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24 November 2020

The Lawrence **Field Operations Campus**
Master Plan

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Attachment A - Existing Conditions Analysis

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1

Introduction

The Lawrence Field Operations Campus. In early 2018, the City of Lawrence, Kansas streamlined City services to create the Municipal Services and Operations Organization, commonly referred to as MSO. The Organization is divided into several Divisions that provide services to the collective of residents and businesses in Lawrence. It is the desire of the City to create a single campus-oriented facility that consolidates the Field Operations for MSO Divisions--along with two Field Operations Divisions within the Parks and Recreation Department. Construction of a Field Operations Campus will result in numerous efficiencies related to time and expenses saved.

In 2019, a Design Team led by Dake Wells Architecture, Oertel Architects and CFS Engineers was retained to develop a Program and Conceptual Design for the Lawrence Field Operations Campus.

Brief summaries of the field operations for each Division are as follows:

CMG – Central Maintenance Garage
The Central Maintenance Garage provides service and repair to the entire fleet of City owned equipment. Maintenance staff are responsible for day to day preventative maintenance services, as well as detailed large scale repairs, including repairs of specialized equipment. Divisional leadership is responsible for all fleet asset management, including fuel management and fleet equipment purchase and replacement.

FAC – Facility Maintenance Division
The Facility Maintenance Division is responsible for the maintenance and continued operation of the current 258 facilities owned and operated by the City of Lawrence. Services include HVAC, electrical, plumbing, building structure maintenance and grounds maintenance.

FOR – Forestry Division
The Forestry Division works to protect and maintain street trees throughout the City of Lawrence, enhancing community image and pride through the beautification of public spaces. Forestry works closely with Streets, Water, Wastewater, Traffic, and Horticulture Divisions as well as other Parks and Recreation facilities to provide these services.

HOR – Horticulture Division
Horticulture Division staff provides maintenance and services which beautify and preserve parks, natural areas, municipal building exteriors, right of way landscaping, and traffic landscaping throughout the City of Lawrence to enhance community image and civic pride. Horticulture works closely with Forestry staff and Parks and Recreation facilities to provide these services.

HHW – Household Hazardous Waste Facility
The Household Hazardous Waste Facility is a component of the Environmental Division for the City of Lawrence, and is a joint venture between the City of Lawrence and Douglas County. The purpose is to provide residents a proper and easy way to dispose of common household hazardous waste, and to remove these dangerous items from traditional waste streams, reducing the threat to the environment and overall public health.

INS – Inspections Division
The Inspections Division provides installation and repair oversight for all City of Lawrence infrastructure construction and repair activities.

SWD – Solid Waste Division
The Solid Waste Division has been a City service since 1946 and provides a valuable service to Lawrence residents. The collection services are provided to residential and commercial entities within the City. Collections include trash, recycling, yard waste, bulky items and tires. The Division maintains a stock of commercial dumpsters and an operational vehicle fleet that requires specialized work areas.

STWT – Stormwater Division
Stormwater Division staff oversee the construction and maintenance of stormwater infrastructure throughout the City of Lawrence and are closely integrated with the Streets Division.

STRT – Streets Division
The Streets Division provides day to day general maintenance for the network of City roads and supports other Divisions in their respective maintenance of City infrastructure.

TRAF – Traffic Division
The Traffic Division maintains and monitors signs and signals throughout the City of Lawrence. To accomplish this mission, the City makes, stores and repairs signal equipment as well as street and traffic signs. The Division works closely with Streets, Water and Wastewater Divisions for use of signs in addition to coordinating maintenance activities.

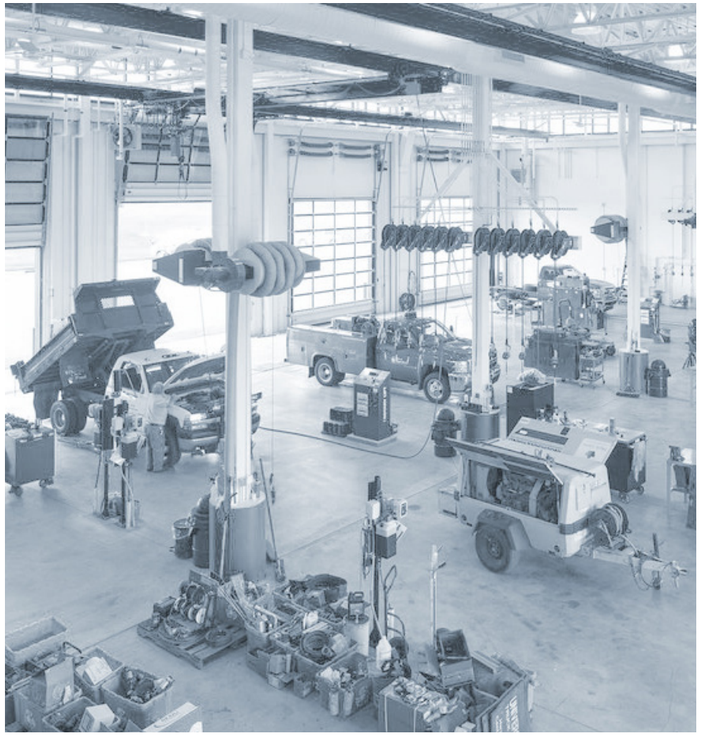
WSWT – Wastewater Collections Division
Wastewater Collection staff is responsible for maintaining the City's sanitary sewer system. Their work efforts prevent sewer backups and overflows to homes and businesses within the City.

WTDT – Water Distribution Division
Water Distribution staff is responsible for maintaining the water distribution system for the City of Lawrence. They ensure clean water and fire protection to everyone within the City. Water Distribution services include providing water meters, as well as servicing and repairing the entire water distribution network. The Water Distribution Division operates closely with the Streets Division and Wastewater Collections Division.

2

Project Imperatives

Based on feedback from MSO staff, the Design team developed a series of Project Imperatives that embody the spirit and goals of this project. Aside from addressing Divisional needs, key priorities for the project include: creating operational efficiencies, developing safe and healthy work environments, remediating the contaminated Farmland Site, enhancing the local ecosystem, and showing respect to the surrounding community. Although these imperatives may continue to adapt and change, they will remain at the forefront of the design process in the Master Panning phase.



1. **Consolidate municipal operations onto a single campus.** Create a Master Plan for an efficient campus environment, encouraging spaces shared by multiple Divisions.

2. **Remediate the Farmland site through phased construction.** Develop a phasing strategy that allows for the site to be methodically remediated over time.

3. **Improve working conditions and safety.** Conditions in some existing facilities do not meet current standards with regard to operation, ventilation, safety and flood mitigation. It is imperative that the staff that provide critical services are allowed to work in an efficient, safe facility.

4. **Be a great neighbor.** The Farmland site is adjacent to a residential neighborhood. Carefully study impacts and design to control traffic, sound, visual and light impacts on this community through careful design.

5. **Embrace Sustainable Design**. Understand the implications of baseline and "code minimum" thinking and consider design strategies that prioritize resource efficiency, carbon reduction, and ecosystem rehabilitation.

6. **Design for the present...and the future.** Consider current needs in context of predicted future industry trends, and design to create facilities that are flexible enough to adapt. Use Life Cycle Analysis tools to balance initial construction costs with longer term operational costs. LCA also includes understanding the costs and benefits of protecting vehicles from the elements.

7. **Promote the health and well being of staff.** Design a facility with an awareness that the occupants are essential workers. Focus on glare free daylighting, acoustic controls, access to ventilation and fresh air, soil vapor intrusion and other environmental components that contribute to workers feeling healthy and productive.

8. **Be resilient.** Design to maintain continuous operation in the midst of and aftermath of disasters. Design to adapt, should future emergencies dictate temporary uses for the project. Design to meet typical social distancing requirements of future pandemics. Additionally--address resiliency of some existing facilities. Although some are obsolete and located in flood-prone areas, some have the potential to be repurposed to address community needs.

3

Existing Facility Conditions

The City of Lawrence currently operates nearly a dozen separate facilities to house field operations for Divisions within the Municipal Services and Operations Department (MSO) and the Parks and Recreation Department. The Divisions have done their very best to operate from these facilities over the years, but the poor condition of the existing facilities makes it difficult to be responsive to the operational needs of the City. Many of the buildings are undersized, or have design idiosyncrasies that result in poor operational flow. Most are in need of significant maintenance and infrastructural upgrades.

Current facilities working conditions have a significant potential to contribute to health issues. One such example is the use and function of the Streets Division "Red Barn", where trucks run within the facility without minimum safety requirements for ventilation of harmful CO and NO2 fumes from the exhaust of these vehicles. These fumes can cause respiratory illnesses and exacerbate existing health conditions. Another example is the cramped conditions at the Central Maintenance Garage, which can increase the risk of injury to technicians.

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911

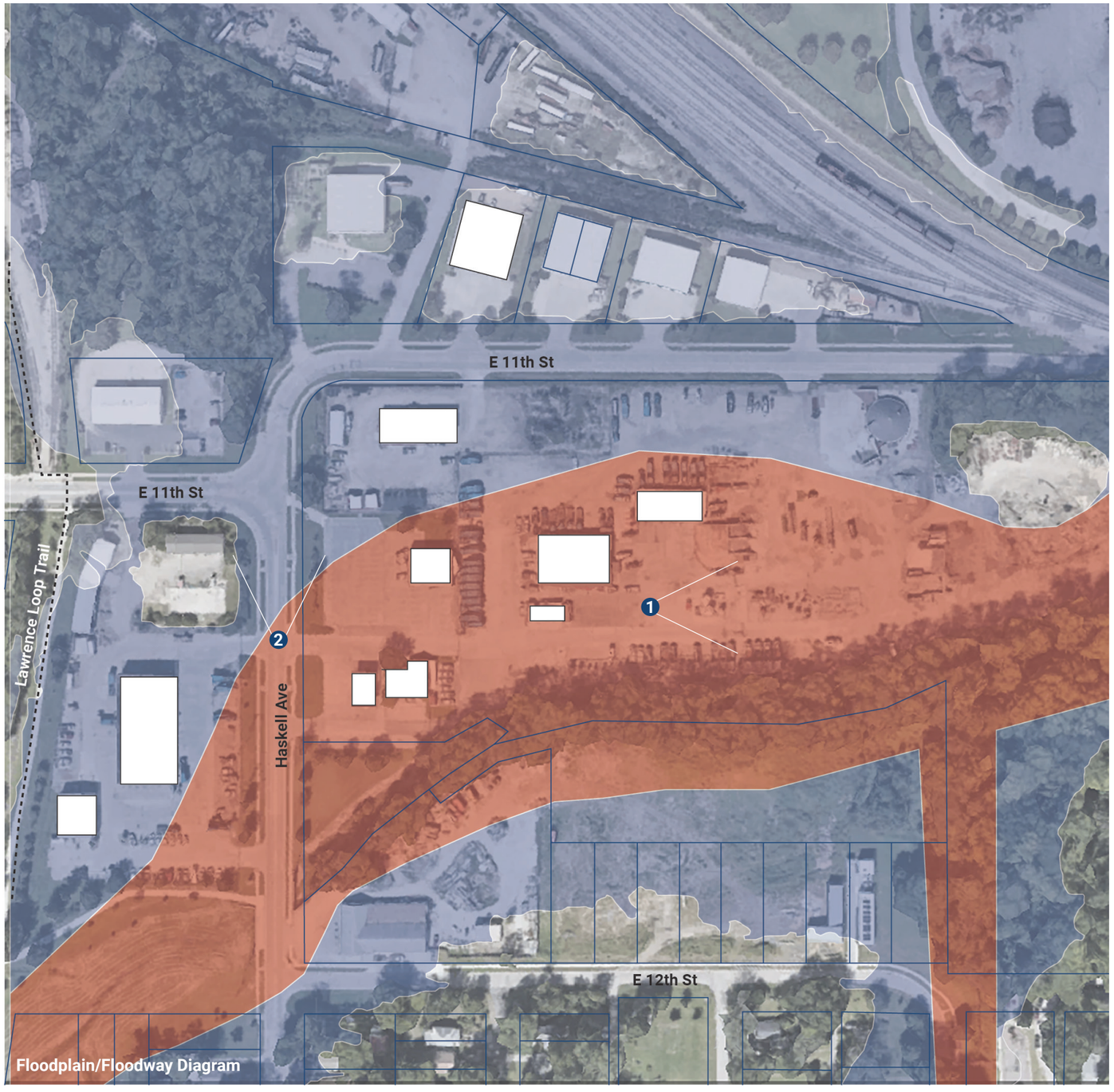
Existing Floodway Conditions

Aside from deferred maintenance issues, many of the buildings exist in the 500 year floodplain, some of them in the 100 year floodplain, and some of them are located directly in the floodway. According to the Lawrence City Code (Chapter 20 Article 12), new construction or improvements are prohibited in the floodway. Many of the facilities located at the corner of 11th St and Haskell Ave do not comply with this requirement.

Floodways are expected to flood--it's not a question of "if" but "when". A flood could prove very costly to the City--79 large / specialized vehicles are currently located in the floodway (53@ Solid Waste and 26 @ MSO). If all were lost in a flood event, this would result in a replacement cost of over $21,000,000. This number does not include smaller vehicles that would also be lost.

Although a campus arrangement will create many time and cost-saving efficiencies, the most significant efficiency is related to avoiding the negative impact of a flood event on existing field operations. Although this efficiency can be translated to dollars, it is perhaps best appreciated with regard to the disruption on critical city services provided by MSO. Improvements to damaged buildings are not allowed by City Code, so major disruptions would occur until a new code-compliant facility was established. It is important to note that these disruptions would occur in the aftermath of a disaster--the flood event--a time when many services provided by MSO are needed.

11th and Haskell site looking East



Floodplain/Floodway Diagram

11th and Haskell site looking North

Bag Warehouse Existing Conditions

The Bag Warehouse is a 161'-0" by 820'-6" structure comprised of 82 structural steel frames that are spaced 20' apart in two rows. The substructure of c-channel purlins are spaced roughly 4' apart. A layer of fiberglass blanket insulation sits between the substructure and the corrugated metal panels that wrap the exterior. The interior is dimly lit with lights that are inconsistently spaced throughout the warehouse. Roof vents are located every 40' at the peak of every-other structural frame.

