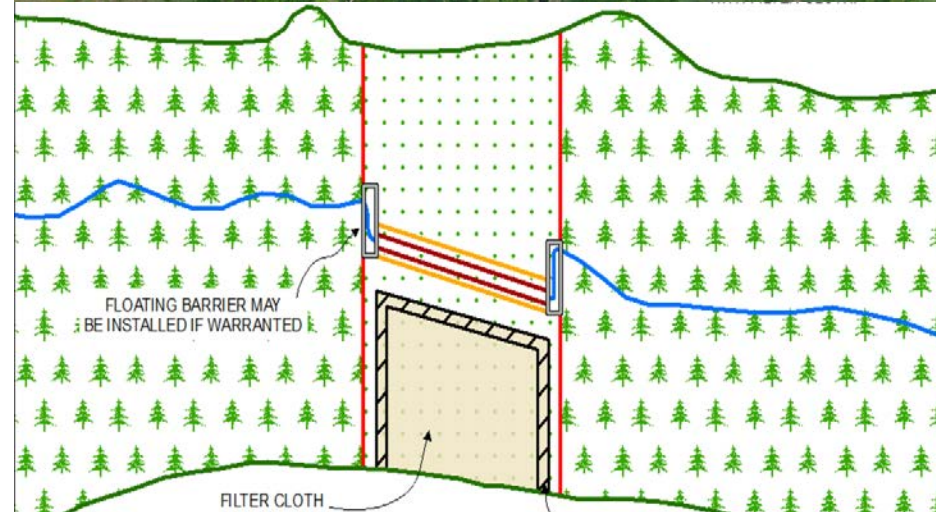
- ✓ pH
- ✓ Temperature
- ✓ Conductivity
- ✓ Turbidity
- ✓ Total Dissolved Solids
- ✓ Alkalinity
- ✓ Hardness
- ✓ Total Phosphorous
- ✓ Ortho Phosphate
- ✓ Total Nitrogen
- ✓ TKN
- ✓ Nitrate/Nitrite
- ✓ Fluoride
- ✓ Sulfate
- ✓ Chloride
- ✓ Aluminum
- ✓ Selenium
- ✓ Calcium
- ✓ Magnesium
- ✓ Arsenic
- ✓ Cadmium
- ✓ Chromium
- ✓ Iron
- ✓ Lead
- ✓ Nickel
- ✓ Zinc



Other ERP Water Quality Monitoring

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- Both Surface and Ground Water Monitoring
 - Annual Gross Alpha and Radium 226/228
- Daily turbidity monitoring for activities such as stream crossing construction and removal
- Reclaimed Streams and Wetlands prior to reconnection
 - Turbidity
 - Temperature
 - Dissolved Oxygen
 - pH
 - Conductivity



Water Quality Standards

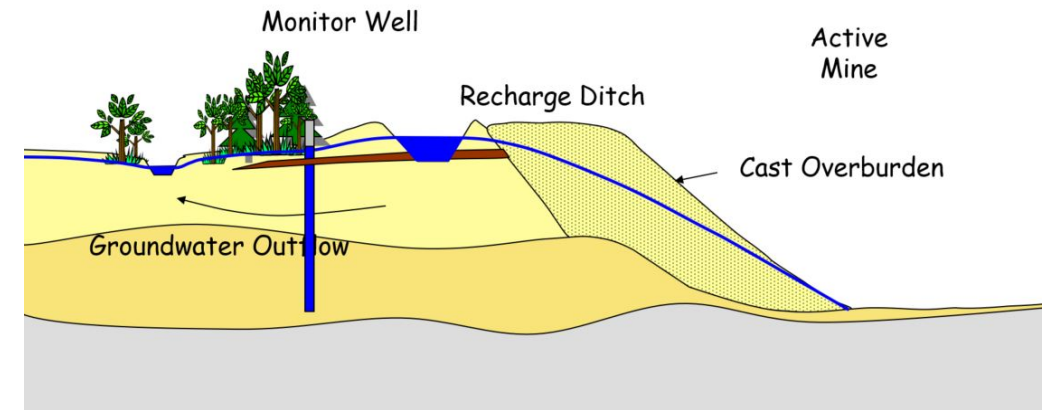
What Happens if Water Quality Standards are Exceeded?

- Mosaic's Internal Response and Reporting Policy
- Immediately cease all work contributing to the water quality violation
- Stabilize all exposed soils contributing to the violation
 - Modify work procedures
 - Install more turbidity containment devices
 - Repair any non-functioning devices
- Notify Appropriate Agencies (Section B.4 of the DeSoto County phosphate ordinance requires spill notification procedures)
- Other Spill Reporting Requirements:
 - Spills > Reportable Quantity (RQ) must be reported to the Florida State Watch Office
 - Public Notice of Pollution

Water Quantity Protections & Monitoring

ERP – Water levels and flows in wetlands and other surface water adjacent and downstream shall be protected.

- Implement and Comply with SWFWMD Water Use Permit
- The Environmental Management Plan (EMP) is designed to accomplish:
 - Prevent adverse impacts
 - Monitor pre-mining (baseline), during mining, post-mining
 - Corrective Action
 - Reporting
- Mandatory Mitigation Distance (MMD)
- Site Specific Drawdown Mitigation Plan (SSDMP)
- Techniques may consist of but not limited to:
 - Water table maintenance ditches
 - Mining orientation and timing
 - Back-casting



Water Quality & Quantity Protection

- ✓ Environmental Management Plan
- ✓ Ditch and Berm Systems/Recharge
- ✓ NPDES Outfall Limitations
- ✓ Best Management Practices

"...with proper attention to stormwater quality-based BMPs, mining operations can minimize their water quality impacts on areas beyond their mine recirculation system boundaries (inside the limits of the ditch and berm system)." – FAEIS 2013



Engineered System
Maintained at
Design Elevation



Outside Slopes
are Vegetated for
Erosion Control

Temporary
Wildlife Habitat



Other ERP Water Quantity Monitoring

- Surface and Groundwater modeling conducted to verify final topography supports onsite and offsite wetlands and surface waters
- Protection of stream flow – must maintain a buffer along one side of preserved creeks during mining
- Downstream flows shall not be reduced by mining activities to cause adverse impacts to creeks



Other ERP Water Quantity Monitoring

- Wetland Hydrographs for each created wetland
 - Water levels, average water depth, and hydroperiod hydrographs
 - Staff gauges and piezometers
 - Within range of values documented in reference wetlands
- Stream Gauging in created stream reaches
 - Water level and flow hydrographs, occurrence of bankfull events
 - Continuous stage level recorders and flow measurements to develop flow rating curves
 - Within range of values documented in reference streams and design plans



Other ERP Water Quality Monitoring

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- Biological Monitoring of Mitigation Streams must be similar to reference streams
 - Lotic versus lentic macroinvertebrate taxa
 - Functional feeding groups
 - Species diversity
 - Species richness
- Fish Sampling shall demonstrate viable fishery resource has been established



Reclaimed Stream - Native Fishery



Agency Inspections – Mosaic is Highly Regulated

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Water Monitoring Programs, Permitting and Compliance

Scott Lehr / Senior Environmental Manager -
Compliance



National Pollutant Discharge Elimination System (NPDES)

- Created in 1972 by the USEPA under the federal Clean Water Act (CWA)
- NPDES program is delegated to Florida Department of Environmental Protection
 - EPA has oversight authority
- NPDES permits establish water quality limits for surface water from permitted outfalls to protect designated uses of receiving waters
- Permits include monitoring and reporting framework to ensure ongoing compliance with these limitations
- Includes requirements for development and use of Spill Controls, Best Management Practices and Waste Minimization programs



