Kentucky Division of Environmental Program Support

Annual Report

Fiscal Year 2020

(July 2019 to June 2020)

July 2020

Energy and Environment Cabinet
Department for Environmental Protection

502-564-6120 (Lab)
dep.ky.gov/deps

DIVISION OF ENVIRONMENTAL PROGRAM SUPPORT

Mission Statement:

It is the mission of the Division of Environmental Program Support (DEPS) to provide scientific data of known accuracy and precision in a timely manner to programs within the Department for Environmental Protection to enable those programs to make appropriate environmental decisions. The division maintains a technically skilled and properly trained staff and a fully equipped environmental chemistry laboratory to accomplish its mission.

Message from the Assistant Director:

On behalf of all of the staff in the Division of Environmental Program Support, I am once again very pleased to present this year's DEPS Annual Report. This report includes divisional activities and accomplishments that took place during the Fiscal Year 2020 (July 1, 2019 to June 30, 2020).

It has been a year that will be forever engrained in our memories as one that we didn't see coming and even if we had we wouldn't have been able to prepare. The coronavirus and everything that has happened since early March of 2020 easily masks the excitement that had been building during the first 8 months of the fiscal year. The year was coming along with so much positivity that it feels like the air in the room had suddenly disappeared. The individual divisions within the department all have a story to tell about how they have fared during the last few months of FY20. This annual report will concentrate on the progress made despite the COVID -19 roadblock.

In summary the laboratory testing numbers were very similar to the total numbers from the previous year. If not for the change in direction due to the virus the lab would have easily eclipsed last year's totals. Over 4900 samples were logged into our system in FY20 compared to over 5300 samples the previous year. The average turn-around-time (TAT) for samples the past two years, has been virtually the same at around 16 days.

The development of the PFAS Drinking Water method has been a very significant accomplishment for the lab over the past couple of years. The lab not only sees sub part per trillion levels of PFAS in drinking water but now has capability to analyze non-potable water samples following the SW-846 8327 Method. This method will allow for difficult and heavily contaminated sources to be analyzed in a variety of matrixes. Having the ability to analyze samples at both very low level like drinking water and at highly contaminated sites is a must for any lab running PFAS. The Commonwealth is in a prime position (analytically speaking) as the federal and state regulatory statutes are initiated and finalized in the future.

The reorganization of the Environmental Services Branch into its current divisional status was a major milestone in fiscal year 2019. One of the highlights in 2020 involved hiring the appropriate staff into the (3) vacant Chemistry Branch Manager Positions. These internal promotions were a much needed boost to lab moral. With new management in these position the division has been able to concentrate on the larger programmatic needs. COVID-19 protocols, telecommuting and work schedule changes would have been very difficult to handle if these individuals were not hired to help manage their own specific areas.

I am very appreciative of the quality and dedicated staff working in centralized laboratory facility. Their skill levels in their craft and dedication toward their duties are outstanding. I remain optimistic that the worst is behind us and pray for everyone's safety in the coming year.