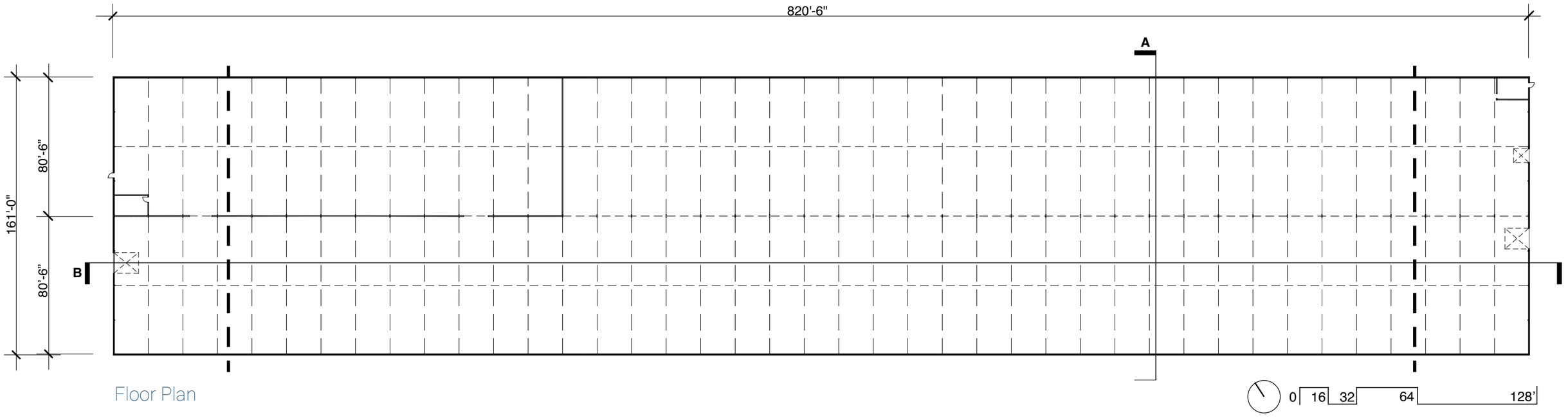
The structural steel frames are in good condition. There appears to be no serious damage to the primary structure, however the insulation and corrugated metal show clear signs of water damage and overall deterioration. If the Bag Warehouse is to be reused within the Lawrence Field Operations Facility, we would recommend that the insulation and building envelope be replaced where as the primary structure could remain intact.

The Warehouse is located within the existing site boundary near the 15th street entrance. The building's location may be in conflict with current zoning setback requirements. A zoning variance from the Board of Zoning Appeals (BZA) may be required to obtain approval for a non-conforming use of an existing building within a setback.

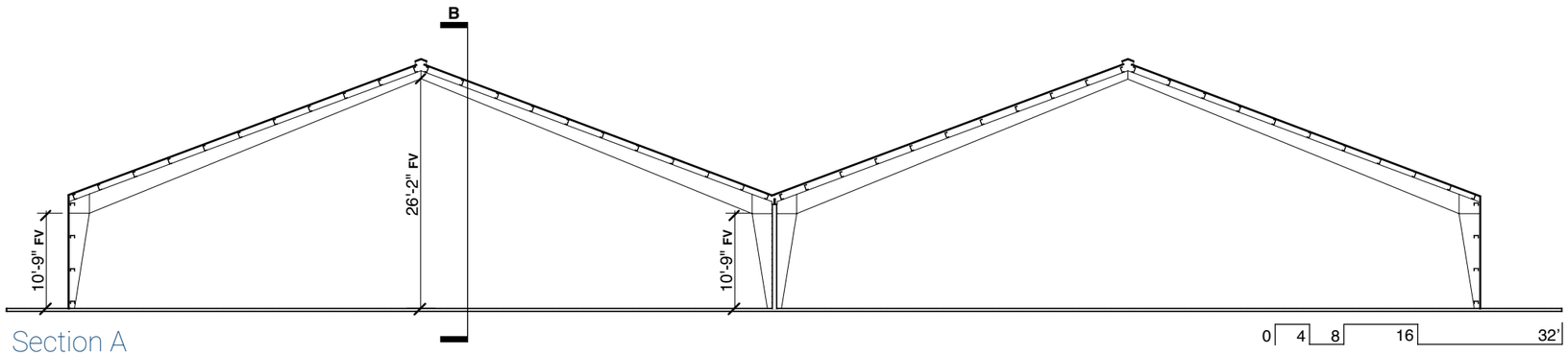
The building's finish floor elevation is below the City's main sewer system and would require a grinder pump if any sanitary service is required. Although the warehouse is sprinklered, additional fire suppression systems may need to be added per code requirements.

The addition of utilities and other site improvements, such as drives and parking around the building, would also be challenging due to the site location and topography. The steep hill to the south and drainage ditch/floodplain to the north leaves little room to construct site improvements.

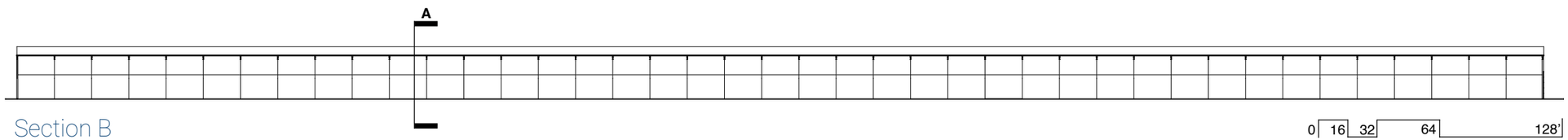
Bag Warehouse Interior



Floor Plan



Section A



Section B

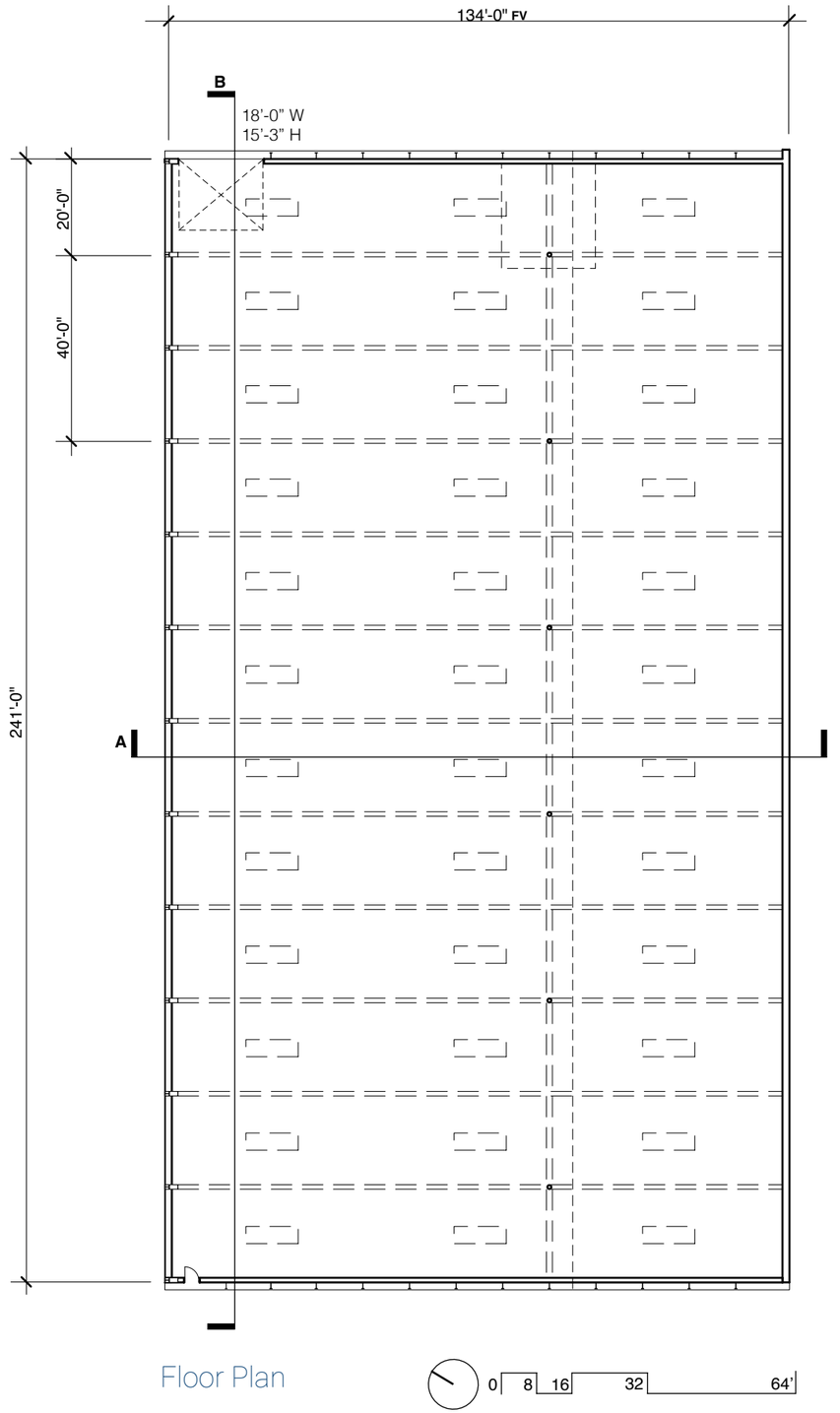
Bulk Warehouse Existing Conditions

The Bulk Warehouse is a 134’-0” x 241’-0” structure comprised of 11 pre-engineered structural steel frames that are flanked by full hight concrete walls on three sides. The steel frames are spaced 20’ apart with columns occurring every 40’.The substructure of c-channel purlins are spaced roughly 5’ apart. The structure is covered by a corrugated metal roof.

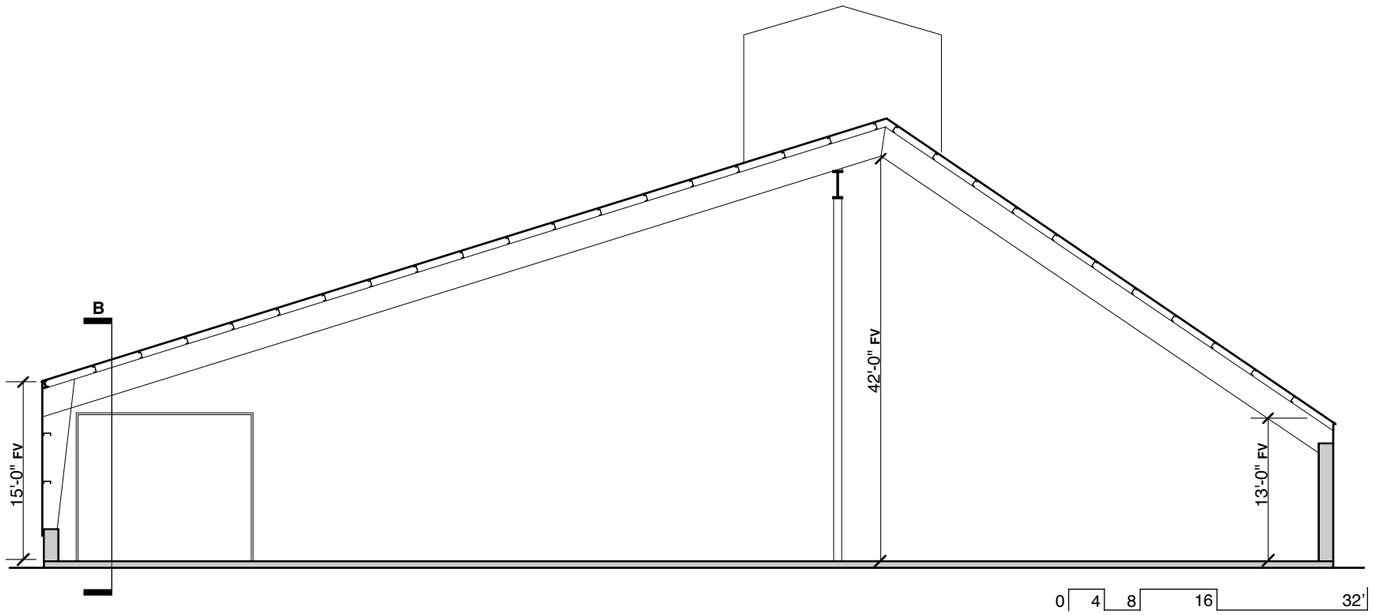
The Bulk Warehouse is currently filled with salt to be used as ice melt. The Design Team is unable to identify how the salt may be compromising the structural integrity of the steel members in which it covers. Damage to the steel structure can be observed on the north facade of the warehouse. Additionally, a portion of the concrete foundation wall has been removed.

The interior is well lit by skylights that are equally spaced across the roof along with several overhead lights. There does not appear to be any fire suppression or ventilation systems present within the structure.

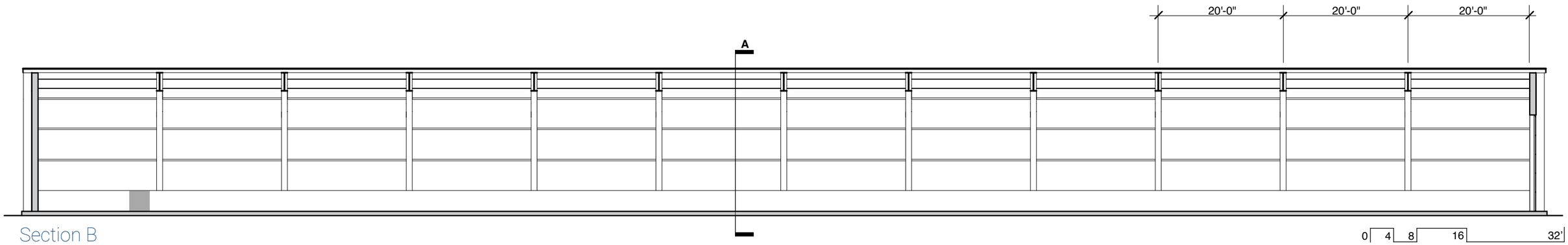
The Bulk warehouse is not currently located within the site boundary. In order for the Warehouse to be used as a part of the Lawrence Field Operations Facility, the current site boundary would need to be moved. If the property line is or is not adjusted, the building may still be in conflict with zoning setback requirements. A zoning variance from the Board of Zoning Appeals (BZA) may be required to obtain approval for a non-conforming use of an existing building within a setback. Additionally, the location of the Warehouse in relation to the railroad spur and proposed main entry may cause accessibility problems due to future train traffic.