Establishing Outfall Limits

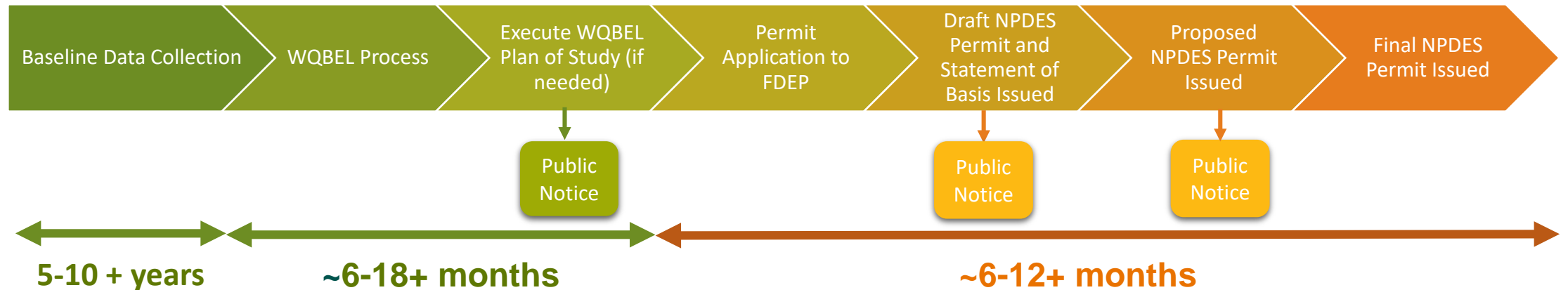
Consistent with CWA requirements, Florida law requires that the FDEP establish limits for any discharges

Technology-Based (TBEL)	Water Quality-Based (WQBEL)
Industry Specific	Level I – for existing discharges
Mosaic's mining activities fall under the mineral processing category	Level II – for new discharges based on water quality standards
Mandates specific limits for pH and Total Suspended Solids (TSS)	Sets site specific limits protective of receiving water designated use; for all other parameters, may supersede Technology-based effluent limits

General NPDES Permitting Process

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- NPDES Permits applied for every 5 years
- NPDES Applications also submitted for modifications



Mosaic NPDES Permit Application Packages

- Completed FDEP Forms
- Engineering Report
- WQBEL Study/Report
- Discharge and water quality data (previous 5 years)
- Water Balance Diagram
- Water Flow Diagram(s)
- Identification of controlled discharge locations
- Description of water sources and treatment, operational controls, Best Management Practices (BMP)

Baseline Data Collection

- Data collected to support mining applications with Federal, State and Local agencies is also used for NPDES permitting
- Establishes baseline data for streams with potential to receive water from outfall(s)
- Collected in-stream data, can include:
 - Water quantity
 - Water quality
 - Biology (SCI, RPS, LVS)
 - ❑ Stream Condition Index (SCI)
 - ❑ Rapid Periphyton Survey (RPS)
 - ❑ Linear Vegetation Survey (LVS)
- Baseline data collection on order 5-15 years (site dependent)
- Sampling conducted in accordance with FDEP standard procedures (SOPs)



“Pre-WQBEL” Meetings and Plan of Study Coordination

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- Mosaic’s NPDES permit applications may require a Water Quality Based Effluent Limitation (WQBEL) study
 - State law requires the applicant to coordinate with the Department on:
 - ☐ Information required;
 - ☐ The agreed upon methods of data collection and analysis; and
 - ☐ Data quality control/quality assurance requirements.
- The applicant must provide public notice that a Plan of Study has been submitted to FDEP for review

Execution of WQBEL Plan of Study

- Upon approval of plan, Mosaic will begin preparing the study
- During the course of the study:
 - The study may be amended by written agreement between the Department and the applicant;
 - The applicant shall present the study results to the Department upon completion;
 - Applicant may continue meetings with the Department regarding other aspects of the permit application during WQBEL study; and
 - Applicant may proceed with the initial NPDES permit application during the WQBEL study.

General NPDES Permit Application Requirements

- Completed FDEP form 62-620.910(1) includes:
 - Activities conducted at site;
 - Industry codes that best reflect activities;
 - List of other permits/authorizations associated with the facility; and
 - Topographic maps depicting facility boundary, infrastructure and proposed discharge or land application locations.
- An “Engineering Report” typically includes:
 - Types and quantities of all waste materials to be generated
 - Engineering controls and design criteria
 - Design of outfalls
 - A discussion of the following:
 - ❑ Anti-degradation requirements
 - ❑ Discussion of receiving water body classifications/standards
 - ❑ Discussion of WQBEL’s
 - ❑ Materials used and stored on site and method of containment / clean-up

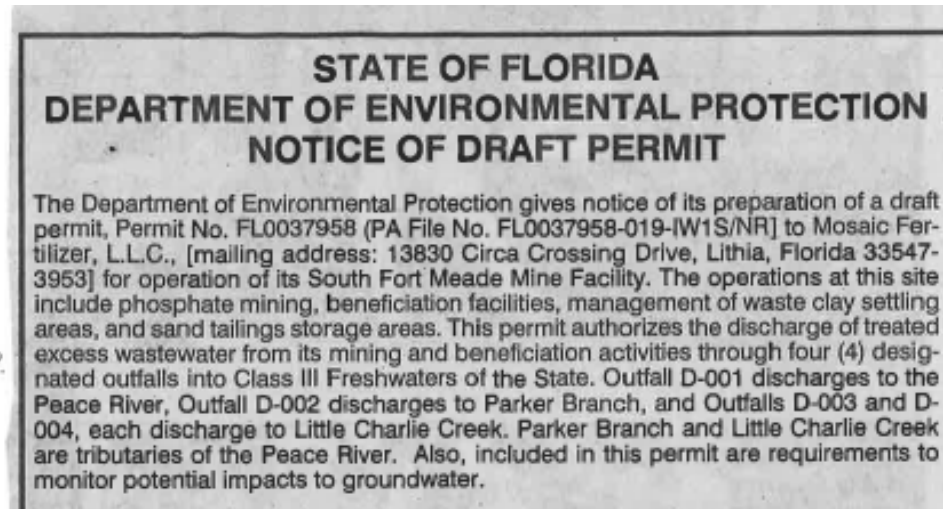
Issuance of Draft Permit and Statement of Basis

- Following FDEP's review of the NPDES application, and subsequent additional information requests, the Department will issue a draft permit and Statement of Basis (aka "Fact Sheet")
 - Draft Permit contains the proposed permit conditions
 - Statement of Basis will include:
 - ❑ Description of activities authorized under the permit
 - ❑ Summary of basis for the permit conditions including:
 - References to applicable statutory or regulatory provisions
 - Justification for all outfall limitations
 - References to WQBEL Study or other calculations used to establish outfall limitations
 - Description of procedures for reaching final decision on draft permit
- Draft permit is also reviewed by EPA

Public Notice of Draft Permit

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- Following issuance of the draft permit, the applicant is required to publish public notice of Department's issuance of the Draft permit in a newspaper of local circulation
 - 30-day public comment period



Proposed and Final Permit

- Following 30-day public comment period:
 - FDEP will address any comments received from public or from EPA
 - Revise the permit conditions and statement of basis accordingly
 - Issue “Proposed” Permit
- Following issuance of the proposed permit, the applicant is required to publish another public notice (14 days)
- After the public notice period, final permit is issued by FDEP

Final Issuance of NPDES Permit

- Issued for a 5-Year Period
- Sets requirements for outfall water quality and routine monitoring
- Monitoring Reports –submitted monthly
 - Submitted electronically to FDEP/EPA
 - Include all required water quality monitoring data
 - Identifies any potential issues or deviations
 - Certified by Responsible Official
- The permit may also include special conditions related to other reports, analyses, or evaluations required such as:
 - Biological Monitoring Requirements
 - Aquatic Toxicity Testing
 - Sand Tailings Monitoring
 - Groundwater Monitoring