Michael C. Goss

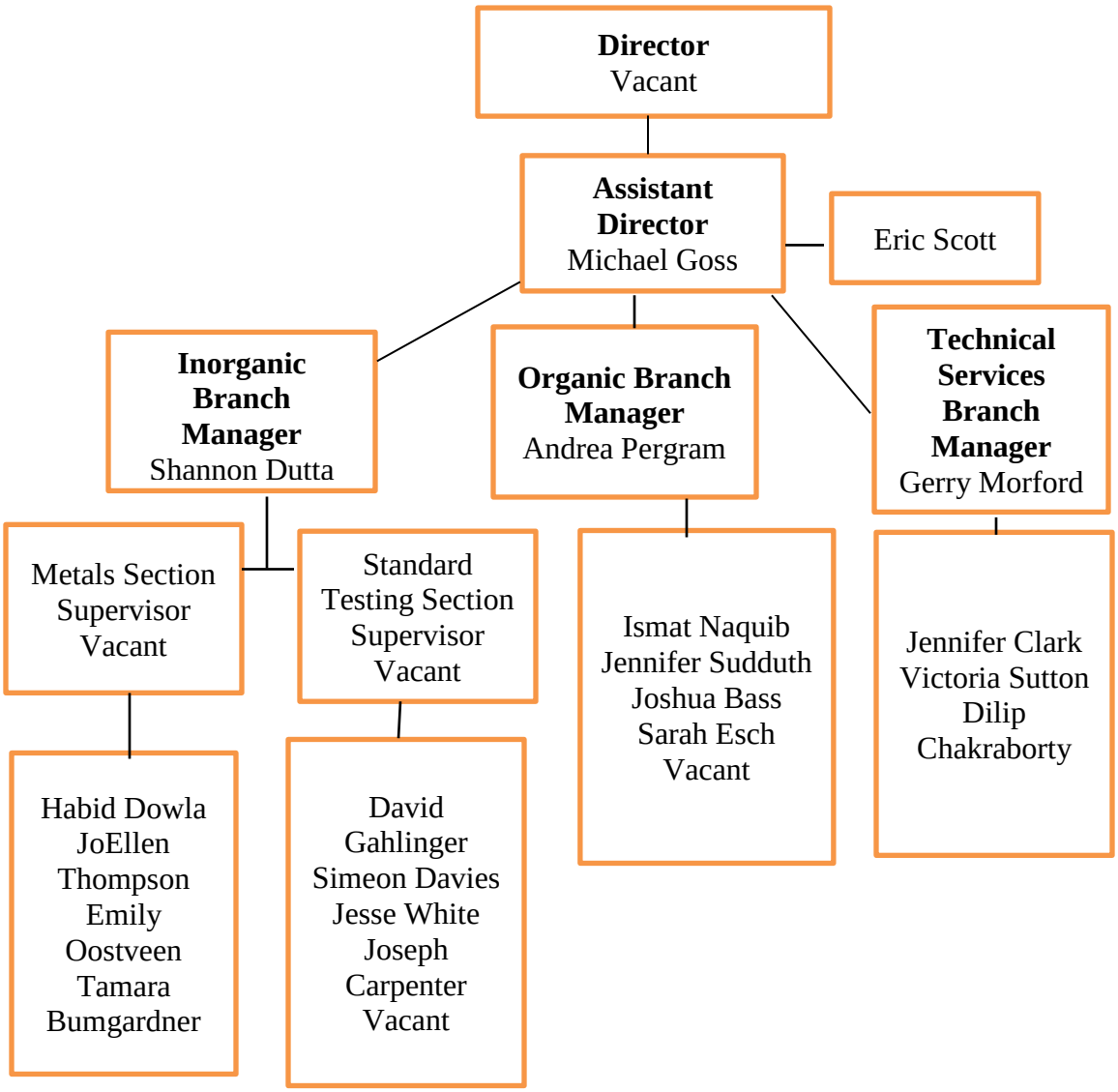
Divisional Background Introduction:

The Division of Environmental Program Support (DEPS) was organized in 2009 (Executive Order 2009-538). The department consolidated internal support functions for the department into the new division to create necessary efficiencies and redundancies. These functions included departmental administrative services, environmental laboratory services, and environmental response team (ERT) coordination. In fiscal years 2015 and early 2016, these functions expanded to include information/public records management, application development human resources management, and departmental budgeting.

In 2017 the Energy and Environment Cabinet underwent another reorganization. This reorganization resulted in the abolishment of GAPS and the transfer of those administrative functions to the newly created Office of Administrative Services (OAS) within EEC. Three branches previously located in the DEPS structure were reorganized into the newly formed OAS. This left the Division of Environmental Program Support with two branches. One being the Environmental Response Branch and the other the Environmental Services Branch. The Environmental Services Branch (ESB) is located at 100 Sower Boulevard in Frankfort in the Central Laboratory Complex. The ERT Branch is located in the 300 building on Sower Boulevard.

The Division of Environmental Program Support underwent its last reorganization November 16th, 2018. This reorganization resulted in the re-establishment of the chemistry laboratory located at 100 Sower Blvd as the Division of Environmental Program Support and the movement of the ERT Branch into the Division of Waste Management. The structure of the DEPS is represented below.

Division of Environmental Program Support



Chemical Analytical Services:

The Inorganic and Organic Branches are responsible for conducting analysis of all current Inorganic and Organic testing found in the LOQAM (Laboratory Operations Quality Assurance Manual). Matrix of samples can be in various forms of water, soil, sediment, solid and fish tissue. In addition the Branches are both responsible for the following as related to inorganic and organic testing, respectfully:

- Developing new methods as requested by the Department for Environmental Protection to meet current programmatic changes and environmental demands;
- Testifying and defending in court all sample results and analytical data originating and reported by the division;
- Conducting all testing related to Proficiency Test (PT) studies to maintain accreditation and certification with both National Environmental Laboratory Accreditation Program (NELAP) and US EPA drinking water certification programs;
- Reviewing and implementing both current and new state and federal laws and regulations that effect DEP programs, including the Clean Water Act, Resource Conservation and Recovery Act (RCRA), Safe Drinking Water Act (SDWA) and the Comprehensive Environmental Response Compensatory Liability Act (CERCLA);
- Yearly evaluation and maintenance of the analytical and quality control procedures as specified in the LOQAM and standard operating procedures;
- Reporting all data to respective clients within 14 days of sample receipt.