Floor Plan



Section A



Section B

4

Master Plan

After thoroughly reviewing the operational needs of each Division, the Design Team developed a series of test fit options for the Farmland Site. The topographic conditions, adjacency to the surrounding community, and the remediation of contaminated soil were taken into consideration when determining placement of buildings on site. After thorough analysis and consideration of the complexities of this site, a Master Plan concept was developed.

1. Fuel Island
2. MSO Building: Water, Wastewater, Streets, Stormwater, Traffic & Inspections Divisions
3. Central Maintenance Garage
4. Solid Waste Division
5. Facility Maintenance Division
6. Forestry & Horticulture Divisions
7. Household Hazardous Waste Division
8. Rainwater Collection Tank
9. Bag Warehouse (existing)
10. Bulk Warehouse (existing)
11. Stormwater Retention Pond

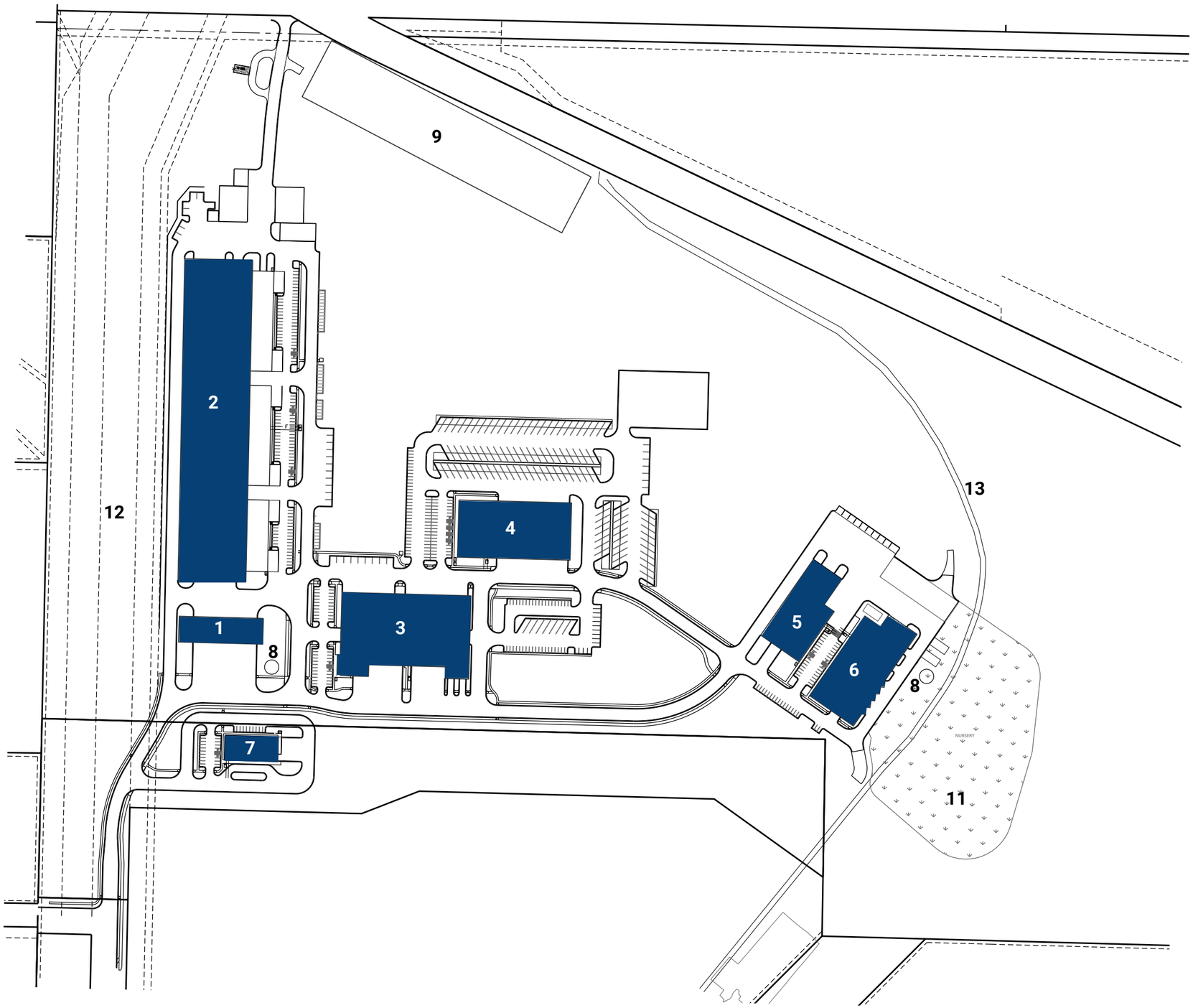
▲ - Primary Entry - O'Connell Rd & E 19th Street
All MSO traffic to travel on O'Connell Road only

▽ - Secondary Entry - Emergency Use Only

= = = - Railroad Spur Easement

—·— - Property Line

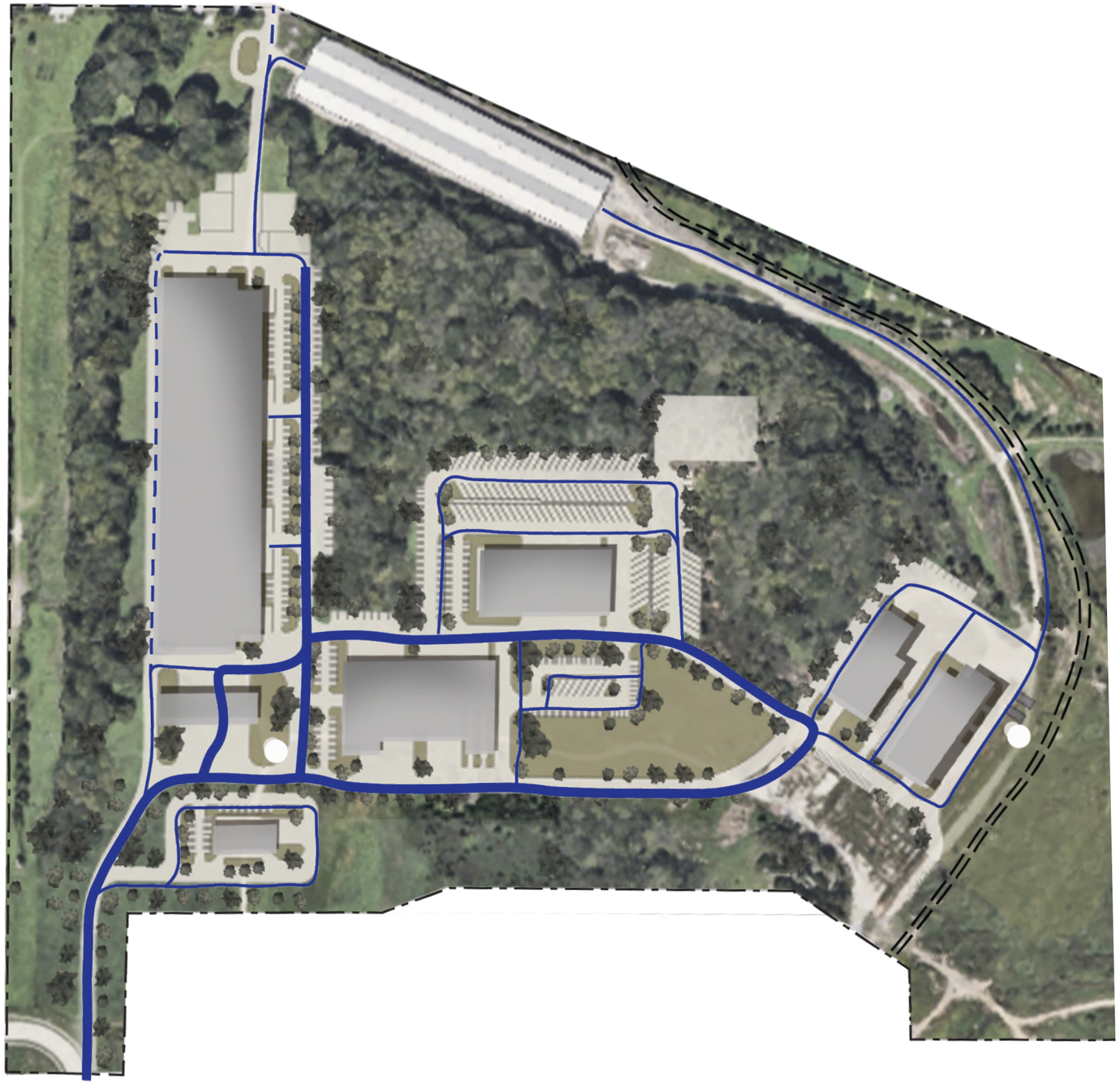
0 200 400 800 1,600'



Civil Site Layout

1. Fuel Island
2. MSO Building: Water, Wastewater, Streets, Stormwater, Traffic & Inspections Divisions
3. Central Maintenance Garage
4. Solid Waste Division
5. Facility Maintenance Division
6. Forestry & Horticulture Divisions
7. Household Hazardous Waste Division
8. Rainwater Collection Tank
9. Bag Warehouse (existing)
10. Bag Warehouse (existing)
11. Plant Nursery
12. Utility Easements
13. Railroad Spur

0 100 200 400’



Vehicle Circulation

The main access to the site will be an extension of O'Connell Road to the north of 19th Street. The site is designed with an operational progression in mind: fuel, wash, park and (following day) load. A centralized loop road will provide internal circulation through the site for this daily fleet movement flow for the different departments. A second point of access is being proposed off of 15th Street for emergency vehicle/fire access only.

- Primary Circulation
- Secondary Circulation
- Emergency Access Only

0 200 400 800'

Water Management

The on site stormwater management will consist of 3 different systems. Clean rainwater will be collected off parking lots and piped to the existing detention basin. Surface runoff from green space and contaminated groundwater will be collected and piped over to existing ponds and wetland areas east and west of the existing detention basin. Rainwater off of building roofs is being proposed to be collected, piped and pumped to one of two on site tanks where it will be reused where it will be used to wash vehicles and irrigate landscape.

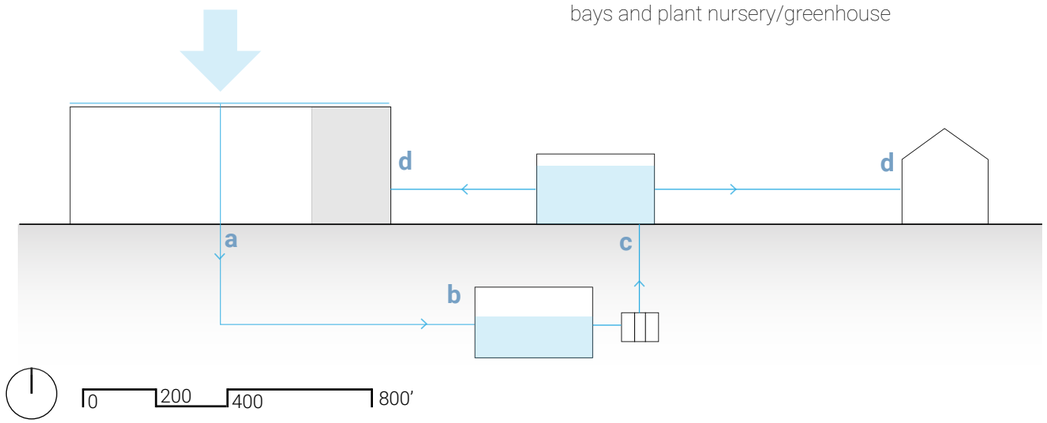
The proposed waterline will connect to the existing main at 19th & O'Connell Road. The proposed waterline will be looped throughout the site to provide domestic and fire line services to each building. The second point of connection to provide a looped feed for the property will run north to 15th Street, then to the existing waterline to the west.

The proposed sanitary sewer will connect to the existing main located to the east of the Bulk Warehouse. Gravity main will be installed to serve the majority of the site, including CMG, HHW, SWD, FAC, FOR & HOR. Due to site slope and resultant finish floor elevations, the MSO Building will require a lift station. The proposed lift station is also placed in a location that has the ability to serve the Bag Warehouse if the need ever arises to install plumbing in that facility.

A major efficiency of the campus design is the inclusion of dedicated wash bays in each of the first three construction phases. By locating dedicated wash bays, with state of the art washing equipment, within each Division, typical queuing times will be reduced by 66% and times-per-wash by 50%. In addition, improved washing frequency raises awareness and observation, triggering problems being caught earlier. The rainwater capture system is also projected to save over 7,000,000 gallons of potable water per year.