Typical Monitoring Report Submittal

DEPARTMENT OF ENVIRONMENTAL PROTECTION DISCHARGE MONITORING REPORT - PART A											
PERMITTEE NAME: Mosaic Fertilizer LLC ADDRESS: 13830 Circa Crossing Dr Lithia, FL 33547 FACILITY: Mosaic Fertilizer, LLC - South Ft Meade Mine LOCATION: 5880 Manley Rd Fort Meade, FL 33841 COUNTY: POLK						PERMIT NUMBER: FL0037958 LIMIT: FINAL FACILITY TYPE: IW MONITORING GROUP: D-001 REPORT: Quarterly GROUP: Industrial DESCRIPTION: OUTFALL 001 to unnamed swale then to the Peace River MONITORING PERIOD: From: 10/01/2020 To: 12/31/2020					
Parameter		Quantity or Loading		Units	Quality or Concentration		Units	No. Ex.	Frequency of Analysis	Sample Type	
Sulfate, Total	Sample Measurement					90.6		0	1 Quarterly	Grab	
PARM Code 00945 1 Mon. Site: EFF-001	Permit Requirement					Report (Daily Mx)	mg/L		(1 Quarterly)	(Grab)	
Fluoride, Total (as F)	Sample Measurement					1.71		0	1 Quarterly	Grab	
PARM Code 00951 1 Mon. Site: EFF-001	Permit Requirement					10.0 (Daily Mx)	mg/L		(1 Quarterly)	(Grab)	
Fluoride, Total (as F)	Sample Measurement					0.56		0	1 Quarterly	Grab	
PARM Code 00951 6 Mon. Site: SWD-001	Permit Requirement					Report (Daily Mx)	mg/L		(1 Quarterly)	(Grab)	
Chlorophyll a	Sample Measurement					27.3		0	1 Quarterly	Grab	
PARM Code 32230 1 Mon. Site: EFF-001	Permit Requirement					Report (Daily Mx)	ug/L		(1 Quarterly)	(Grab)	
NAME/TITLE PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT		I CERTIFY UNDER PENALTY OF LAW THAT THIS DOCUMENT AND ALL ATTACHMENTS WERE PREPARED UNDER MY DIRECTION OR SUPERVISION IN ACCORDANCE WITH A SYSTEM DESIGNED TO ASSURE THAT QUALIFIED PERSONNEL PROPERLY GATHERED AND EVALUATED THE INFORMATION SUBMITTED, BASED ON MY INQUIRY OF THE PERSON OR PERSONS WHO MANAGE THE SYSTEM, OR THOSE PERSONS DIRECTLY RESPONSIBLE FOR GATHERING THE INFORMATION; THE INFORMATION SUBMITTED IS, TO THE BEST OF MY KNOWLEDGE AND BELIEF, TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT FOR KNOWING VIOLATIONS.					SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT		TELEPHONE	SUBMITTED ON	
Keith Nadaskay							Electronically Signed		(863) 800-9259	01/26/2021	



Typical Monitoring Report Submittal

DEPARTMENT OF ENVIRONMENTAL PROTECTION DISCHARGE MONITORING REPORT - PART A

PERMITTEE NAME: Mosaic Fertilizer LLC
 ADDRESS: 13830 Circa Crossing Dr
 Lithia, FL 33547
 FACILITY: Mosaic Fertilizer, LLC - South Ft Meade Mine
 LOCATION: 5880 Manley Rd
 Fort Meade, FL 33841
 COUNTY: POLK

PERMIT NUMBER: FL0037958
 LIMIT: FINAL
 FACILITY TYPE: IW
 MONITORING GROUP: D-002
 REPORT: Monthly
 GROUP: Industrial

DESCRIPTION: Discharges into an unnamed swale, a tributary of Parker Branch, then Little Charlie Creek which discharges into the Peace River

MONITORING PERIOD: From: 12/01/2020 To: 12/31/2020

Parameter		Quantity or Loading		Units	Quality or Concentration			Units	No. Ex.	Frequency of Analysis	Sample Type
Flow	Sample Measurement	6.46	19.16						0	1 Continuous	Recording Flow Meter with Totalizer
PARM Code 50050 1 Mon. Site: EFF-002	Permit Requirement	Report (Mo Avg)	Report (Daily Mx)	MGD						(1 Continuous)	(Recording Flow Meter with Totalizer)
Stream Flow, Instantaneous	Sample Measurement		5.16						0	1 Monthly	Instantaneous Sample
PARM Code 00061 5 Mon. Site: SWB-002	Permit Requirement		Report (Daily Mx)	MGD						(1 Monthly)	(Instantaneous Sample)
Stream Flow, Instantaneous	Sample Measurement		20.40						0	1 Monthly	Instantaneous Sample
PARM Code 00061 6 Mon. Site: SWD-002	Permit Requirement		Report (Daily Mx)	MGD						(1 Monthly)	(Instantaneous Sample)
Specific Conductance	Sample Measurement						681		0	1 Monthly	Grab
PARM Code 00095 1 Mon. Site: EFF-002	Permit Requirement						Report (Maximum)	umhos/cm		(1 Monthly)	(Grab)

Typical Mosaic NPDES Outfall

- Weir structure
- Flow metering
- Access for water quality monitoring
- Upstream controls
 - Valves
 - Pumps
 - Ditch blocks
 - Ponds, reservoirs



FDEP Oversight and Compliance Reviews

- Routine onsite inspections
 - Typically semi-annually
- Records Review
 - Water Quality monitoring records
 - Laboratory records and SOPs
 - Waste minimization and BMP Plans
- Field visit of outfalls, other ENV sensitive areas
- FDEP occasionally conducts WQ monitoring of NPDES outfall (aka split sampling)



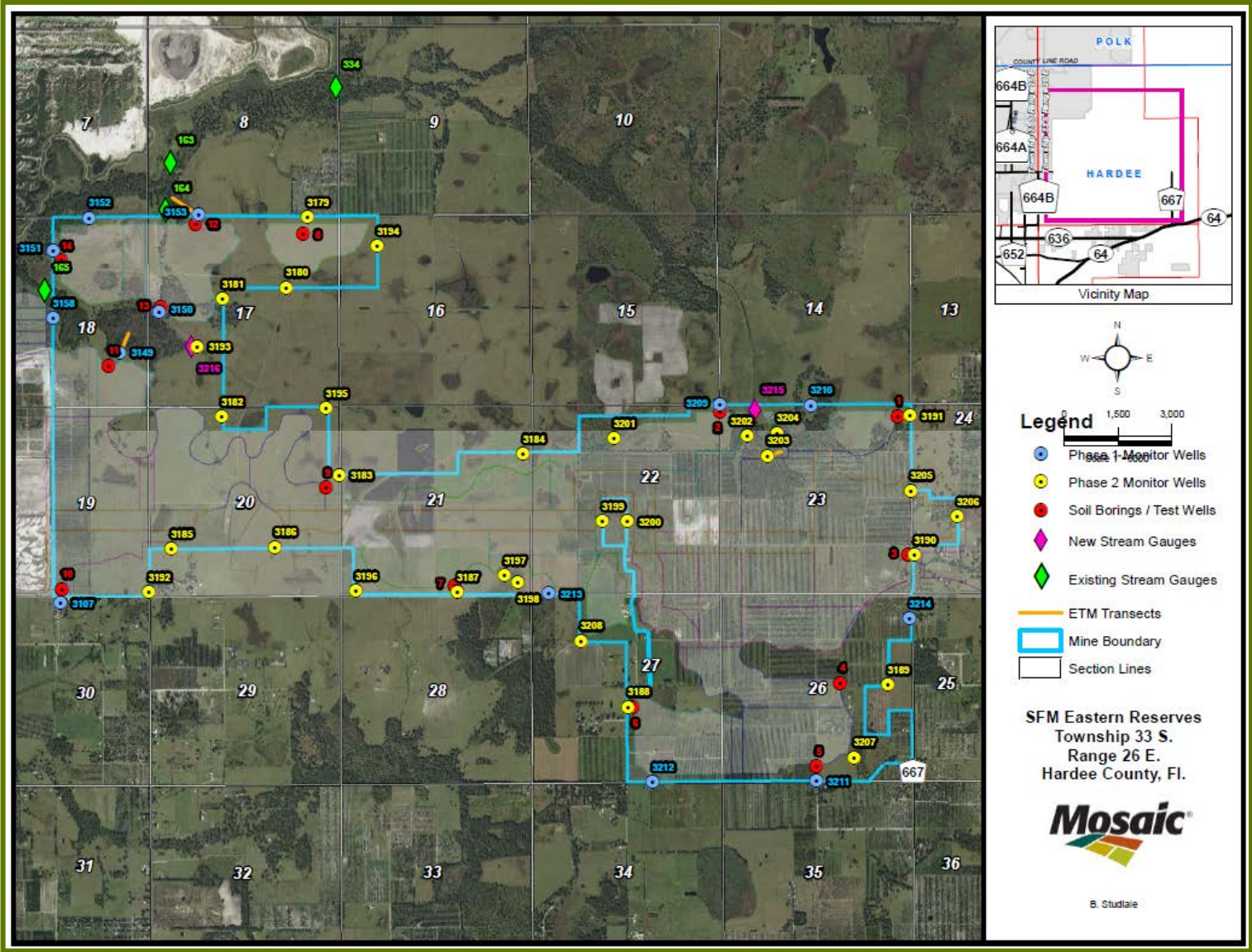
Groundwater Use (Water Use Permitting)