The Organic Branch tests:

- Volatile Organic Compounds
- Semi-volatile Organic Compounds
- Pesticides Analysis
- Herbicides Analysis
- PAH Analysis
- PCB Analysis
- Total Petroleum Hydrocarbons
- Oil and Grease
- Diesel Range Organics
- Technical Chlordane
- Diquat
- Haloacetic Acids (HAAs)
- Per & Poly Fluoroalkyl Substances (PFAS)
- Microscystins (HAB)
- Cylindrospermopsin (HAB)
- Anatoxin-A (HAB)
- MBAS
- Glyphosate
- Ethanol
- Endothal
- Glycols
- Toxaphene
- Parquat

The Organic Branch also coordinates, plans and assigns a sample workload for all organic preparation, analysis, and reporting. Annual test requests numbers within the branch can vary from 4,000 to 5,000 individual tests.

The Inorganic Branch, Metals Section tests:

- Total Metals by ICPMS

1. Aluminum
2. Antimony
3. Arsenic
4. Barium
5. Beryllium
6. Cadmium
7. Chromium
8. Cobalt
9. Copper Lead
10. Manganese
11. Nickel
12. Selenium
13. Silver
14. Strontium
15. Tin
16. Thallium
17. Vanadium
18. Zinc

Total Metals by ICP:

1. Calcium
2. Boron
3. Iron
4. Lithium
5. Magnesium
6. Potassium
7. Sodium

- Hexavalent Chromium Analysis
- Mercury Analysis by CVAA
- Low Level Mercury by CVAF
- Toxicity Characteristic Leaching Procedure (TCLP)

The Metals Section also coordinates, plans and assigns a sample workload for all Metals preparation, analysis and reporting. Annual test request numbers within the Metals Section can vary from 9,000 to 10,000 individual tests.

The Inorganic Branch, Standard Testing Section tests:

- Acidity
- Alkalinity
- Ammonia
- CBOD
- Chloride
- Color
- Conductivity
- Corrosivity
- Hardness
- Ion Chromatography
    - Fluoride
    - Chloride
    - Nitrite
    - Bromide
    - Nitrate
    - Phosphate
    - Sulfate
- Total Dissolved Solids (TDS)
- Total Organic Carbon (TOC)
- Total Kjedahl Nitrogen (TKN)
- Total Phosphorus
- Total Suspended Solids (TSS)
- Turbidity

Nitrate
Nitrite
Ortho Phosphate
pH
Phenolics
Residual Chlorine
Settleable Solids
Sulfate

The Annual test request numbers within the Standard Testing Section can vary from 25,000, 30,000 individual tests.

Jennifer Clark (ES4 -Technical Services Branch) checks samples temperature and pH before logging them into the Laboratory Information Management System (LIMS).

The Technical Services Branch serves a different role from the other branches. This Branch is responsible for:

- Overseeing and providing technical support and advice for all testing sections and branches of the division by scheduled and unscheduled audits of methods and procedures within the laboratory;
- Overseeing all aspects(non-analytical) related to Proficiency Test (PT) studies, including placing orders for the tests, ensuring all personnel analyze their respective samples on time, combining results for electronic delivery and distributing the results once received with proper corrective action requests;
- Communicating PT related work with vendors, NELAP and USEPA in order to maintain accreditation and certification with both NELAP and the USEPA drinking water program;
- Communicating knowledge of the current state and federal laws or regulations that effect DEP programs, including the Clean Water Act, Resource Conservation and Recovery Act (RCRA), Safe Drinking Water Act (SDWA), and the Comprehensive Environmental Response Compensatory Liability Act (CERCLA);
- Distribution of Chain of Custody (COC) and copies of sample reports to all clients. All data deliverables are in the electronic form and are refined and suited to best meet the needs of the individual program requests;
- Ensuring all laboratory balances, ovens, refrigerators, freezers, walk-in coolers, incubators, desiccators, thermometers, pipettes and other fine measuring devices are properly maintained, calibrated and checked for inaccuracy as required for NELAP and USEPA guidelines.

DEPS– Activities and Accomplishments

The Division of Environmental Program Support (DEPS) provides laboratory-testing services essential for the identification and characterization of environmental pollutants in the Commonwealth. These services are required by KRS 224.10-100(7) "Secure necessary scientific, technical, administrative, and operations services including laboratory services by contract or otherwise"; and (16) "monitor the environment to afford more effective and efficient control practices to identify changes and conditions in ecological systems and to warn of emergency conditions". Additionally, 40 CFR 123.26 - Requirements for Compliance Evaluation Programs states that "State programs shall have inspection and surveillance procedures to determine, independent of information supplied by regulated persons, compliance or non-compliance with applicable program requirements."