1. Vehicle Wash Bay
2. Rainwater Storage Tank

a. Rainwater is harvested from roofs
b. Harvested rainwater travels to an underground collection tank
c. Water is filtered and pumped into an above ground tank
d. Water is reused in vehicle wash bays and plant nursery/greenhouse



Noise Management

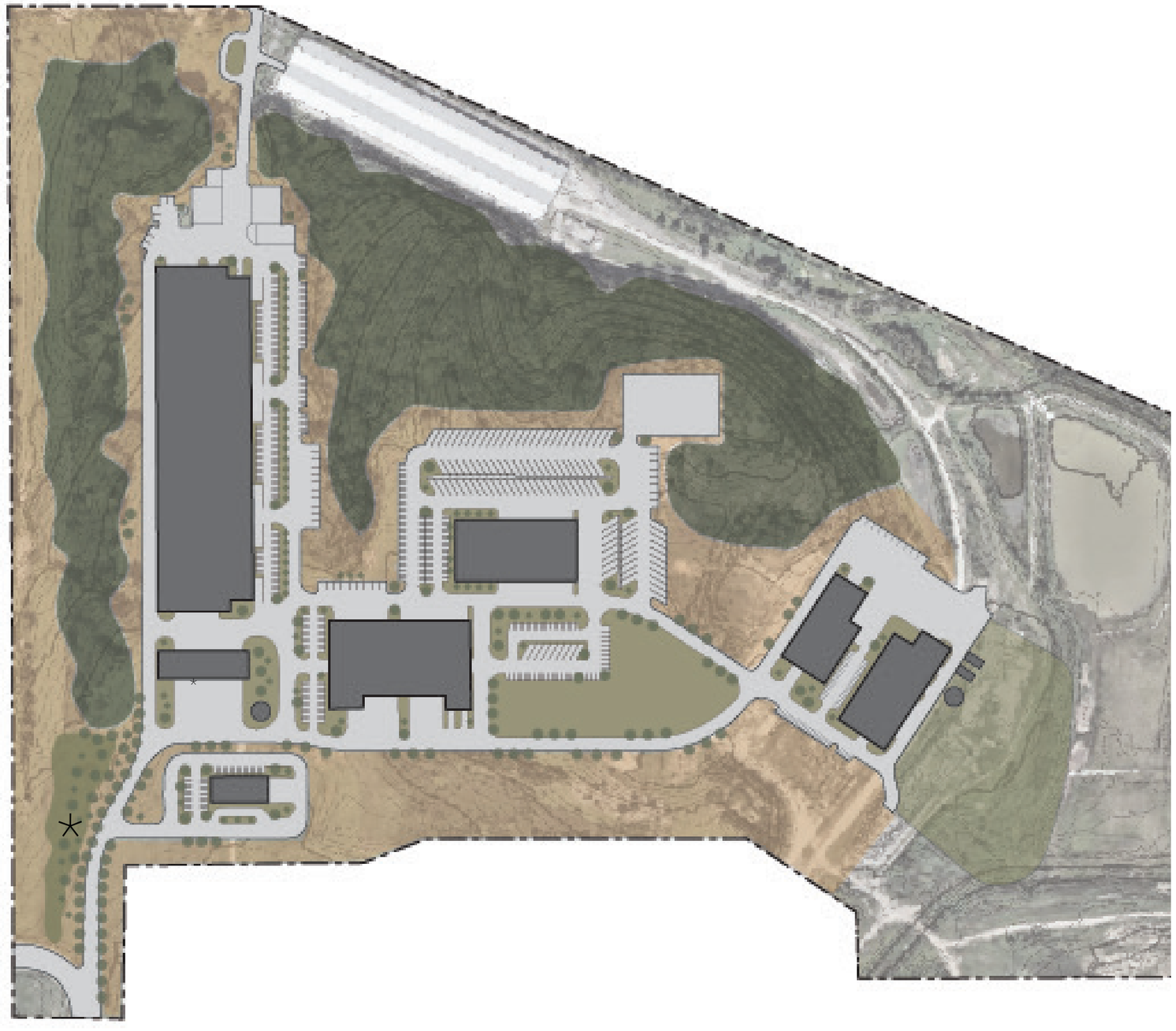
The Lawrence Field Operations Facility Campus Master Plan locates the primary flow of vehicles and overall operational activity in the center of the campus. This strategy works in unison with the linear shape of the MSO building as well as the existing tree line landscaping buffer along the West side of the site to minimize noise traveling to the adjacent neighborhoods. A proposed landscaping berm is located near the Southwest corner of the site to provide an additional buffer along the entry road to the campus.

The campus noise management strategy will be continuously refined throughout future design phases as more detailed analysis is conducted.

Noise Management Diagram

- Existing trees; visual and sound buffer
- Berming and evergreen trees to contribute to noise attenuation

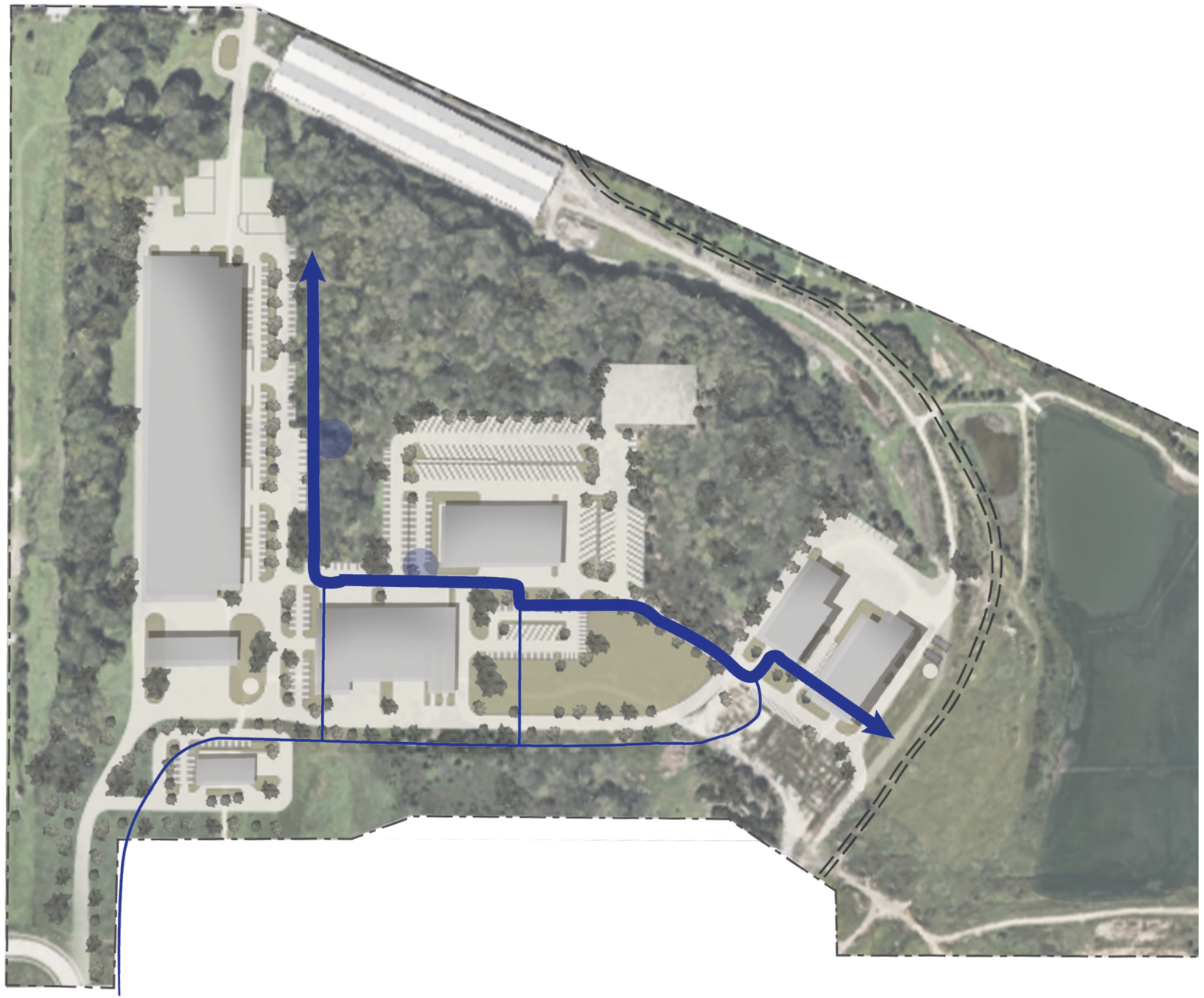
0 200 400 800'



Landscape Plan

- Existing trees to remain
- Seeded prairie grass mix with fescue mow strip around all buildings and roads
- Interior campus landscaping to include shrub plantings and seeded prairie grass mix
- Proposed landscaping tree
- Landscaping berm; visual and noise barrier

0 200 400 800’



Pedestrian Circulation

A central pedestrian circulation spine will connect all facilities on campus, allowing for safe and easy access between each building. This path will be defined by wide sidewalks, landscaping, street trees and pedestrian crosswalks where needed. In addition, this spine will connect two outdoor break areas, one just north of the Central Maintenance Garage and the other sitting East of the MSO building.

Secondary circulation paths throughout the campus provide additional pedestrian safe connections between buildings.

- Primary Circulation

- Secondary Circulation

Outdoor Break Area

0 200 400 800’

Landscape Plan

The following goals were created to help guide a site and landscape design strategy for the Lawrence Field Operations Campus:

1. Maintain existing habitat and preserve existing vegetation.
2. Provide a visual connection to 15th Street
3. Create a clear, secure entry sequence for a civic campus
4. Develop signage and landscape in non-vehicular boundary areas to communicate restricted nature of site
5. Create safe and secure emergency vehicle access.
6. Develop campus to work within existing stormwater infrastructure, etc.
7. Connect campus with primary pedestrian circulation path.
8. Provide vegetation per requirements of remediation study.
9. Develop palette of maintenance friendly landscape elements to reinforce idea of civic campus
10. Enhance occupant experience by providing features for workers to connect to the landscape, including break areas, walking paths and landscape features at building entries.
11. Utilize shade to reduce urban heat island effect

Landscape Palette

A number of low-maintenance plant species have been considered for the Lawrence Field Operations Campus. Final species selections would be vetted with the City and could include:

- **a.** Maidenhair Tree
- **b.** Miyabei Maple
- **c.** Swamp White Oak
- **d.** Pacific Sunset Maple
- **e.** Limeglow Juniper
- **f.** Swamp Milkweed
- **g.** Prairie Dropseed
- **h.** Hameln Dwarf Fountain Grass
- **i.** Spike Gayfeather
- **j.** Ames St. Johns Wort

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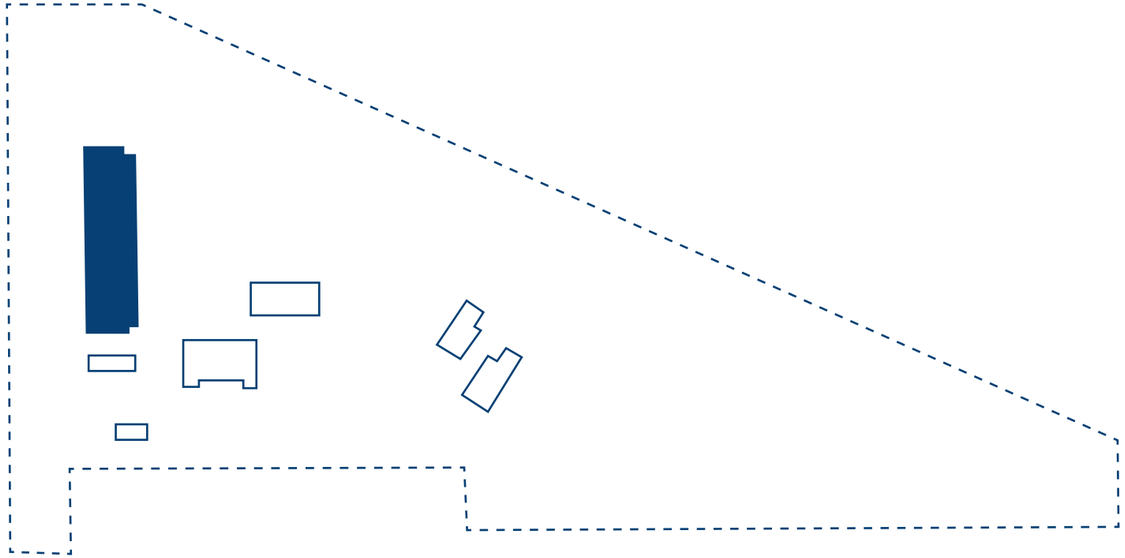
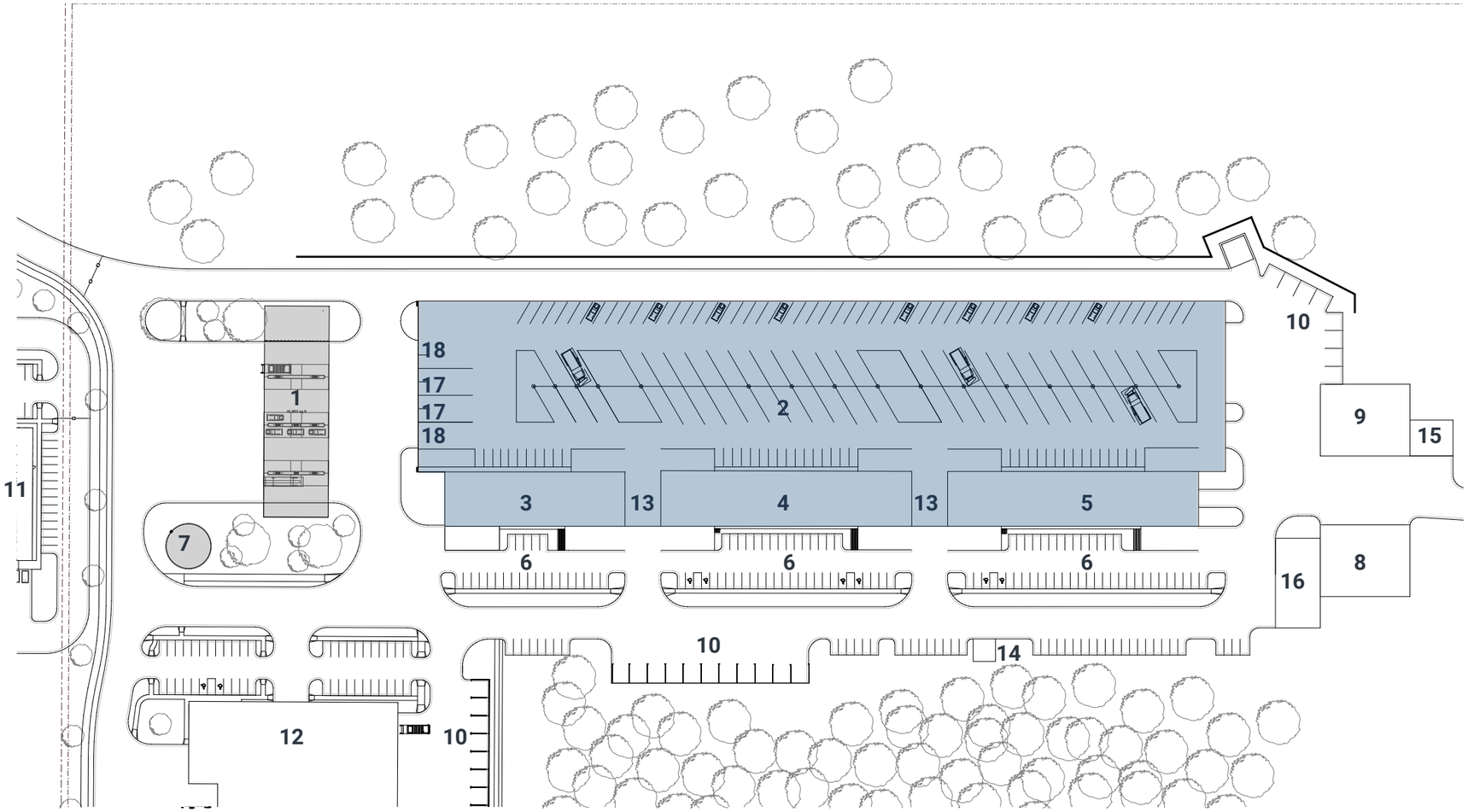
MSO Building