- Groundwater withdrawals are currently authorized by Mosaic's Integrated Water Use Permit (IWUP)
- IWUP establishes facility limitations on groundwater withdrawals for a combination of Mosaic facilities
- Phosphate industry and Mosaic have significantly reduced groundwater use from historic levels
- Since 2012, average usage is approximately 48% of IWUP-permitted quantities
- Overall, Mosaic reuses and recycles approximately 90% of its water, and uses reclaimed water from various municipalities

Groundwater Monitoring Program

- SWFWMD permits require groundwater and surface water monitoring to ensure that mining does not impact these resources
- Over 1,000 piezometers have been installed at Mosaic's mining operations to monitor groundwater levels
- Piezometers are monitored for four (4) consecutive years prior to mining to establish baseline water levels
- Monitoring data is reviewed on a weekly basis by Mosaic staff and reported monthly to SWFWMD, FDEP, and County authorities
- Mosaic also conducts periodic assessments of approximately 125 preservation areas to ensure wetland conditions are maintained

Piezometer Network – South Ft. Meade Eastern Reserves



Coordination with SWFWMD

- SWFWMD routinely conduct inspections of Mosaic's groundwater mitigation programs:
 - Pre-mining monitoring network establishment
 - Groundwater protection design (recharge ditches)
 - Routine inspections of preservation areas during mining activities to ensure wetland conditions are maintained
 - Annual environmental monitoring plan summary tours

Investigation of Groundwater Concerns

- The IWUP requires Mosaic to investigate groundwater concerns identified at properties near mining activities
- Mosaic coordinates with SWFWMD staff following reported groundwater and/or water quality concerns
- Groundwater monitoring data and usage is reviewed by Mosaic staff to assess relative groundwater levels
- An onsite assessment of the concern is typically conducted by Mosaic or a third party
- Results of investigation are provided to SWFWMD, FDEP, County staff and the subject property owner

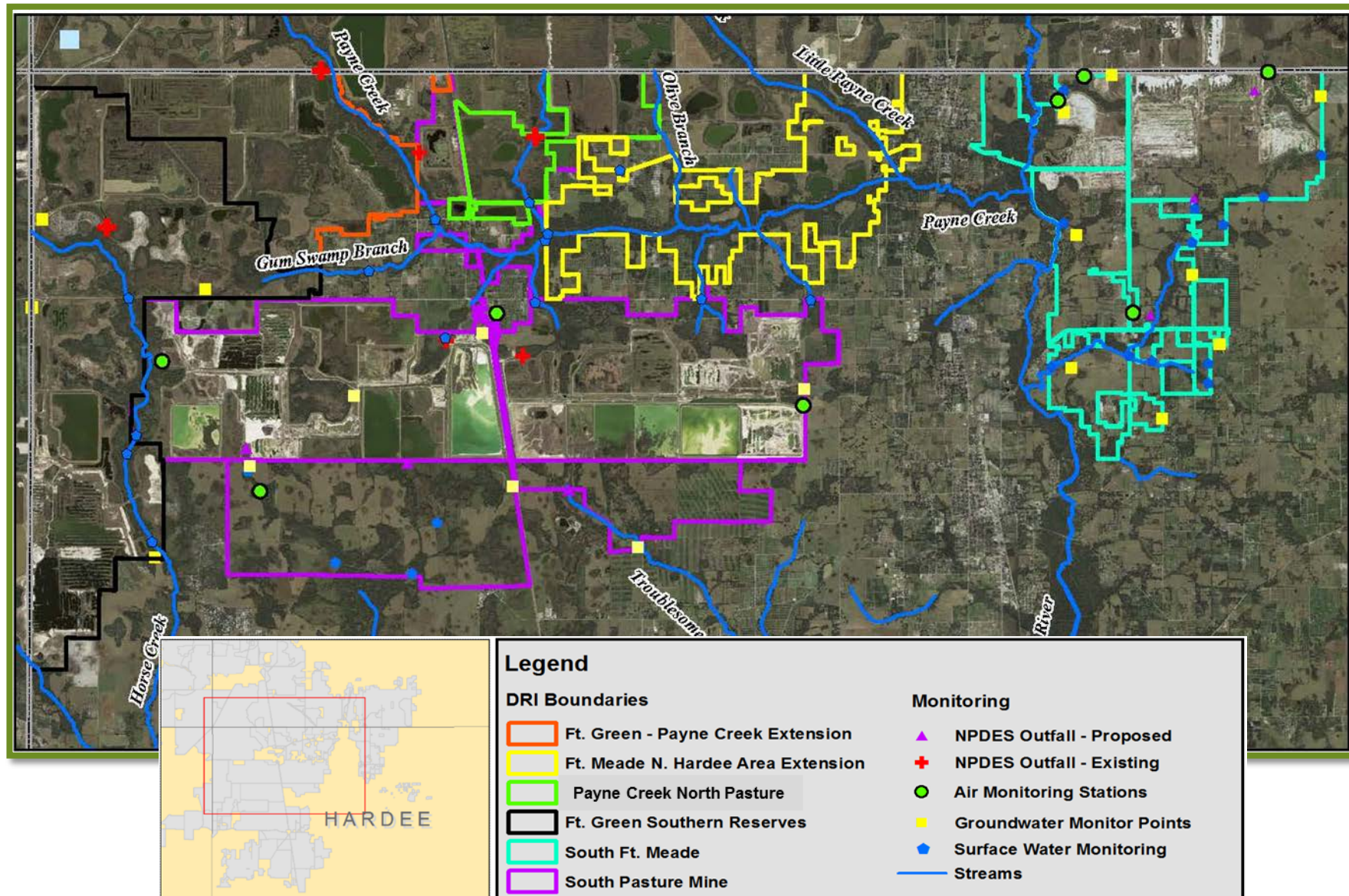
Mosaic Water Quality Monitoring Topics

- Water Quality Field Sampling, Major Analyte Groups
- NPDES Outfall Systems
- Surface Water and Ground Water
- Piezometric Well Water Level Monitoring
- Meteorological and Climatological
- QA/QC Measures and Regulatory Oversight
- Anomalous Measurements and Response
- Field Sampling Conclusion

Water Quality Sampling Analyte Groups

- Many of the aspects of field sampling, including equipment decontamination procedures, sample collection methods, appropriate materials of sample container construction and preservation techniques are based on “analyte groups”.
 - **Organics**- Oil & Grease, PAH’s, PCB’s, Benzene, Toluene, Haloethers, etc.
 - **Inorganics**- Nitrogen, Phosphorous, Ammonia, Chloride, Fluoride, etc.
 - **Bacteriological**- Total/Fecal Coliforms, *E. Coli*, *Enterococci*, *Salmonella*, etc.
 - **Radiological**- Gross Alpha Particle Activity, Radium 226/228, Uranium, Radon 222, etc.
 - **Metals**-Iron, Aluminum, Magnesium, Copper, Lead, Mercury, etc.
 - **Biological**- Chronic/Acute Toxicity, Chlorophyll-A, algal taxonomy and enumeration, etc.
 - **Field Measurements**- Ph, Specific Conductance, Dissolved Oxygen, Temperature, Turbidity, Salinity, Total/Free Chlorine Residual.

Water Quality Monitoring Assets



NPDES Outfall and Storm Water Management Systems

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- Effluent (water being discharged) monitoring occurs on a routine basis (weekly, monthly, quarterly, semi-annually, and annually). Each NPDES outfall is assigned a “background” and “downstream” monitoring station in the same receiving body to assure that discharge effluent will not impact watershed.
- All sampling must be conducted in accordance with FDEP SOP-001.
- Effluent is sampled for parameters and analysis set forth in each facilities unique NPDES permit.
- Continuous monitoring for volume of water being discharged occurs using dedicated instrumentation at each outfall.
- Florida NPDES permits have an anti-degradation policy:
 - FDEP cannot permit discharges that will degrade a water body such that it no longer meets its designated use

NPDES Outfalls



Surface Water Monitoring

- Mosaic maintains over 250 surface water monitoring locations.
- Sampled per operational permitting requirements for over 100 water quality parameters.
- Samples are collected daily, weekly, monthly, quarterly, semi-annually, and annually based on different permitted compliance requirements.
- All surface water systems are monitored by Mosaic, must meet or exceed the FDEP Class III standards for surface water quality as set forth in FAC 62-52.530.
- Surface water quality/ quantity data submitted by Mosaic routinely for regulatory review and oversight.
- Continuous monitoring via data logging instrumentation.
- Mosaic Environmental Technicians use processes and procedures set forth in Florida Department of Environmental Protection Standard Operating Procedures for Field Monitoring (FDEP-SOP-001) when performing surface water quality monitoring.