The DEPS has accomplished much over the past several years and hopes to continue its progression as a dependable and reputable lab. The DEPS maintains accreditation status (attained in 2007) under the National Environmental Laboratory Accreditation Program (NELAP). In order to keep this accreditation the lab must continuously pass a very rigorous but well defined testing and auditing process. DEPS lab was audited on-site by NELAP assessors in March of 2019. The accrediting authorities must visit DEPS on-site for a whole week on a bi-annual basis. The lab is currently "Certified" and in good standing with all accrediting entities. This includes US EPA Drinking Water Certification group which last visited the lab in April of 2018. Region 4 DW Certification team visits the lab on-site every third year.

The DEPS continues to maintain a high level of analytical services to the Department. The testing activities of the branch support 18 individual programs managed by the Division of Water (DOW) along with 7 programs within the Division of Waste Management (DWM). DEPS is also the primary laboratory for the Environmental Response Team (ERT). In this fiscal year, 120 samples were brought in and analyzed by DEPS staff in response to ERT request for services. Besides the regular DEP monitoring programs, the DEPS lab provides analytical support for specific Department of Natural Resources (DNR) programs. Through MOAs the lab provides work for both their Cumulative Hydrologic Impact Assessment (CHIA) project and the Abandoned Mine Lands (AML) program. In FY19-20 the lab received 249 DNR related samples. This is much lower than previous years but part of that can be attributed to the coronavirus pandemic. DNR has put on hold all sampling since the middle of March, 2020. DEPS also analyzes a variety of samples for Military Affairs and Kentucky State University on an as needed basis.

Past Years Accomplishments:

Dealing with environmental emergency situations is common for the Division of Environmental Program Support (DEPS) laboratory staff. Over the past several years professional chemistry services have been needed to identify and monitor a number of high profile events. One such notable event happened on the Ohio River in the fall of 2015. The issue related to harmful algae blooms (HABs) that appeared along hundreds of miles of the river and required close monitoring and quick turnaround of results for a specific HAB strain called Microcystin. The DEPS had earlier that year brought on line, two new methods to analyze for HABs and in hindsight it couldn't have worked out any better for DEP. This massive outbreak had many drinking water facilities and municipalities along the Ohio on edge as the bloom approached their communities. It even had Louisville wondering if they would have to cancel an Ironman event that was scheduled to take place. DEPS chemist took on many additional hours, including weekends, to get results that everyone needed to make the "right" decisions.

Harmful Algae Bloom on the Ohio River in October of 2015

In September of 2016, DEPS was asked to provide services in regards to the Long Lane/ Southern Wood property in Montgomery County. Due to the overwhelming high number of samples the soil testing during the remediation stages was handled by an outside contractor; however, DEPS was one of the primary responders to this incident and did both the initial testing at this site in Mt. Sterling and a sister site in Winchester. DEPS was also called upon to provide all of the air monitoring testing at the site over the course of the excavation and remediation process. Over all DEPS ran over 280 samples from both sites.

Per- & Polyfluoroalkyl Substances (PFAS):

In the 2019 DEPS took part in a comprehensive study that garnered some very positive feedback. This study and all of the details surrounding it (background, purpose, scope, analysis, findings and conclusions) are available via this link (https://eec.ky.gov/Environmental-Protection/ Documents/PFAS Drinking Water Report Final.pdf). In summary it was an evaluation study concentrating on Kentucky's drinking water quality and concentrated on 8 specific (high profile) PFAS contaminants. PFAS have been identified as contaminants of emerging concern. These compounds are found everywhere and have been used since the 1940s for their ability to resist heat, oil, grease and water. DEPS role in this study was naturally to provide quality, defensible data on these water sources.

The USEPA's, Third Unregulated Contaminant Monitoring Rule (UCMR3) effort examined the occurrences of six PFAS compounds in drinking water nationwide from 2013-15. In Kentucky, 121 water systems were sampled. In this study 4-6 years later, 81 community public water treatment plants were sampled and analyzed by DEPS over a 4 month period. Each site was sampled in duplicate and included field blanks. The number of PFAS compounds that DEPS reported was eight. Kentucky added 4,8-dioxa-3H-perfluorononanic acid (ADONNA) and Hexafluoropropylene oxide dimer acid (HFPO-DA) or GenX.