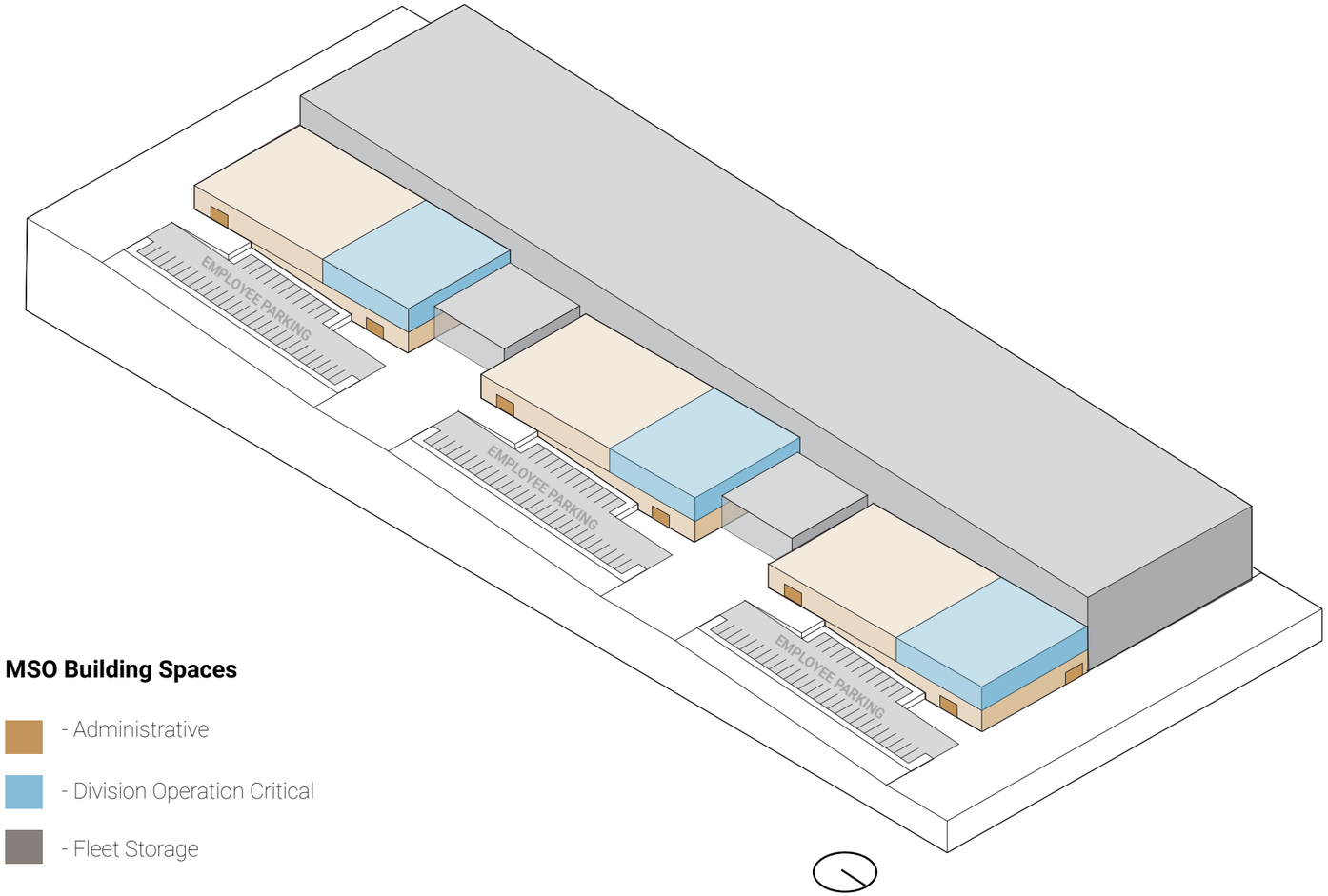


1. Fuel Island**
2. Conditioned Vehicle Storage
3. Building A: Traffic Division
4. Building B: Stormwater and Streets Divisions
5. Building C: Water, Wastewater and Inspections Divisions
6. Employee Parking
7. Rainwater Storage Tank
8. Salt Shed
9. Sand and Salt Mixing Shed
10. Bulk Material Bins
11. Household Hazardous Waste Facility
12. Central Maintenance Garage
13. Enclosed Operational Space - 'Alley'
14. Outdoor Break Area
15. Brine Making and Storage
16. Pipe Laydown Area
17. Wash Bay
18. Vehicle Bypass Lane

**Proposed Phase 1 construction of the MSO Building includes a Fuel Island designed to meet the needs of the entire field operations campus. This layout offers efficiencies related to time and operational costs, resulting in reductions of queuing time from 30-60 minutes to 10 minutes during peak times. A properly sized Fuel Island would allow the City to purchase fuel at discounted prices, and to allow for safer vehicle and equipment access, reducing potential for accidents.

Site Plan

0 100 200 400



MSO Building Spaces

- Administrative
- Division Operation Critical
- Fleet Storage

Architectural Narrative

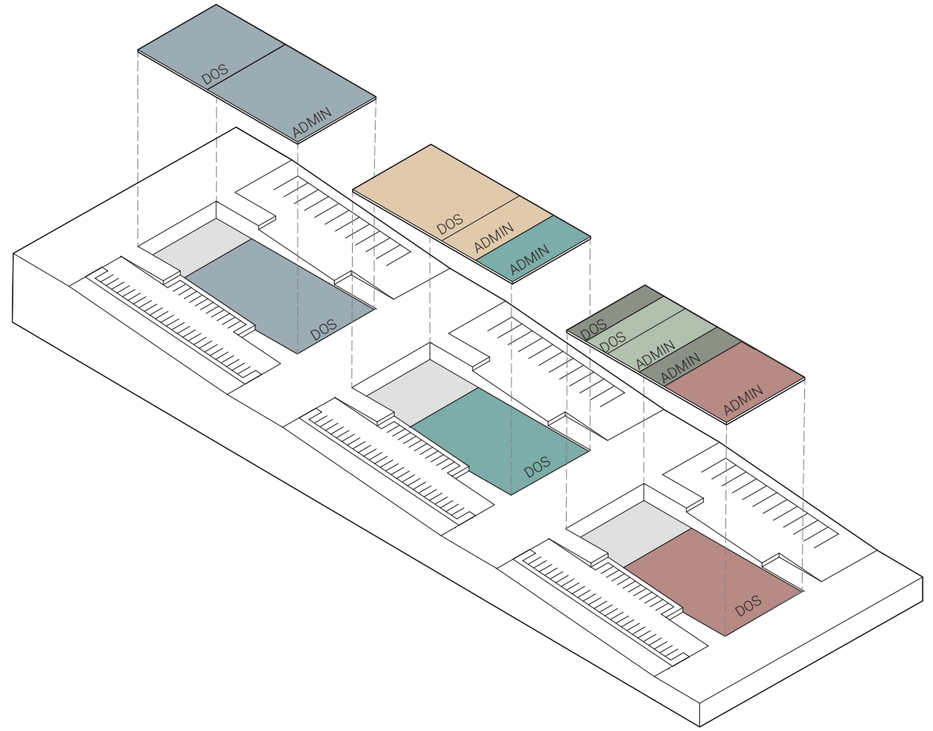
The MSO Building includes Administrative spaces, Division Operation Critical spaces and Conditioned Vehicle Storage for Water, Wastewater, Streets, Stormwater and Inspections Divisions Fleets. Given the challenge of a sloping site, the Design Team worked to provide a design that maximized efficiency and operational flow for each Division. In order to maximize the amount of grade access for the loading, unloading and parking of fleet vehicles, the program was divided into three buildings that step down the site. Each of the buildings is connected by an enclosed operational space--an alley of sorts--to give a covered area for loading and unloading, as well as to provide additional access points into the fleet parking area.

The program is organized with Administrative spaces on the upper floor, allowing Division Operation Critical spaces to occupy areas with primary grade access.

The existing Bag Warehouse is proposed to hold Sander Racks for the Streets Division as well as additional storage for all MSO Divisions as required.

The Divisions are organized to maximize efficiency between overlapping operations. Divisions that share management or work closely with one another on a daily bases are grouped in close proximity.

This sectional diagram shows how the Design Team capitalized on the sloped site to create grade access for all 6 Divisions, while connecting continuously with the Conditioned Vehicle Storage Building beyond. The natural 1:20 slope of the site allows the Conditioned Vehicle Storage Building to have a gently sloped floor and maintain an efficient and consistent floor to roof structure height.



Building A

- Traffic Division

Building B

- Stormwater Division
- Streets Division

Building C

- Wastewater Collections Division
- Water Distribution Division
- Inspections Division