Surface Water Monitoring Stations

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Groundwater Monitoring

- Mosaic maintains over 300 groundwater monitoring wells.
- Sampled for over 100 water quality parameters, per operational permitting requirements.
- Samples are collected daily, weekly, monthly, quarterly, semi-annually, and annually based on different permitted compliance requirements.
- Groundwater quantity/quality data submitted by Mosaic routinely for regulatory review and oversight.
- Mosaic Environmental Technicians use processes and procedures set forth in Florida Department of Environmental Protection Standard Operating Procedures for Field Monitoring (FDEP-SOP-001) when performing groundwater quality monitoring.
- Wells range in depth from 10' to over 1000' deep, spanning the shallow, intermediate, and deep Floridan aquifer.
- Continuous water level monitoring via data logging instrumentation installed under certain circumstances.

Groundwater Monitoring Stations

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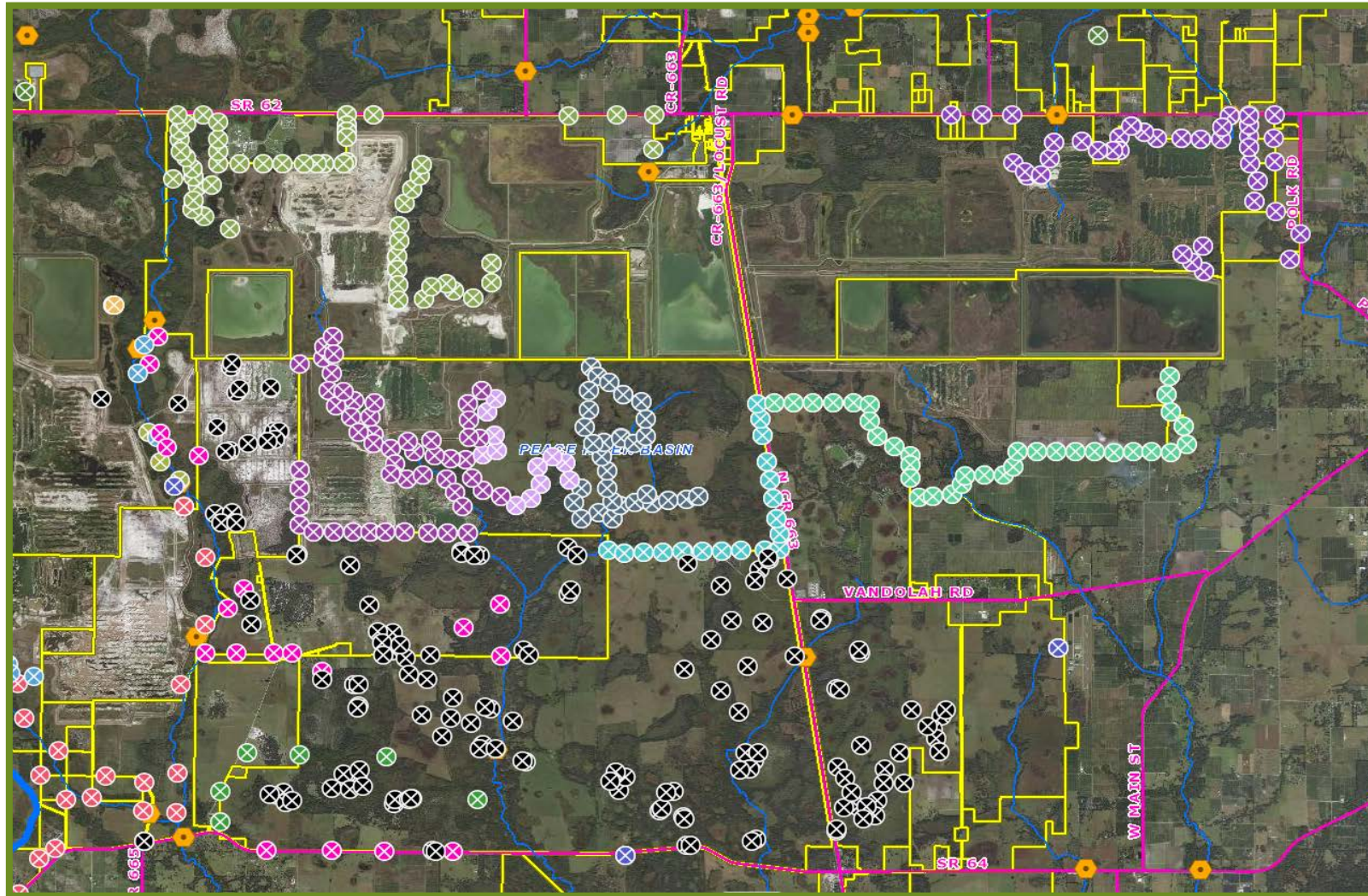
Piezometric Wells (Ground Water Elevation)

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- Over 1500 piezometers monitored by Mosaic.
 - Situated at property boundaries and adjacent to preservation areas.
- Piezometers are located near storm water management systems, preservation areas, streams, and wetlands.
- Monitor groundwater levels adjacent to the mining operation.
- Levels monitored before, during, and after mining.
- Monitored on a weekly basis, data submitted to SWFWMD for review and oversight.
- All readings are logged redundantly, on both paper field sheet and entered into smartphone application connected to Mosaic database.



Hardee County Piezometric Well Network



Piezometric Well Monitoring

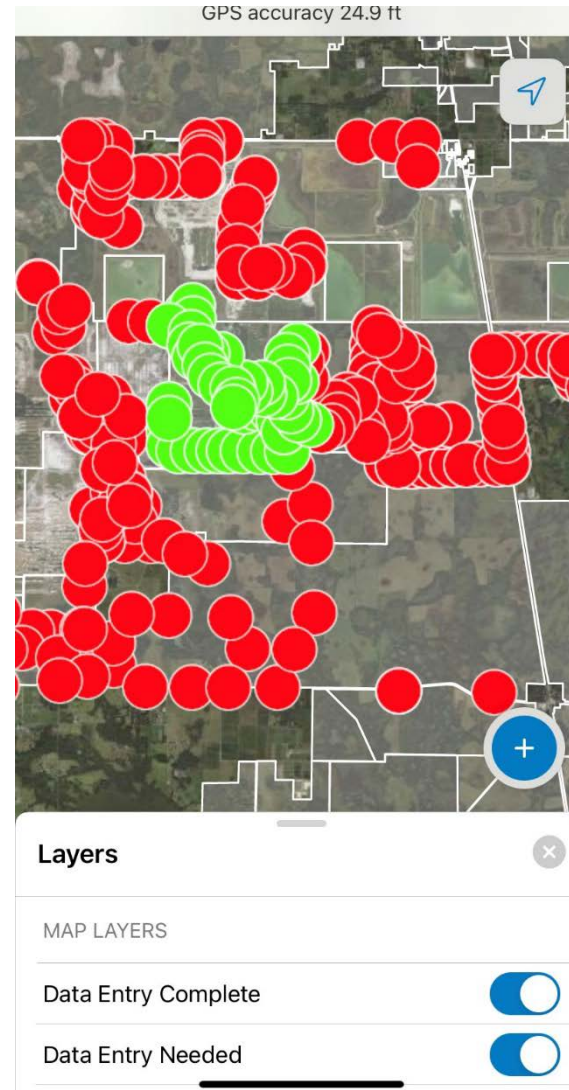
Four Corners Reclamation Wetlands
Weekly

Personnel: L McCary

Rec. ID#	Serial ID#	Reading:	Date:	Rec. ID#	Serial ID#	Reading:
112	15125	2.40	9-28-18	171	15127	2.77 9-27-18
117	15128	2.38		175	15126	2.81 9-27-18
120	15110	3.30		185	15109	2.97 9-28-18
122	15107	2.82	9-27-18	189	15108	3.36 9-27-18
127	15106	2.70	9-27-18	302	15134	2.39
129N	15122	3.04	9-28-18	303	15167	3.41
129S	15123	2.25		306	15136	3.31
131	15121	2.22		311	15135	3.60
133	15120	3.60		320	15133	5.94
135	15124	3.93		323	15130	2.10
139	15115	NA		326	15139	8.80
140	15116	NA		357	15138	6.25
141	15119	3.10		361	15143	2.84
141S	15117	1.21		363	15142	NA
141W	15118	2.38		365	15141	2.72
145	15114	6.81		369	15140	2.90
147	15112	2.97		920	15131	3.40
149	15111	1.90		925	15132	2.70
151	15113	2.94				