Updates on Analytical Instruments:

Replacing equipment with newer, more efficient instruments over time has always been critical to the lab's ability to maintain productivity without additional staff. Over the years the laboratory has been able to acquire funding through various means for the purchase of much needed instrumentation. Sometimes the budget has been able to account for these purchases and sometimes the lab benefits from grant offerings and awards. One of the most notable and expensive purchases in the past year was the Agilent LC-MSMS (Liquid Chromatograph Triple Quadrupole Mass Spectrometer). This instrument

was purchased through the combination of budgeted and USEPA grant money. It is being purposed toward the analysis of PFAS but will also provide DEPS much needed backup capabilities for HABs and Herbicides. This is the second instrument of this type being used in the lab. Besides a Nitrogen Generator that is needed to run in tandem with the LC MSMS, there were no other instrument purchases made in FY20.

Agilent LC-MSMS instrument. Primary analytical equipment being used for PFAS Testing

Testing Numbers:

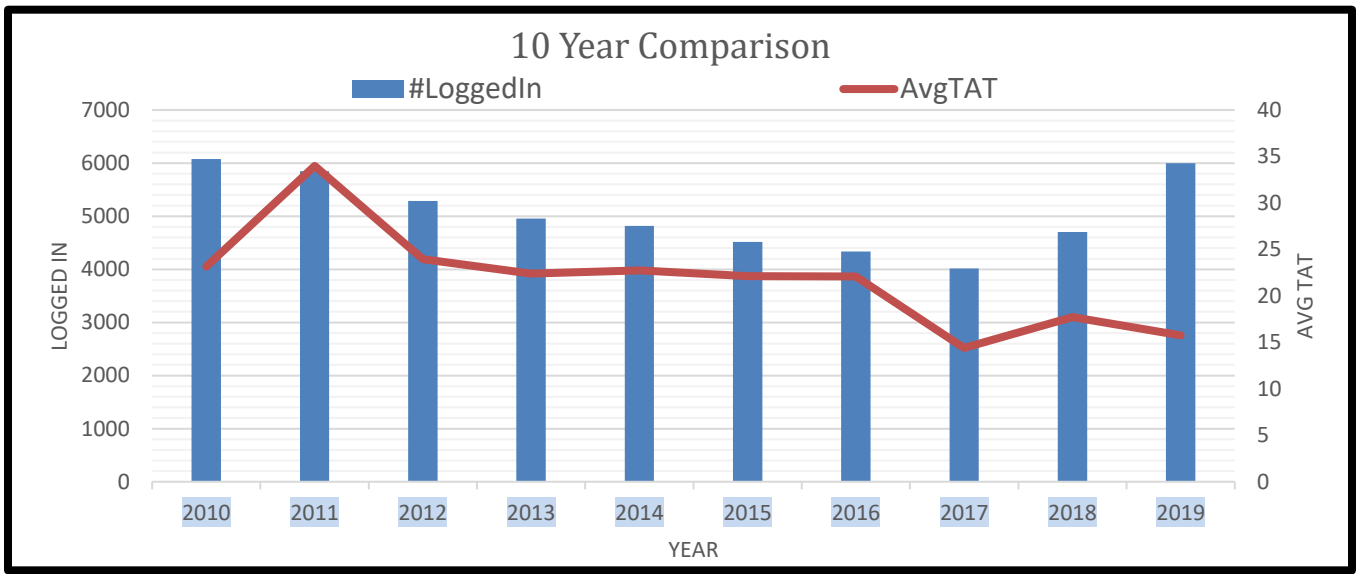
DEPS continues to provide testing services for the Department in accordance with the allocated budget monies. In FY2020, the total number of samples analyzed was (4903) and the average turn-around time (TAT) was 16.43 days. In FY2019, the number of samples analyzed was (5349), with an average TAT of 16.54 days. This is pretty close to the same number of samples and would have been higher this year if not for the pandemic. The last 4 months of this fiscal year saw a cut of 50% in the normal number of samples being analyzed. Field staff could not get out and collect samples like they normally would have. Regardless this has been a very good year for the lab. Staff has continued to work very hard to improve their TAT and have been diligent in making all areas of the laboratory more efficient. Increasing production levels without risk to the quality of service, is the lab's number one goal. Utilizing the most innovative techniques, purchasing the most efficient testing apparatus and emphasizing productive batch sizing have all contributed to this trend.