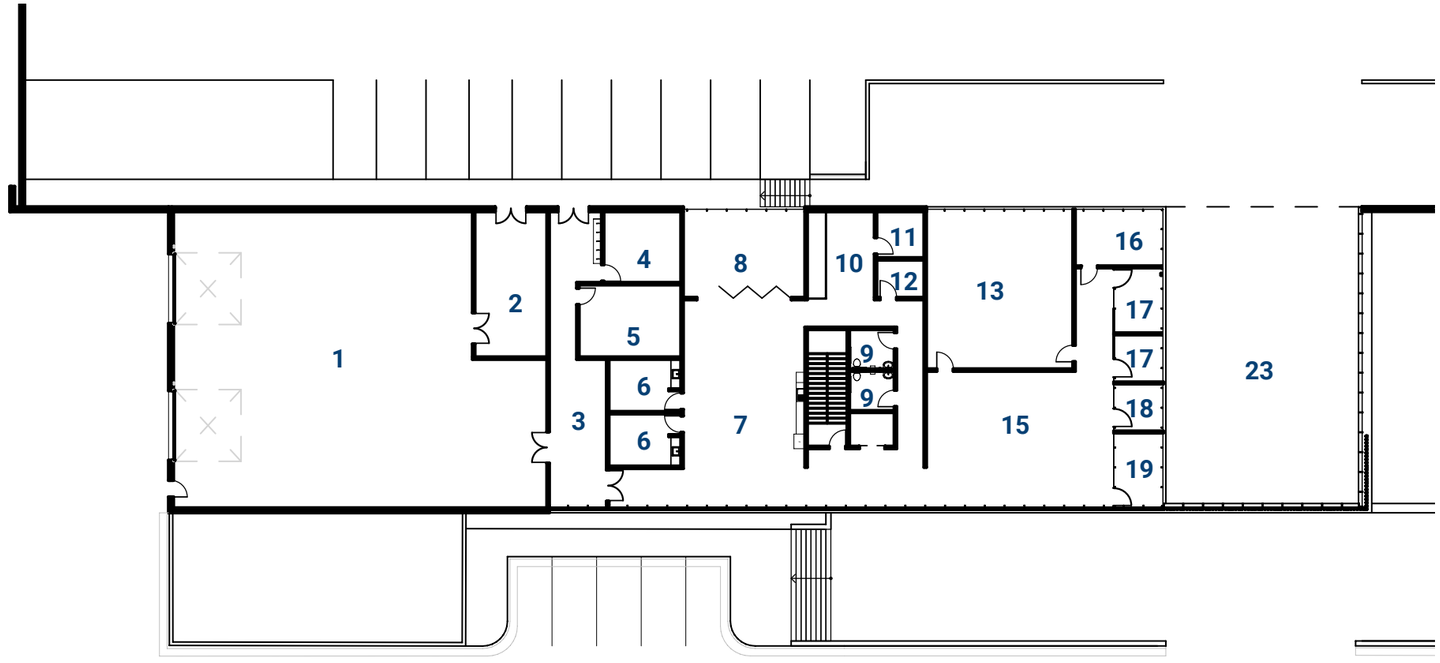
-Mechanical

- Conditioned Vehicle Storage Beyond

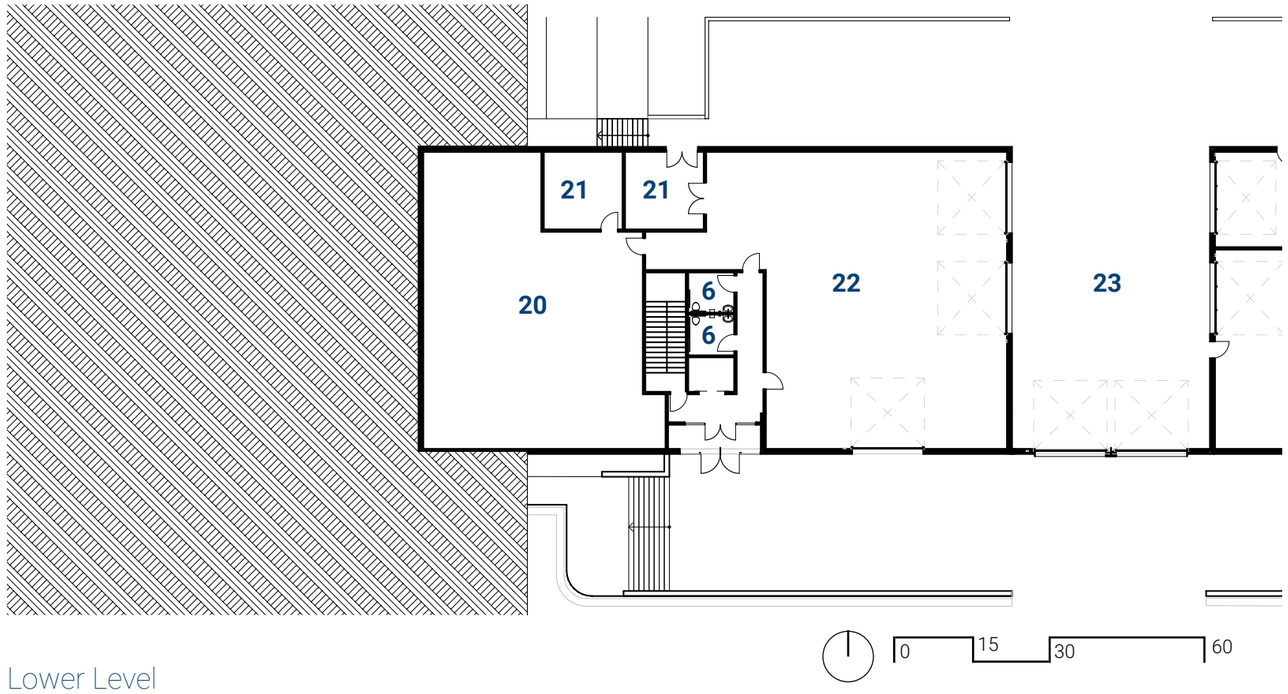
Building A

Traffic Division

1. Signal Equipment Storage Shop
2. Hazardous Storage
3. Mud Room
4. Women's Locker Room
5. Men's Locker Room
6. Wellness Room
7. Break Room
8. Training Room
9. Restroom
10. Copy Room/Work Area
11. Storage
12. Janitor
13. Tactics Central Unit
14. IT Closet
15. Open Office
16. Small Conference Room
17. Staff Office
18. Division Supervisor's Office
19. Division Manager's Office
20. Mechanical
21. Secure Storage
22. Sign Fabrication and Storage
23. Enclosed Operational Space - 'Alley'



Upper Level

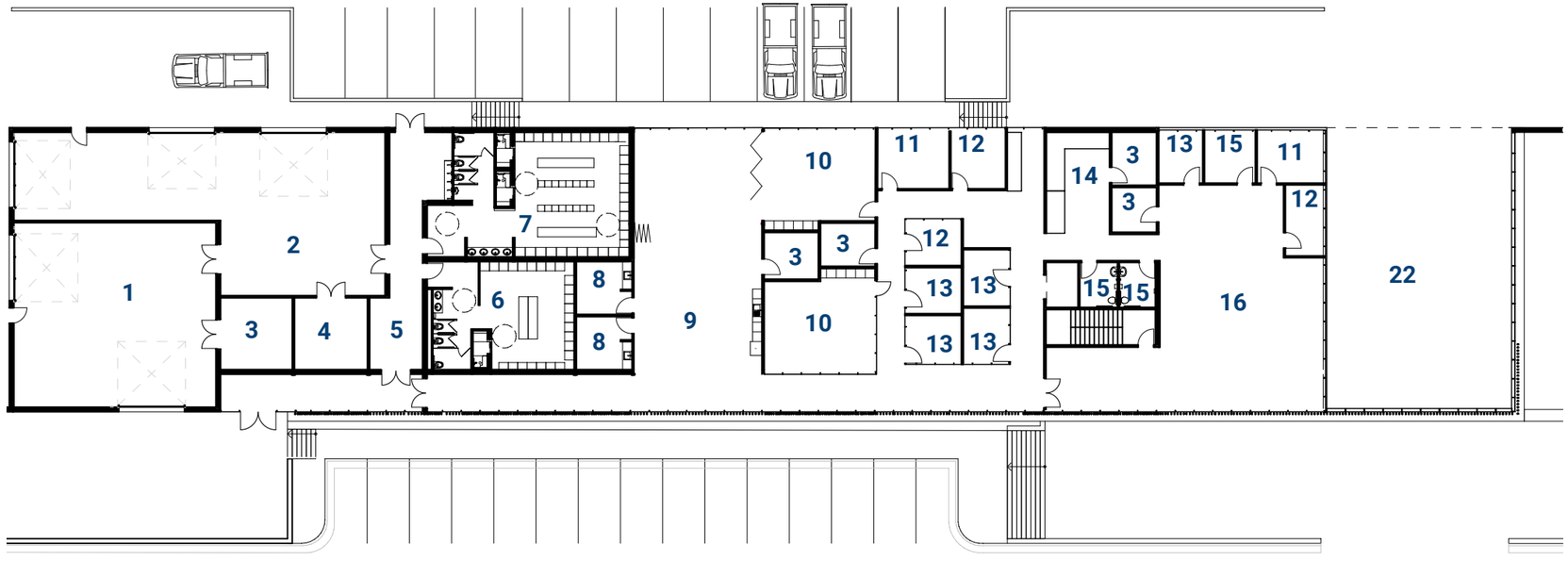


Lower Level

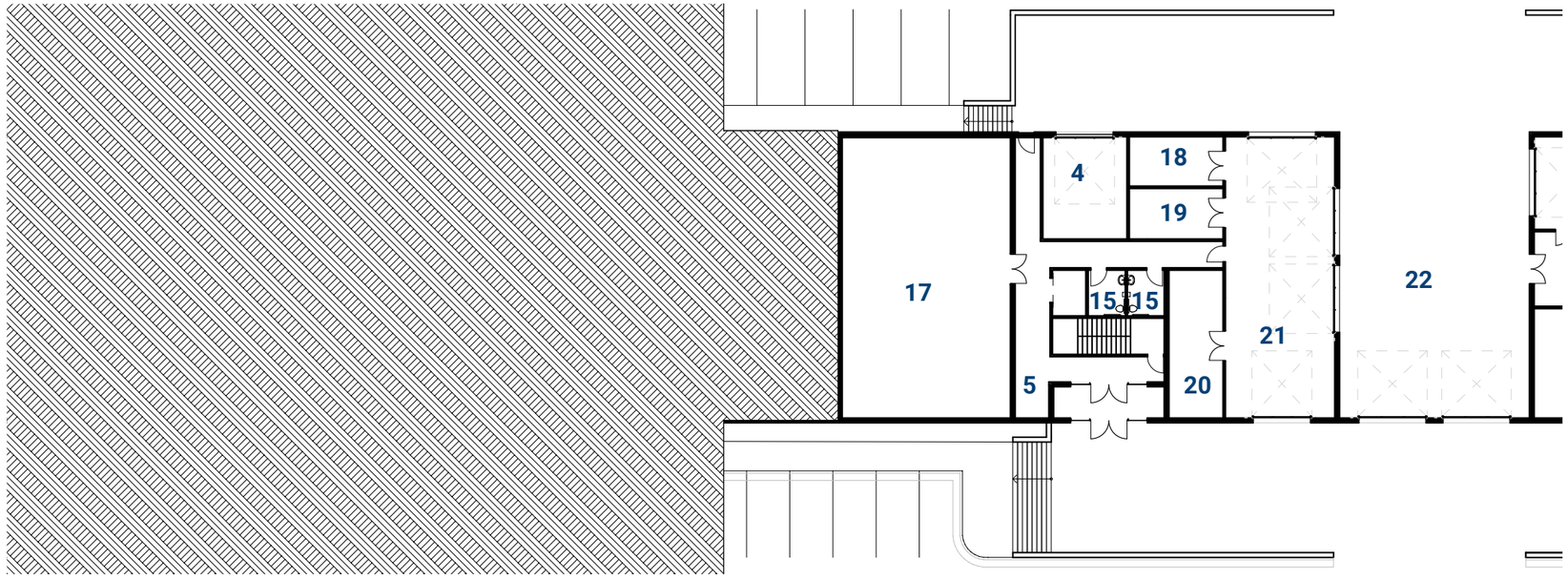
Building B

Streets and Stormwater Divisions

1. Shared Fabrication Shop
2. Material and Equipment Storage Shop
3. Storage
4. Secure Storage
5. Mud Room
6. Women's Locker Room
7. Men's Locker Room
8. Wellness Room
9. Break Room
10. Training Room
11. Division Manager's Office
12. Division Supervisor's Office
13. Staff Office
14. Copy Room/ Work Area
15. Restroom
16. Open Office
17. Mechanical
18. Bulk Fluids Storage
19. Parts Storage
20. Tool Storage
21. Asphalt Shop
22. Enclosed Operational Space - 'Alley'