Comments: 363 - unable to access Piezo

Deep standing water



Data Entry Needed: MON-1099 671270.39E 1145293.22N 8.7 mi

Created by
ARCGIS · 1 day ago

SAMPLE_POINT_AREA
Ona Permitting Piezometers

SERIALNUMBER
1099

EC_FACILITY_NAME
MON-1099

CURRENT_READING
-

CURRENT_COMMENT
-

CURRENT_IWUP_CODE
Normal

CURRENT_AGENCY_COMMENT
Normal

PREVIOUS_READING
4.05

Meteorological and Climatological Monitoring

- Continuous monitoring of weather and atmospheric conditions:
 - Ambient Air Temperature
 - Barometric Pressure
 - Wind Speed
 - Wind Direction
 - Precipitation
 - Relative Humidity
- Mosaic personnel perform weekly download of weather data and perform preventative maintenance on monitoring equipment/instrumentation.
- Meteorological data used for environmental reporting purposes, per facility operational permits and to support internal water management, strategy, and modeling efforts.

Weather Station and Rain Gauge

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Quality Assurance and Quality Control

- Mosaic Field Environmental Technicians who perform physical sampling are routinely trained and updated on FDEP SOP's for Field Monitoring.
- Strict adherence to SOP's insured by both internal and external audit process of sampling procedures by regulatory authorities.
- All meters are calibrated per FDEP SOP-001 preceding and proceeding any water quality sample collection activities.
- All meter and probe maintenance is documented.
- Each water quality monitoring program is designated unique field sampling documentation.

Precision Measurements, Why They Matter

- During routine regulatory audits of Mosaic's internal water quality sampling activities (CEI or Compliance Evaluation Inspection), FDEP reviews all calibration and sampling documentation.
- Provides feedback to Mosaic, compliance is a "two-way-street".
- FDEP requisitions feedback on SOP for the collection of environmental samples from all parties subject to regulation.
- Major difference between store bought water testing "pens" and precision water quality measurement instrumentation accuracy. The latter is industry standard for professional field sampling activities, the former is unacceptable for these activities.
- Ability to precisely calibrate instrumentation using multiple standards of measurement, ability to store and log collected data for audit purposes, overall ruggedness and reliability for daily use, level of accuracy.



Anomalous Measurement Investigation Process

- Something out of the ordinary has been noted, now what?
- Environmental Field Technicians are on the front line at detecting water quality anomalies and assisting with the determination of cause.
- Is there an equipment issue? Has the meter calibration been checked, then rechecked? Has a CCV (continuous calibration verification) been performed? Have all wires, probes, connections, and membranes been visually inspected?
- Once equipment issue is ruled out, a collaborative approach between multiple internal groups is utilized to determine cause.
 - Electronics and water are a difficult combination to make work well together, routine maintenance is required for consistent meter accuracy and reliability.
 - Equipment issues are noted to be the cause of anomalous water quality readings most of the time.
- What are the meteorological conditions at the sample location where anomaly was noted, could they affect water quality? Is there another natural, or operational cause to consider?

Field Sampling is Completed, Now What?

- Samples have been collected from the field and preserved correctly per FDEP SOP-001, then placed on ice for transport to environmental laboratory.
 - Sample preservation is a crucial part of the overall water quality data collection process.
 - Different parameter analysis methods require different sample preservation techniques to be performed after sample is collected, and prior to laboratory receipt.
 - Ph buffering with acids, sample bottle color distinctions, temperature control with ice.
- Chain of Custody utilized to document sample ownership from field collection to laboratory analysis, this is a legal document and subject to regulatory audit.
- Environmental Technician physically relinquishes custody of water quality samples from themselves, to laboratory staff via signature on chain of custody.
- Project specific sampling documentation is used by laboratory staff to instruct them on what analysis is required for sampling event.

Laboratory Analysis

Josh Lipham/ Technical Director



Certification Program

- NELAP
 - National Environmental Laboratory Accreditation Program
 - ISO based standard (International Organization for Standardization)
 - Accrediting body - FL Dept. of Health
 - Comprehensive Quality System



Scope of Accreditation

- Analytical Hub
 - Inorganic
 - Organic
 - Radiological
 - Microbiology
 - Bioassay



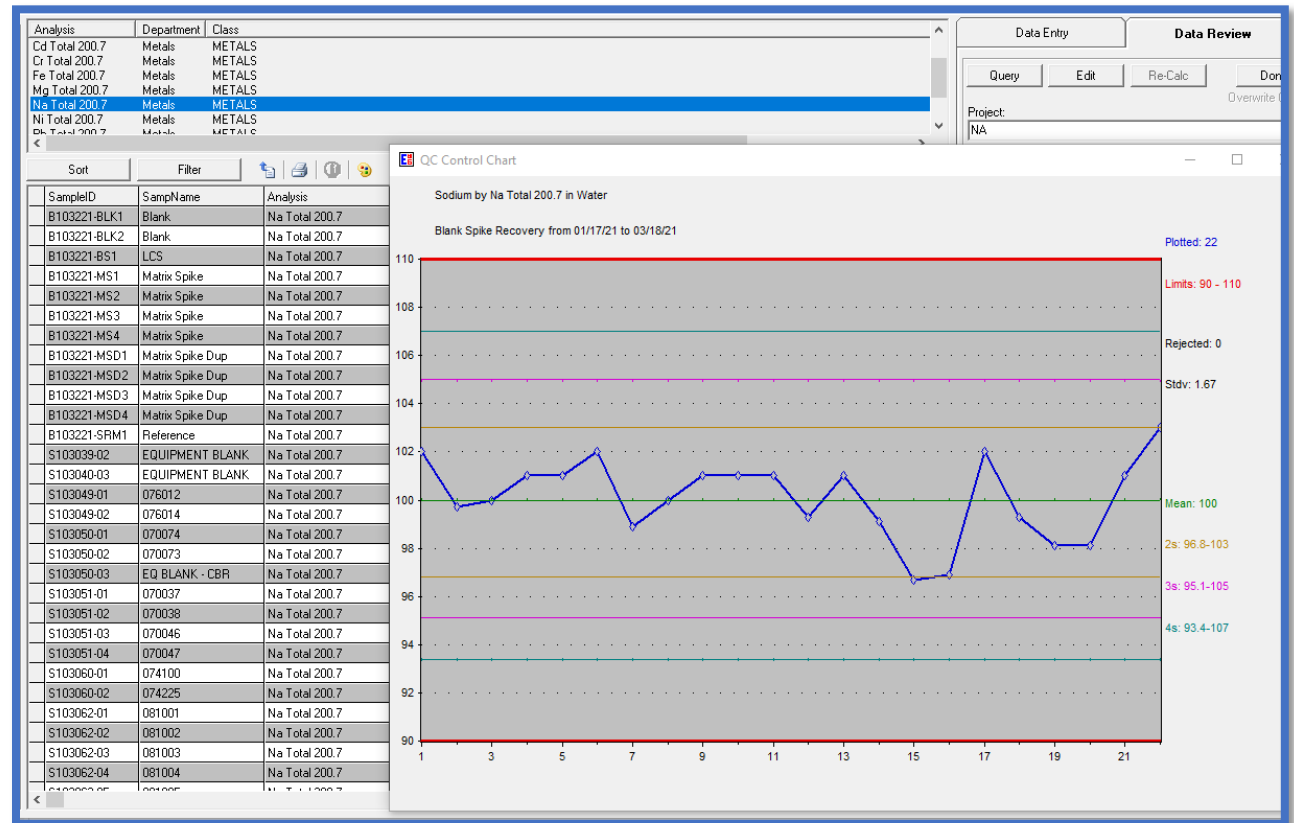
Sample Workflow

- Sample Receiving
 - Chain of Custody
 - Field activity information
 - Appropriate containers
 - Preservations confirmed



Sample Workflow

- LIMS (Laboratory Information Management System)
 - Sample Control
 - Lab Analysis
 - Quality Assurance
 - Reporting