Please see the worksheet below for a listing of all programs that the DEPS laboratory provided testing for in FY 2020

Fiscal Year 2020 Month by Month Sample Loading

FY2019-20	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June	Total	
A02 – DOW 106 Grant	38	122	20	28		3	7	24	14	5	24	5	290	5.91%
A07 – DOW Lakes - HAB Study	1	21	57	54	1						2	2	138	2.81%
A16 – DOW Lakes	67		61										128	2.61%
A17 – DOW Probabilistic	8	2							12		1	1	24	0.49%
A18 – DOW Drinking Water	31	27	53	71	12	20	17	25					256	5.22%
A19 – DOW Ambient	74	93	79	98	80	82	85	90	75	61	89	70	976	19.91%
A20 – DOW Fish Tissue						20	113	60					193	3.94%
A21 – DOW Groundwater	3	2	4		2	1	2	2		2	5		23	0.47%
A22 – DOW Wild Rivers	3	3		7			7			7	14		41	0.84%
A25 – DOW Reference Reach	8	11	3	9	8	8	6	11	13	7		19	103	2.10%
A29 – DOW Intensive Survey	3	2	2										7	0.14%
A39 – DOW Groundwater Monitoring	17	20	12	18	25	12	21	20	14	6	6	29	200	4.08%
A40 – DOW Floyds Fork Monitoring	41	69	55										165	3.37%
A44 – DOW TMDL	19	10	15	8	16	6			7		1		82	1.67%
A46 – DOW Success Monitoring	110	76	42	38	49	49	50	50	30				494	10.08%
A56 – DOW Wetlands Monitoring	8	39	2	31	13	33	11	17	13				167	3.41%
A66 –Cause and Source Analysis		3	19	20									42	0.86%
A70 – DOW PFAS	71	50	13	24				14	2	26	19	8	227	4.63%
B02 – DWM HW RCRA	12			10	5			3	4	2	9	1	46	0.94%
B03 – DWM HW Solid Waste	14	3	7	11	9	5	2	12	33	6	9	35	146	2.98%
B11 – DWM Oil and Gas Well				9	6								15	0.31%
B13 – DWM Urban Background Study		59	118										177	3.61%
B25 – DWM HW State CERCLA	13	20	17	15	16	2	7	15		17			122	2.49%
B51 – DWM PGDP	8	11	11	11	24	13	9	15	10	2	9	21	144	2.94%
B52 – DWM Maxey Flats						18							18	0.37%
D02 - Internal Lab QC (IDC, MDL)	13	23	9	4	5	7		57	15	24	8	27	192	3.92%
D20 - PT WS Study							14						14	0.29%
D21 - PT WP Study		33		2				33					68	1.39%
D22 - PT Other (Soil)	5		1	10			1			12			29	0.59%
E01 – Emergency Response Team	66	2		22	8	5	7			4	2	4	120	2.45%
P01 – DNR CHIA			67	33		71			73				244	4.98%
P02 - KSU	2												2	0.04%
P04 – DNR AML	1							3					4	0.08%
P05 - Military Affairs		5											5	0.10%
P06 – DNR DOG				1									1	0.02%
Totals	636	706	667	534	279	355	359	451	315	181	198	222	4903	100.0%

The 10 Year Comparison chart below reveals how things are trending and captures one significant achievement this past year. The number of samples that the lab has been receiving was trending down to a low in 2017 but has been trending back up in 2018 and 2019. The amount of time that the laboratory staff spent on running the samples and getting the reports back to the clients has dropped from a high of 33 days in 2011 to a low and more respectable time frame of 15.75 in 2019. The labs goal is to get samples back within 14 days. With staff levels lower than it is used to having it will be a challenge as the sample numbers increase over time. Adjustments will need to be made as things return back to normal.



Certification, Quality Control and Proficiency Testing:

In order to maintain certification by the National Environmental Laboratory Accreditation Program (NELAP) and the USEPA, the Division of Environmental Program Support laboratory must run periodic blind tests or proficiency tests (PTs) for all of the parameters the lab is registered to analyze and report. The PT provider or testing agency is a NELAP registered chemical manufacturing business and is certified for this responsibility. DEPS must pass the blind test for each non-potable water analyte, twice each year. The USEPA Water Certification Program requires that the laboratory pass each drinking water analyte, once each year. Here is how DEPS performed in Calendar Year 2019 on PTs.