Upper Level

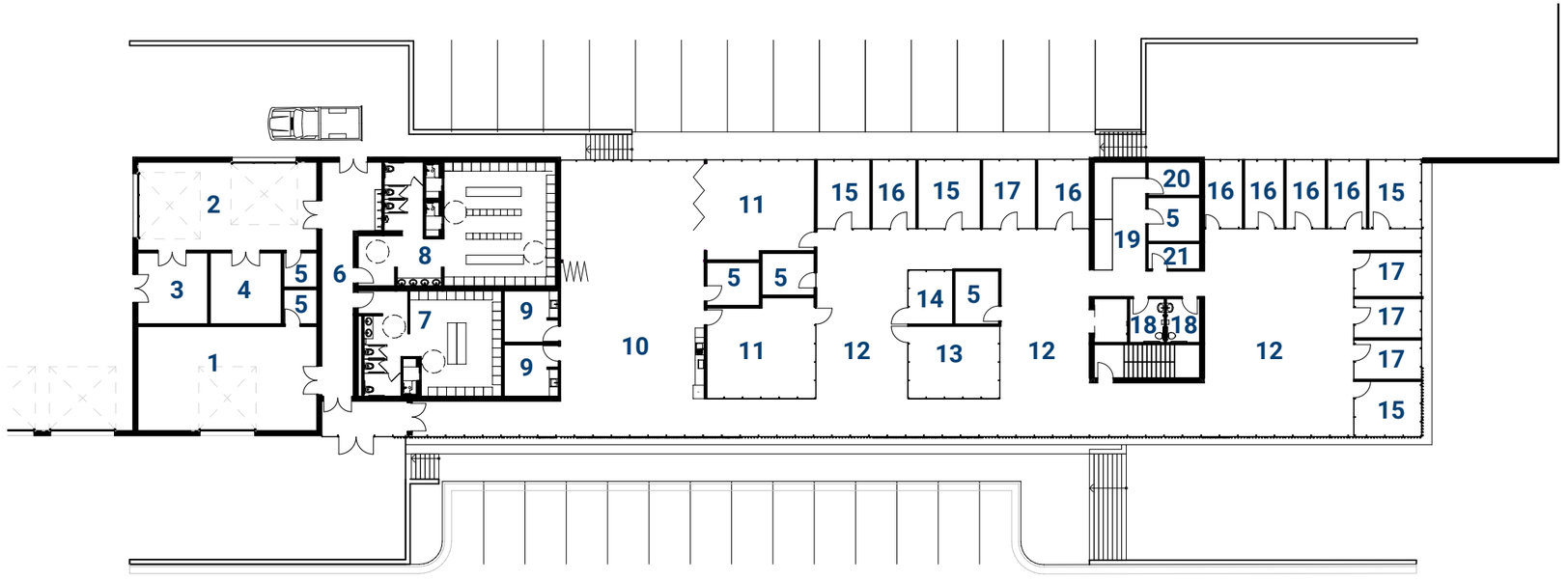


Lower Level

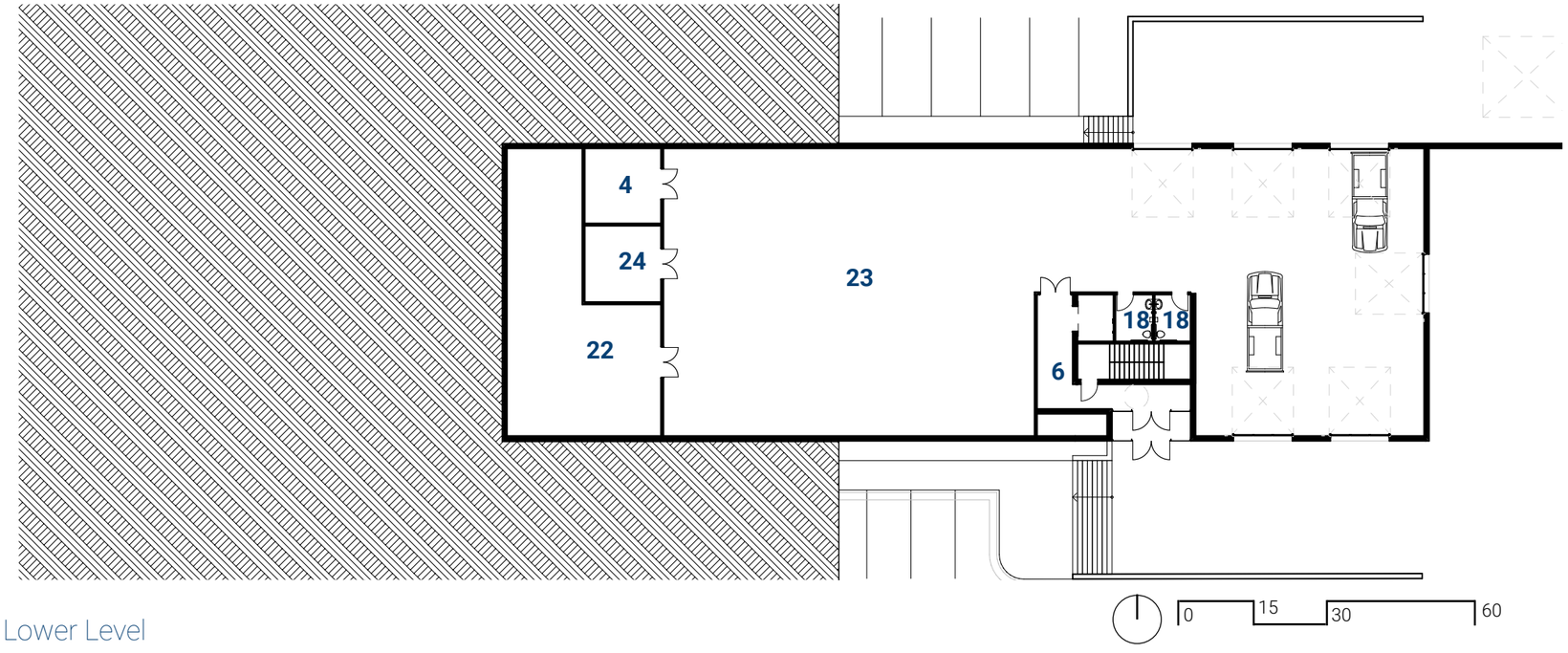
Building C

Water, Wastewater & Inspections Divisions

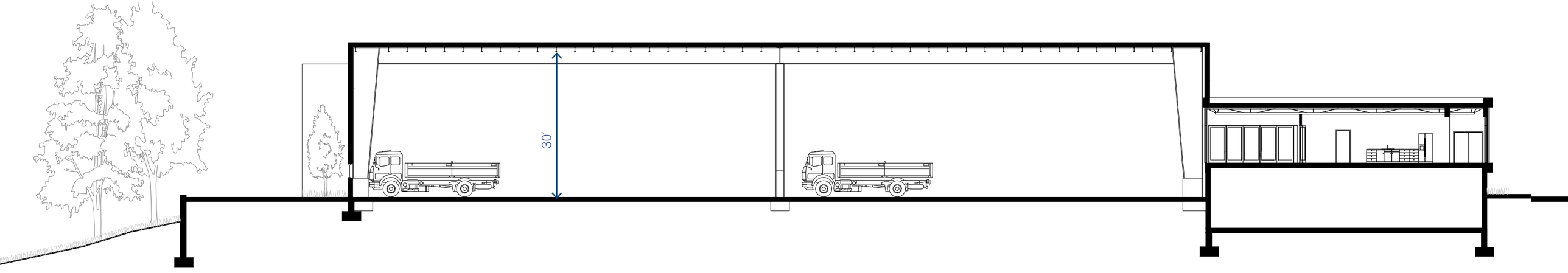
1. Inspections Open Workshop
2. Wastewater Shop
3. Wastewater Storage
4. Secure Storage
5. Storage
6. Mud Room
7. Women's Locker Room
8. Men's Locker Room
9. Wellness Room
10. Break Room
11. Training Room
12. Open Office
13. Standard Conference Room
14. Small Conference Room
15. Division Manager's Office
16. Division Supervisor's Office
17. Staff Office
18. Restroom
19. Copy Room/Work Area
20. IT Closet
21. Janitor
22. Mechanical
23. Field/Distribution Shop
24. Hazardous Storage



Upper Level



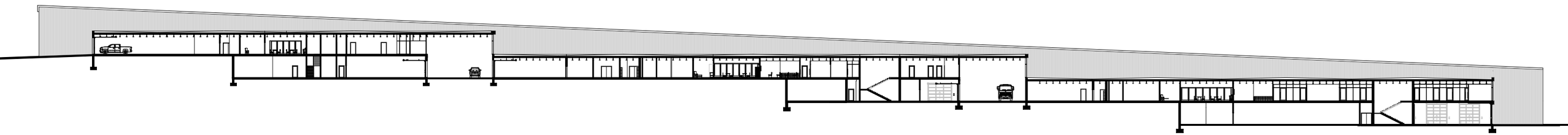
Lower Level



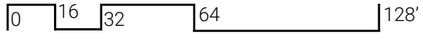
Building B Cross Section

0 8 16 32 64'

View from vehicle storage area looking toward Exposed Operational Space - ‘Alley’



MSO Longitudinal Section



View of MSO Building B looking northeast

View of MSO Building B break room looking toward training room

View of MSO Building B break room looking north

ADMINISTRATIVE	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
DIV.1a - Building Entry / Vestibule	100	10'x10'	1	100	
DIV.1b - Reception	100	10' x 10'	1	100	
DIV.2 - Division Manager Office	180	12' x 15'	1	180	
DIV.3 - Supervisor Office	150	10' x 15'	1	150	
DIV.4 - Staff Office	120	12' x 10'	2	240	
DIV.5 - Field Staff Workstation / Open Office	202	6'x6' x (FTE+1/2PTE)	1	202	
DIV.6a - Small Conference Room	120	12' x 10'	1	120	
DIV.6b - Standard Conference Room	NA			-	
DIV.7 - Large Conference Room-Training Room	500	20' x 25'	1	500	
DIV.8 - Copy Area / Document Work Room	216	12' x 18'	1	173	
DIV.9 - Breakroom	240	25 sf x Staff #	1	240	
DIV.10a - Universal Public Restroom	72	8' x 9'	2	144	
DIV.10b - Men's Locker and Restroom	316	Varies	1	316	
DIV.10c - Women's Locker and Restroom	244	Varies	1	244	
DIV.10d - Wellness Room	168	12' x 14'	1	168	
DIV.10e - IT Closet	48	6' x 8'	1	48	
DIV.10f - Janitorial	63	7' x 9'	1	63	
DIV.11 - General Storage / Supply Closets	100	10' x 10'	1	100	
DIV.12 - Mud Room / Wash Area	96	8' x 12'	1	96	
DIV.13 - General Computer Area	NA			-	Central Computer area - See Also DIV.5 - Field Staff / Open Office
DIV.14 - Laundry Facility	NA			-	
DIV.10g - Mechanical and Electrical Room	478	15% of supported	1	478	
ADMINISTRATIVE AREA SUBTOTAL SF				3,661	
CIRCULATION @ 30%				1,098	
ADMINISTRATIVE AREA TOTAL SF				4,759	

CONDITIONED VEHICLE STORAGE (WARM)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	0	0	
Medium Space	288	12'x24'	8	2,304	
Pickup Space	200	10'x20'	9	1,760	
VEHICLE PARKING SUBTOTAL	4,064				
DOUBLE TRAFFIC LANE STORAGE INCREASE	4,877			8,941	Parking plus traffic lane serving parking
Mezzanine Storage				2,980	Maximum 1/3 of open storage area (IBC)
General Storage area				1,118	Area created by angled parking, used for small implement storage
CONDITIONED VEHICLE STORAGE SUBTOTAL SF				8,941	Parking plus traffic lane serving parking
CIRCULATION @ 15%				1,341	
CONDITIONED VEHICLE STORAGE TOTAL SF				11,400	Sum of parking and traffic lanes, plus additional circ and storage

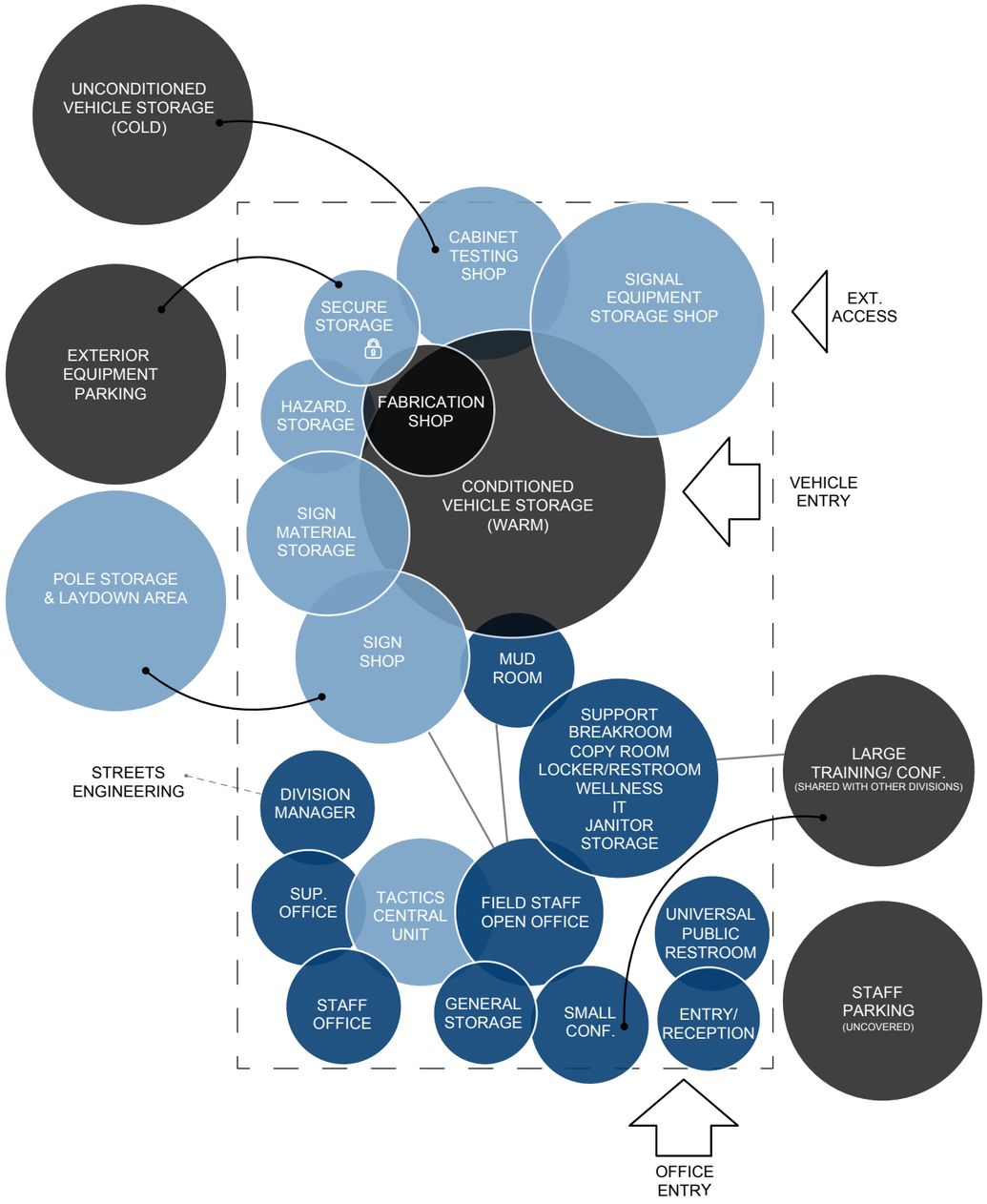
DIVISION OPERATION CRITICAL SPACES	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
TRAF.2 - Fabrication Shop	750	25' x 30'	1	750	
TRAF.3 - Sign Shop	1,500	30' x 50'	1	1,500	
TRAF.4 - Sign Making Material Storage	1,600	40' x 40'	1	1,600	
TRAF.5 - Signal Equipment Storage Shop	4,000	50' x 80'	1	4,000	
TRAF.6 - Cabinet Testing Shop	300	15' x 20'	1	300	
TRAF.7 - Tactics Central Unit	400	20' x 20'	1	400	
TRAF.8 - Secure Storage	256	16' x 16'	1	256	
TRAF.9 - Hazardous Storage	450	15' x 30'	1	450	
TRAF Division Opertion Critical Spaces	9,256				
DIVISION OPERATION CRITICAL SPACES SUBTOTAL SF				9,256	
CIRCULATION @ 30%				2,777	
DIVISION OPERATION CRITICAL SPACES TOTAL SF				12,033	

UNCONDITIONED VEHICLE STORAGE (COLD)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	0	0	
Medium Space	288	12'x24'	0	0	
Pickup Space	200	10'x20'	0	0	
VEHICLE PARKING SUBTOTAL	0				
DOUBLE TRAFFIC LANE STORAGE INCREASE	0			0	Parking plus traffic lane serving parking
Mezzanine Storage				0	Maximum 1/3 of open storage area (IBC)
General Storage area				0	Area created by angled parking, used for small implement storage
UNCONDITIONED VEHICLE STORAGE SUBTOTAL SF				0	Parking plus traffic lane serving parking
CIRCULATION @ 15%				0	
UNCONDITIONED VEHICLE STORAGE TOTAL SF				0	Sum of parking and traffic lanes, plus additional circ and storage

SITE PROGRAM REQUIREMENTS	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Staff Parking and Drive Aisle	284	9' x 18'	10	2,722	1 per staff on largest shift
Exterior Equipment Parking Demands	288	12' x 24'	0	0	
ADA Space plus Aisle	306	9' x 18' +8' Aisle	1	306	
TRAF.10 - Exterior Fleet Parking	0	0	0	0	
TRAF.12 - Pole Storage and Laydown Area	3,000	100' x 30'	1	3,000	
SITE PROGRAM REQUIREMENTS SUBTOTAL SF				6,028	
SITE CIRCULATION @ 150%				9,041	Accounts for access to all sides of separated site functions
SITE PROGRAM REQUIREMENTS TOTAL SF				15,069	

SITE AREA TOTALS					
MAIN BUILDING	28,192				
CIRCULATION AROUND BUILDING	7,048	25% of subtotal			
COLD STORAGE	0				
CIRCULATION AROUND BUILDING	0	25% of subtotal			
SITE PROGRAM REQUIREMENTS	15,069				
CIRCULATION AROUND BUILDING	3,767	25% of subtotal			
Program Totals	54,076				
25% GREEN SPACE	13,519				
Stormwater Management	13,519	25% of subtotal			
GRAND TOTAL SITE AREA SF	105,447	3.15			*Total squarefootage and acreage, plus added 30% of programmed acreage for drainage paths, easements, setbacks, etc.*