Sample Workflow

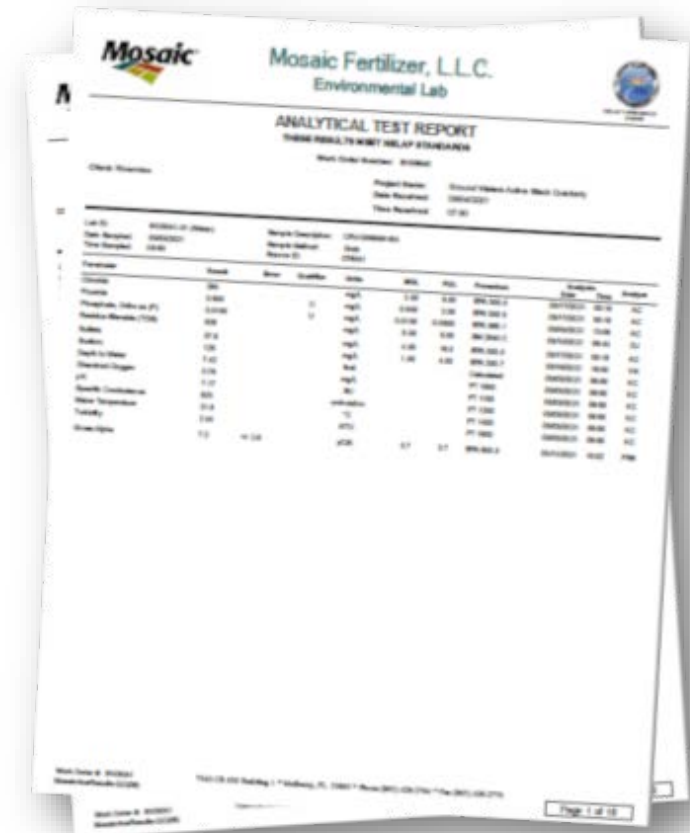
- At the Benchtop
 - Barcoded containers
 - Reagent tracking
 - Data uploads
 - QC verification



Sample Workflow

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- Quality Assurance and Reporting
 - QA Officer evaluation
 - Electronic Data Deliverables
 - Provide data to site specialists for regulatory reporting



Personnel

- Technical Director (NELAP designation)
- Quality Officer (NELAP designation)
- Chemist Associate
- Data Technician
- Lab Technicians



Laboratory Network

- Our Role in Effective Water Management
 - Maintaining a NELAP Quality System
 - Manage data within certified network
 - Deliver high quality results



Beneficiation Analysis

Keith Alam/ Senior Manager Engineering



Beneficiation Process

The process of separating phosphate rock from sand and clay is typically completed in three areas of the beneficiation plant:

- Washer
- Feed Preparation
- Flotation



Beneficiation Process



- Flotation Additives
 - Special additives (mostly biodegradable oils from the pulp and paper industry) are used to coat the phosphate
 - Phosphate physically separates from the sand
 - Sand is pumped back to the field for reclamation



Sand Tailings Monitoring

- Biodegradation of the organic compounds is the principal natural process for the reduction of the organic flotation additives in mine process water.
- Our permits have specific monitoring requirements that focus on the residual flotation additives in mine process waters.
 - Annual sand tailings
 - 5-year renewal

Sand Tailings Monitoring

- Example of the most recent results from Mosaic's South Fort Meade Mine
- Reported to the FDEP on the Discharge Monitoring Reports (DMRs)
- All results show "U"
 - U= Non-Detected (Non-Measurable)
 - Benzene, Chloroform, etc.

Mosaic Fertilizer, L.L.C.

Environmental Lab

ANALYTICAL TEST REPORT

THESE RESULTS MEET NELAP STANDARDS

Work Order Number: S009227

Client: South Fort Meade

Project Name: Sand Tailings

Date Received: 09/24/2020

Time Received: 17:35

Lab ID: S009227-01 (Water) Sample Description: MSF-South Fort Meade Sand Tailings
Date Sampled: 09/24/2020 Sample Method: Grab
Time Sampled: 16:40 Source ID: 003033

Parameter	Result	Error	Qualifier	Units	MDL	PQL	Procedure	Analyte Date	Time	Analyst
1,2-Dibromomethane (EDB, Ethylene dibromide)	0.01		U	UG/L	0.01	0.04	EPA 804.1	10/02/2020	15:54	Bench
Acrolein (Propenal)	0.5		U	UG/L	0.5	2	EPA 824	10/09/2020	12:10	Bench
Acrylonitrile	0.5		U	UG/L	0.5	2	EPA 824	10/09/2020	12:10	Bench
Benzene	0.5		U	UG/L	0.5	2	EPA 824	10/09/2020	12:10	Bench
Bromodichloromethane	0.5		U	UG/L	0.5	2	EPA 824	10/09/2020	12:10	Bench
Bromoform	0.5		U	UG/L	0.5	2	EPA 824	10/09/2020	12:10	Bench
Methyl bromide	0.5		U	UG/L	0.5	2	EPA 824	10/09/2020	12:10	Bench
Bromotrichloromethane	0.5		U	UG/L	0.5	2	EPA 824	10/09/2020	12:10	Bench
Chlorobenzene	0.5		U	UG/L	0.5	2	EPA 824	10/09/2020	12:10	Bench
Chloroethane	0.5		U	UG/L	0.5	2	EPA 824	10/09/2020	12:10	Bench
2-Chloroethyl vinyl ether	0.5		U	UG/L	0.5	2	EPA 824	10/09/2020	12:10	Bench
Chloroform	0.5		U	UG/L	0.5	2	EPA 824	10/09/2020	12:10	Bench
Methyl chloride (Chloromethane)	0.5		U	UG/L	0.5	2	EPA 824	10/09/2020	12:10	Bench
Dibromochloromethane	0.5		U	UG/L	0.5	2	EPA 824	10/09/2020	12:10	Bench
Dichlorodifluoromethane	0.5		U	UG/L	0.5	2	EPA 824	10/09/2020	12:10	Bench
1,1-Dichloroethane	0.5		U	UG/L	0.5	2	EPA 824	10/09/2020	12:10	Bench
1,2-Dichloroethane	0.5		U	UG/L	0.5	2	EPA 824	10/09/2020	12:10	Bench
1,1-Dichloroethylene	0.5		U	UG/L	0.5	2	EPA 824	10/09/2020	12:10	Bench
trans-1,2-Dichloroethylene	0.5		U	UG/L	0.5	2	EPA 824	10/09/2020	12:10	Bench
1,2-Dichloropropane	0.5		U	UG/L	0.5	2	EPA 824	10/09/2020	12:10	Bench
cis-1,3-Dichloropropene	0.5		U	UG/L	0.5	2	EPA 824	10/09/2020	12:10	Bench
trans-1,3-Dichloropropene	0.5		U	UG/L	0.5	2	EPA 824	10/09/2020	12:10	Bench
Ethylbenzene	0.5		U	UG/L	0.5	2	EPA 824	10/09/2020	12:10	Bench
Methylene chloride	0.5		U	UG/L	0.5	2	EPA 824	10/09/2020	12:10	Bench
1,1,2,2-Tetrachloroethane	0.5		U	UG/L	0.5	2	EPA 824	10/09/2020	12:10	Bench
Tetrachloroethylene (Perchloroethylene)	0.5		U	UG/L	0.5	2	EPA 824	10/09/2020	12:10	Bench
1,1,1-Trichloroethane	0.5		U	UG/L	0.5	2	EPA 824	10/09/2020	12:10	Bench
1,1,2-Trichloroethane	0.5		U	UG/L	0.5	2	EPA 824	10/09/2020	12:10	Bench
Trichloroethene (Trichloroethylene)	0.5		U	UG/L	0.5	2	EPA 824	10/09/2020	12:10	Bench
Trichlorofluoromethane	0.5		U	UG/L	0.5	2	EPA 824	10/09/2020	12:10	Bench
Toluene	0.5		U	UG/L	0.5	2	EPA 824	10/09/2020	12:10	Bench
Vinyl chloride	0.5		U	UG/L	0.5	2	EPA 824	10/09/2020	12:10	Bench

Area-wide Environmental Impact Statement (AEIS)