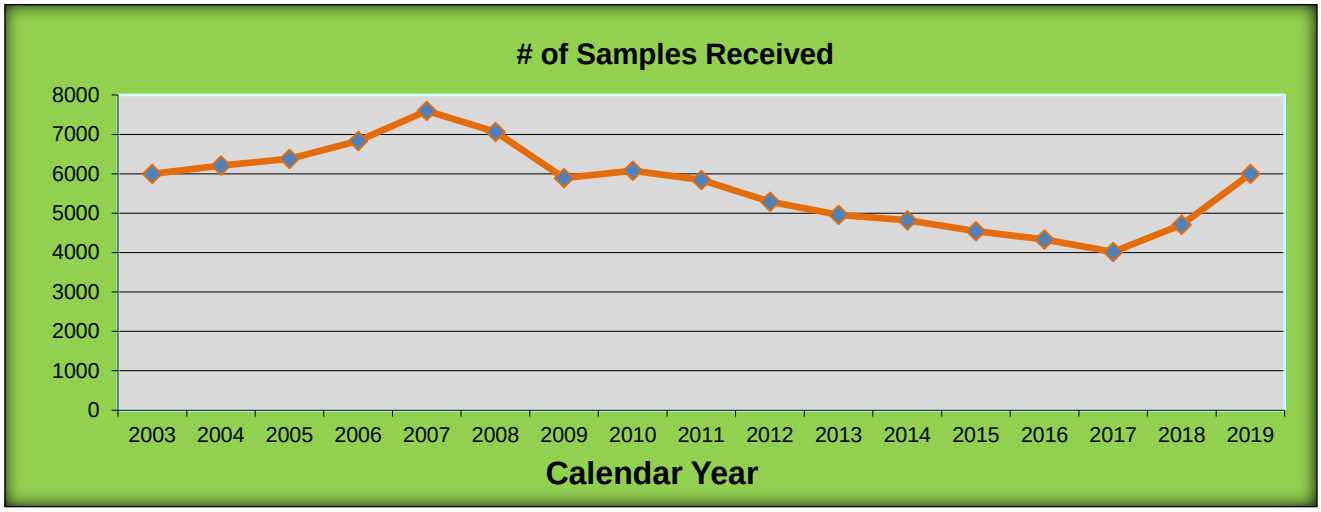
Study Name	Method	#Analytes	#Failed	%Passed
WS-0119	GC-Mass	98	0	100.0
	PCB/Pest	58	0	100.0
	Samp Prep	0	0	na
	Metals	25	5	80.0
	Standard Testing	31	0	100.0
WS-total_2019		212	5	97.6
WP-0219	GC-Mass	298	0	100.0
	PCB/Pest	89	0	100.0
	Samp Prep	2	0	100.0
	Metals	33	3	90.9
	Standard Testing	35	0	100.0
WP-0219-Total		457	3	99.3
WP-0819	GC-Mass	298	2	99.3
	PCB/Pest	89	0	100.0
	Samp Prep	2	0	100.0
	Metals	33	0	100.0
	Standard Testing	35	1	97.1
WP-0819-Total		457	3	99.3
HW-0419	GC-Mass	139	0	100.0
	PCB/Pest	44	1	97.7
	Samp Prep	1	0	100.0
	Metals	34	5	85.3
	Standard Testing	1	1	0.0
HW-0419-Total		219	7	96.8
HW-1019	GC-Mass	139	2	98.6
	PCB/Pest	44	0	100.0
	Samp Prep	1	0	100.0
	Metals	34	1	100.0
	Standard Testing	0	0	100.0
HW-1019-Total		218	3	98.6
Grand Total: WS/WP/HW-2019		1563	21	98.7

Other Notable Quality Control Activities:

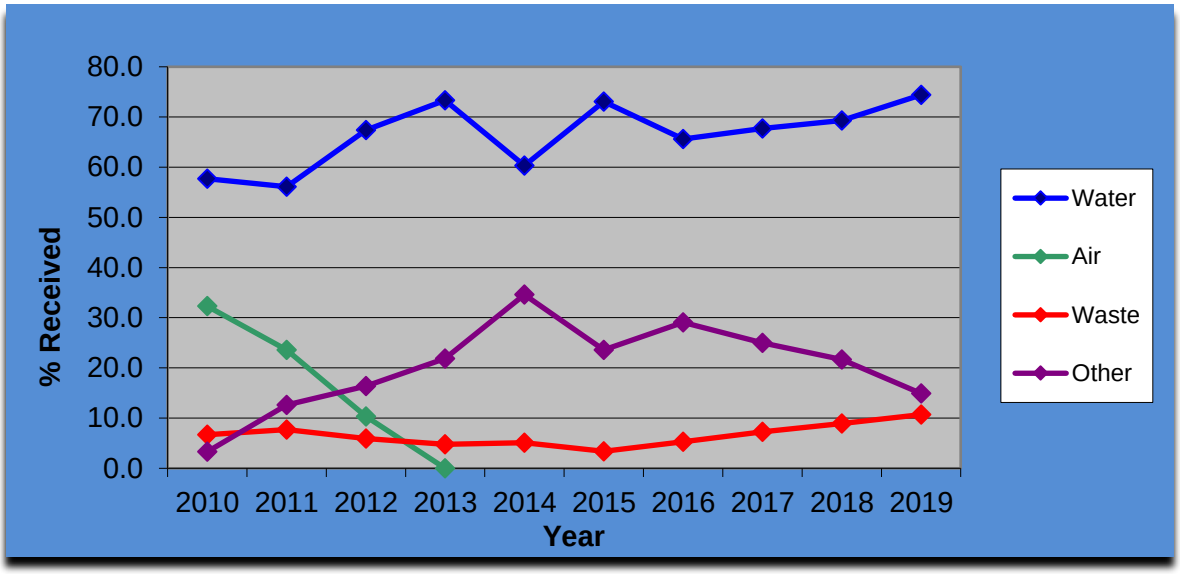
- 58 Standard Operating Procedures (SOPs) were either written or revised in 2019. All SOPs are reviewed annually and either updated or documented as needing no changes.
- The Laboratory Operations and Quality Assurance Manual (LOQAM) and 15 Appendices were updated during 2019.
- In addition, documentation of MSDS sheets, standard and reagent tracking and preparation records, corrective action forms, NIST traceability of weights, certified thermometers and temperature devices were created and maintained. Calibration checks on the support equipment, such as temperature data loggers, thermometers used for certification, weights, and ovens and pipetting devices, required for accurate laboratory results were also performed throughout the year. Since the majority of the samples and standards in the laboratory have specific temperature preservation requirements, temperature data files for the laboratory refrigerators, freezers and incubators were generated to track temperature changes. Initial Demonstrations of Capability for new methods, annual Ongoing Demonstrations of Capability and Method Detection Limits were performed by the analysts.