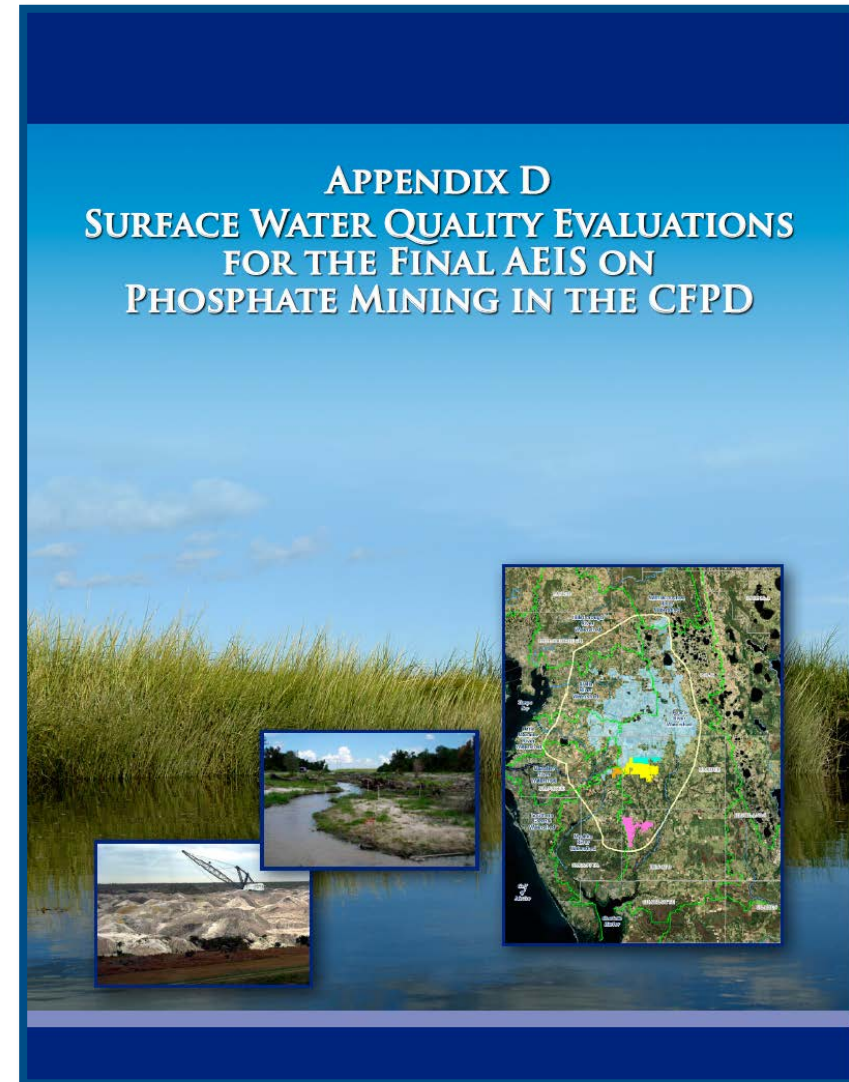
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- In 2010 and 2011, the United States Army Corps of Engineers, Jacksonville District, (USACE) received 4 applications for Department of the Army permits under Section 404 of the Clean Water Act (CWA) from Mosaic and CF Industries, Inc.
- Federal approval of the requested permits would constitute a “Major Federal Action.”
- As a result, the USACE determined that, when viewed collectively, the separate proposed phosphate mining projects have similarities that provide a basis for evaluating their direct, indirect, and cumulative environmental impacts in a single Areawide Environmental Impact Statement (AEIS).
- The Final AEIS, approved in 2013, evaluated the regional environmental and economic impacts of the Applicants’ four proposed mines, as well as the impacts and other reasonably foreseeable alternatives in the Central Florida Phosphate District (CFPD).

Final AEIS

Appendix D: Surface Water Quality Evaluations for the Final AEIS on Phosphate Mining in the CFPD stated:

“Periodic screenings for beneficiation-related chemicals have indicated compliance with primary and secondary drinking water standards. Annual screenings of water used to transport sand tailings for mining-related parameters also show levels that comply with applicable criteria. FDEP continues to monitor such records to ensure that the mining operations are not causing contaminant entry at levels exceeding the applicable standards or reference values.”



Area-wide Environmental Impact Statement (AEIS)

Peter J. Schreuder, PG
President, Schreuder, Inc.

Mr. Schreuder submitted a white paper on behalf of CF Industries, Inc. in April 2011 as part of the AEIS that stated:

“The research conducted has shown that the degradation products of beneficiation reagents used in phosphate mining do not persist in the environment, particularly not in the ground water environment when it has been reconnected to the regional occurrence of the surficial aquifers. It can therefore be concluded that the natural degradation of beneficiation reagents used by the phosphate mining industry has no adverse impact on the environment.”

Florida Institute of Phosphate Research

Patrick Zhang
Research Director, Beneficiation & Mining

“I think the Florida phosphate industry should be commended for leading the world in processing the limited, un-renewable phosphate resource more efficiently than anybody in the world.”

“But the major conclusion of that study is these flotation chemicals are environmentally safe.”

January 30, 2017
Manatee County BOCC
Resolution R-17-017 Wingate East



Mosaic Water Monitoring Programs: Self-Monitoring Enforcement

Vinette Godelia Esq., Partner/ Hopping, Green & Sams



Statutory Violations [Section 403.161, F.S.]

- Part I of Chapter 403, *Florida Statutes*, governs Florida's NPDES program.
- In relevant part, Section 403.161(1), F.S., states that it is a violation for any person to:
 - Cause pollution in a manner that harms or injures human health or welfare, or animal, plant, or aquatic life or property;
 - Violate or become noncompliant with any NPDES permit issued by FDEP; or
 - Knowingly make any false statement, representation, or certification in any document required to be maintained under the NPDES permit, or knowingly render inaccurate any monitoring device or method required to be maintained by the permit.

NPDES Violation Remedies

- Injunctive Relief
- Monetary Penalties
- Judicial Enforcement
- Administrative Enforcement
- Criminal Enforcement

**The above listed remedies are also generally available where there is a violation of the ERP*



Remedies: Injunctive Relief [Section 403.131, F.S.]

DEP has the power to bring a civil action to:

- (1) seek injunctive relief or enforce compliance with Chapter 403, F.S., or any FDEP rule, regulation, permit, clarification, or order;
- (2) enjoin any violation set forth in Section 403.161(1), F.S.; and
- (3) seek injunctive relief to prevent irreparable injury to Florida's natural resources and to protect human health, safety, and welfare caused or threatened by any violation. [Section 403.131(1), F.S.]

In addition to injunctive relief, DEP may seek payment of monetary penalties and fines either administratively or through the judicial system.

Remedies: Judicial Civil & Administrative

[Section 403.121(1), (2), and Section 403.141, F.S.]

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FDEP Judicial enforcement:

- 1) Institute a civil action to establish liability and recover damages for the injury to state natural resources caused by the violation. The court decides on the exact amount of damages, but such damages should cover the state's reasonable costs and expenses in tracing the source of the discharge, controlling and abating the source and pollutants, and restoring impacted natural resources to their former condition.
- 2) Institute a civil action to impose and recover a civil penalty for each violation no greater than \$15,000 per offense. Each day the violation occurs is a separate offense, so penalties compound quickly over time.

FDEP Administrative enforcement:

- 1) FDEP may address cases with penalties of less than \$50,000 through administrative proceedings. The formal administrative enforcement process is typically initiated by serving a Notice of Violation ("NOV") and is finalized through entry of a Consent Order or Final Order.

Remedies: Criminal Enforcement by the U.S. EPA

- The U.S. Environmental Protection Agency retains the ability to pursue criminal enforcement of NPDES violators regardless of whether the permit is issued by state programs.
- Actions can be brought against an organization, or an individual acting within the organization.
- Violation of the Clean Water Act is a felony.



Remedies: Criminal Enforcement by the U.S. EPA

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Activities* that have prompted criminal prosecution

Falsifying NPDES monthly monitoring reports	Failure to properly operate water treatment systems
Repeated or egregious discharge of noncompliant wastewater	Failure to implement proper testing and sampling protocols
Failure to report observable pollutant discharge	Failure to obtain an NPDES permit for outfalls

Data From Real
Cases
Prosecuted
From 2015 to
2021

**None of these cases involved Mosaic or any Mosaic facility*

Punishments

Fines: \$25,000 - \$550,000	Community Service
Restitution: \$100,000 - \$200,000	Public Apology
Probation: 1 year - 3 years	Implementing Environmental Compliance Program
Incarceration: 6 mo. - 15 months	Operator License Forfeiture

Punishments are not mutually exclusive and are often imposed in combination



Questions?