Over the past several years the DEPS laboratory has undergone a significant number of changes that affect laboratory testing output. These changes include but are not limited to reorganizations, budget cuts, monitoring adjustments/requests by other divisions, lab resource reallocations (human and lab space) and instrument purchasing strategies. The total sample numbers has made a turn upward the past couple of years and started the year in a positive direction. As stated before, the pandemic has interfered with field sampling activities and the total number were on a decline during the last part of the fiscal year. Time will tell if things rebound back in a positive direction.

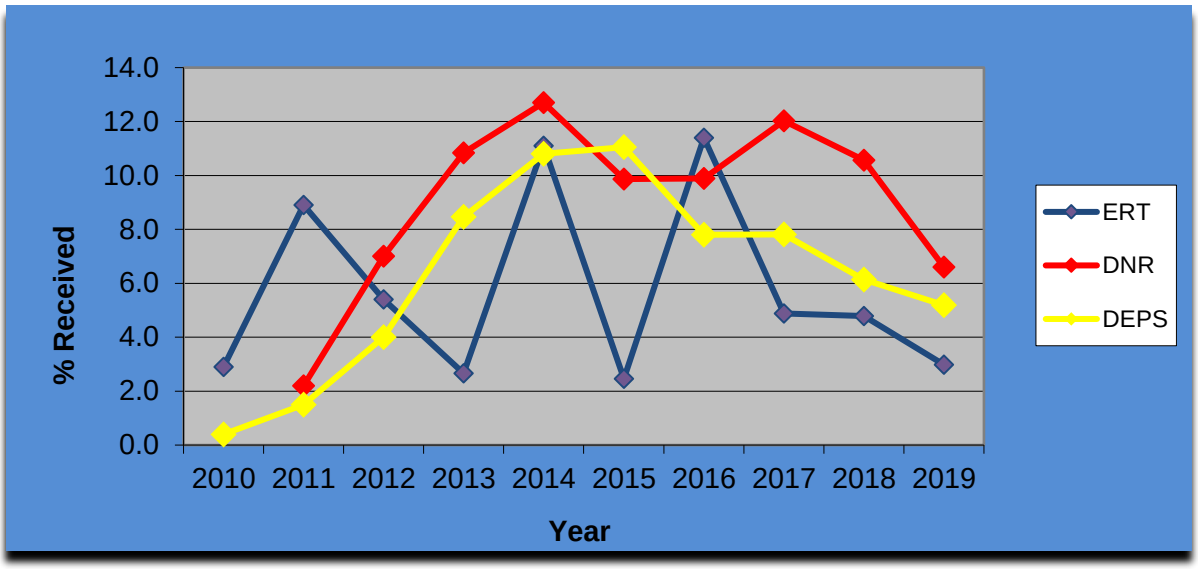
Division of Environmental Program Support – Samples Received from 1/01/03 to 12/31/19



The below graph shows the percentage of samples coming into the lab (past 10 years) from the different Divisions within the Department.



Last 10 years of Other category in the graph above broken down for clarity.


14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
% Received
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Year
ERT
DNR
DEPS