Traffic Division (TRAF)
Programming Summary



Traffic Division

Adjacency Diagram

ADMINISTRATIVE	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
DIV.1a - Building Entry / Vestibule	100	10'x10'	1	100	
DIV.1b - Reception	100	10' x 10'	1	100	
DIV.2 - Division Manager Office	180	12' x 15'	1	180	
DIV.3 - Supervisor Office	150	10' x 15'	1	150	
DIV.4 - Staff Office	120	12' x 10'	1	120	
DIV.5 - Field Staff Workstation / Open Office	1,274	6'x6' x (FTE+1/2PTE)	1	1,274	
DIV.6a - Small Conference Room	120	12' x 10'	2	240	
DIV.6b - Standard Conference Room	NA			-	
DIV.7 - Large Conference Room-Training Room	500	20' x 25'	2	1,000	
DIV.8 - Copy Area / Document Work Room	216	12' x 18'	3	691	
DIV.9 - Breakroom	960	25 sf x Staff #	1	960	
DIV.10a - Universal Public Restroom	72	8' x 9'	2	144	
DIV.10b - Men's Locker and Restroom	604	Varies	1	604	
DIV.10c - Women's Locker and Restroom	316	Varies	1	316	
DIV.10d - Wellness Room	168	12' x 14'	3	504	
DIV.10e - IT Closet	48	6' x 8'	1	48	
DIV.10f - Janitorial	63	7' x 9'	1	63	
DIV.11 - General Storage / Supply Closets	100	10' x 10'	3	300	
DIV.12 - Mud Room / Wash Area	96	8' x 12'	1	96	
DIV.13 - General Computer Area	NA			-	Central Computer area - See Also DIV.5 - Field Staff / Open Office
DIV.14 - Laundry Facility	100	10' x 10'	1	100	
DIV.10g - Mechanical and Electrical Room	1,049	15% of supported	1	1,049	
ADMINISTRATIVE SUBTOTAL SF				8,039	
CIRCULATION @ 30%				2,412	
ADMINISTRATIVE TOTAL SF				10,451	

CONDITIONED VEHICLE STORAGE (WARM)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	19	17,280	
Medium Space	288	12'x24'	18	5,069	
Pickup Space	200	10'x20'	14	2,720	
VEHICLE PARKING SUBTOTAL	25,069				
DOUBLE TRAFFIC LANE STORAGE INCREASE	30,083			55,151	Parking plus traffic lane serving parking
Mezzanine Storage				18,384	Maximum 1/3 of open storage area (IBC)
General Storage area				6,894	Area created by angled parking, used for small implement storage
CONDITIONED VEHICLE STORAGE SUBTOTAL SF				55,151	Parking plus traffic lane serving parking
CIRCULATION @ 15%				8,273	
CONDITIONED VEHICLE STORAGE TOTAL SF				70,318	Sum of parking and traffic lanes, plus additional circ and storage

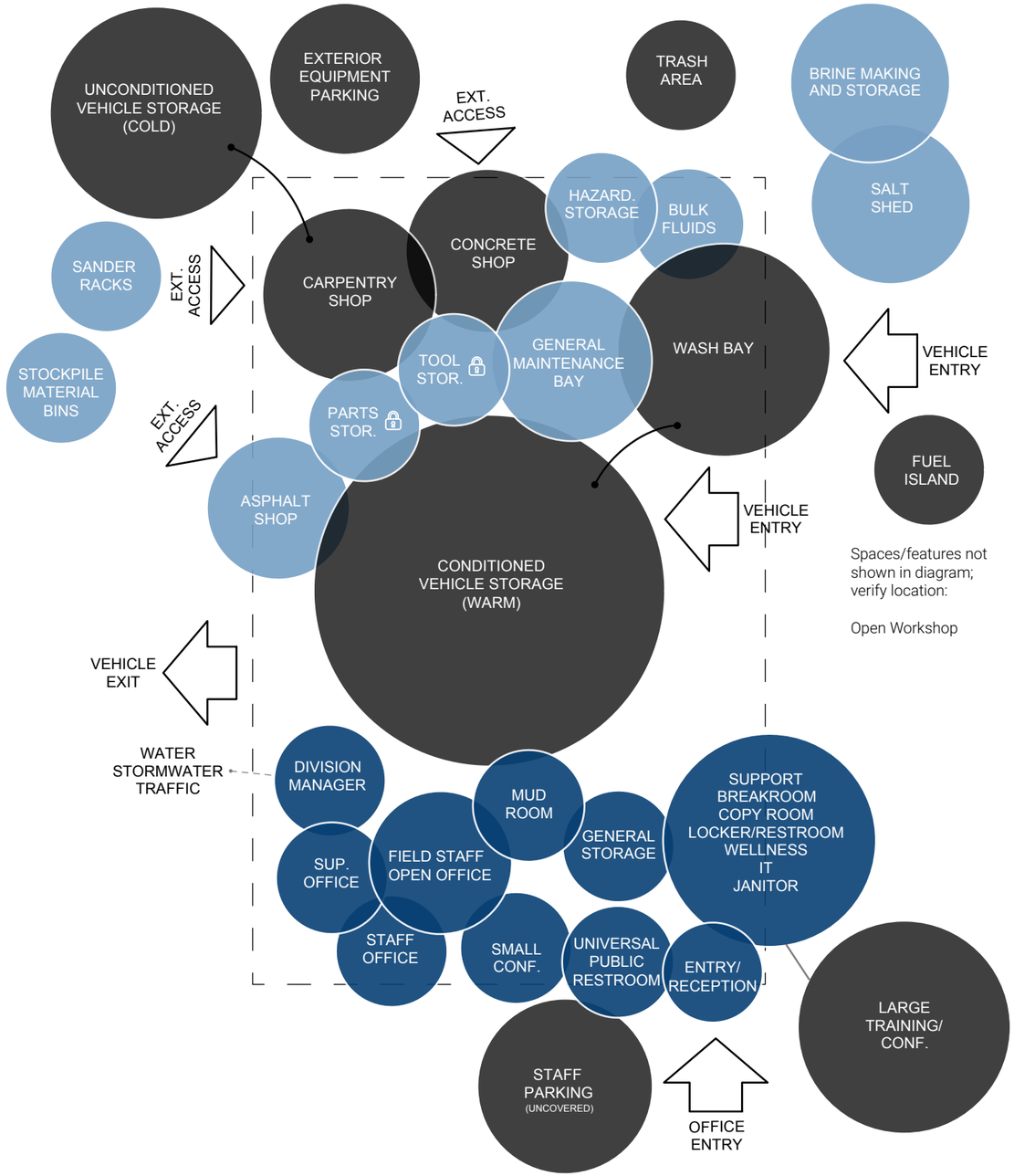
DIVISION OPERATION CRITICAL SPACES	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
STRT.2 - General Maintenance Bay	1,680	30' x 56'	1	1,680	
STRT.3 - Asphalt Shop	1,200	20' x 60'	1	1,200	
STRT.4 - Carpentry / Wood Fabrication Shop	900	30' x 30'	1	900	
STRT.5 - Concrete Shop	960	40' x 24'	1	960	
STRT.6 - Hazardous Storage	450	15' x 30'	1	450	
STRT.7 - Wash Bay	1,680	30' x 56'	2	3,360	
STRT.8 - Parts Storage	224	16' x 14'	1	224	
STRT.9 - Tool Storage	224	16' x 14'	1	224	
STRT.10 - Bulk Fluids Room	192	16' x 12'	1	192	
STRT Division Opertion Critical Spaces	9,190				
DIVISION OPERATION CRITICAL SPACES SUBTOTAL SF				9,190	
CIRCULATION @ 30%				2,757	
DIVISION OPERATION CRITICAL SPACES TOTAL SF				11,947	

UNCONDITIONED VEHICLE STORAGE (COLD)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	0	0	
Medium Space	288	12'x24'	3	922	
Pickup Space	200	10'x20'	16	3,200	
VEHICLE PARKING SUBTOTAL	4,122				
DOUBLE TRAFFIC LANE STORAGE INCREASE	4,946			9,068	Parking plus traffic lane serving parking
Mezzanine Storage				3,023	Maximum 1/3 of open storage area (IBC)
General Storage area				1,133	Area created by angled parking, used for small implement storage
UNCONDITIONED VEHICLE STORAGE SUBTOTAL SF				9,068	Parking plus traffic lane serving parking
CIRCULATION @ 15%				1,360	
UNCONDITIONED VEHICLE STORAGE TOTAL SF				11,561	Sum of parking and traffic lanes, plus additional circ and storage

SITE PROGRAM REQUIREMENTS	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Staff Parking and Drive Aisle	284	9' x 18'	38	10,886	1 per staff on largest shift
Exterior Equipment Parking Demands	288	12' x 24'	13	3,802	
ADA Space plus Aisle	306	9' x 18' +8' Aisle	2	470	
DIV.15 - Trash Area	900	30'x30' (can vary)	1	900	
STRT.12 - Sander Racks	180	10' x 18'	36	6,480	
STRT.14 - Salt and Sand Mixing	4,800	60' x 80'	1	4,800	
STRT.15 - Salt Shed	8,000	100' x 80'	1	8,000	
STRT.16 - Stock Pile Material Bins	800	40' x 20'	8	6,400	
STRT.17 - Brine Making and Storage	1,920	40' x 48'	1	1,920	
Fuel Island	1,500	30' x 50'	1	1,500	
SITE PROGRAM REQUIREMENTS SUBTOTAL SF				29,100	
SITE CIRCULATION @ 150%				43,650	Accounts for access to all sides of separated site functions
SITE PROGRAM REQUIREMENTS TOTAL SF				72,750	

SITE AREA TOTALS					
MAIN BUILDING	92,716				
CIRCULATION AROUND BUILDING	23,179				
COLD STORAGE	11,561				
CIRCULATION AROUND BUILDING	2,890	25% of subtotal			
SITE PROGRAM REQUIREMENTS	72,750				
CIRCULATION AROUND BUILDING	18,188	25% of subtotal			
Program Totals	221,284				
25% GREEN SPACE	55,321				
Stormwater Management	55,321	25% of subtotal			
GRAND TOTAL SITE AREA SF	431,503	12.88			*Total squarefootage and acreage, plus added 30% of programmed acreage for drainage paths, easements, setbacks, etc.*

Streets Division (STRT)
Programming Summary



Streets Division
Adjacency Diagram

ADMINISTRATIVE	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
DIV.1a - Building Entry / Vestibule	100	10'x10'	1	100	
DIV.1b - Reception	100	10' x 10'	0	0	
DIV.2 - Division Manager Office	180	12' x 15'	1	180	
DIV.3 - Supervisor Office	150	10' x 15'	2	300	
DIV.4 - Staff Office	120	12' x 10'	4	480	
DIV.5 - Field Staff Workstation / Open Office	324	6'x6' x (FTE+1/2PTE)	1	324	
DIV.6a - Small Conference Room	120	12' x 10'	1	120	
DIV.6b - Standard Conference Room	NA			-	
DIV.7 - Large Conference Room-Training Room	500	20' x 25'	1	500	
DIV.8 - Copy Area / Document Work Room	216	12' x 18'	1	288	
DIV.9 - Breakroom	400	25 sf x Staff #	1	400	
DIV.10a - Universal Public Restroom	72	8' x 9'	1	72	
DIV.10b - Men's Locker and Restroom	380	TBD	1	380	
DIV.10c - Women's Locker and Restroom	260	TBD	1	260	
DIV.10d - Wellness Room	168	12' x 14'	1	168	
DIV.10e - IT Closet	48	6' x 8'	1	48	
DIV.10f - Janitorial	63	7' x 9'	1	63	
DIV.11 - General Storage / Supply Closets	100	10' x 10'	3	300	
DIV.12 - Mud Room / Wash Area	96	8' x 12'	1	96	
DIV.13 - General Computer Area	NA			-	Central Computer area - See Also DIV.5 - Field Staff / Open Office
DIV.14 - Laundry Facility	NA			-	
DIV.10g - Mechanical and Electrical Room	612	15% of supported	1	612	
ADMINISTRATIVE SUBTOTAL SF				4,691	
CIRCULATION @ 30%				1,407	
ADMINISTRATIVE TOTAL SF				6,098	

CONDITIONED VEHICLE STORAGE (WARM)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	13	11,520	
Medium Space	288	12'x24'	10	2,765	
Pickup Space	200	10'x20'	8	1,680	
VEHICLE PARKING SUBTOTAL	15,965				
DOUBLE TRAFFIC LANE STORAGE INCREASE	19,158			35,123	Parking plus traffic lane serving parking
Mezzanine Storage				11,708	Maximum 1/3 of open storage area (IBC)
General Storage area				4,390	Area created by angled parking, used for small implement storage
CONDITIONED VEHICLE STORAGE SUBTOTAL SF				35,123	Parking plus traffic lane serving parking
CIRCULATION @ 15%				5,268	
CONDITIONED VEHICLE STORAGE TOTAL SF				44,781	Sum of parking and traffic lanes, plus additional circ and storage

DIVISION OPERATION CRITICAL SPACES	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
STWT.2 - Stormwater Shop	800	20' x 40'	1	800	
STWT.3 - Levee Shop	900	30' x 30'	1	900	
STWT.4 - Secure Storage	256	16' x 16'	1	256	
STWT.5 - Material and Equipment Storage Shop	1,350	45' x 30'	1	1,350	
STWT.6 - Wash Bay	1,680	30' x 56'	2	3,360	
STWT Division Opertion Critical Spaces	6,666				
DIVISION OPERATION CRITICAL SPACES SUBTOTAL SF				6,666	
CIRCULATION @ 30%				2,000	
DIVISION OPERATION CRITICAL SPACES TOTAL SF				8,666	

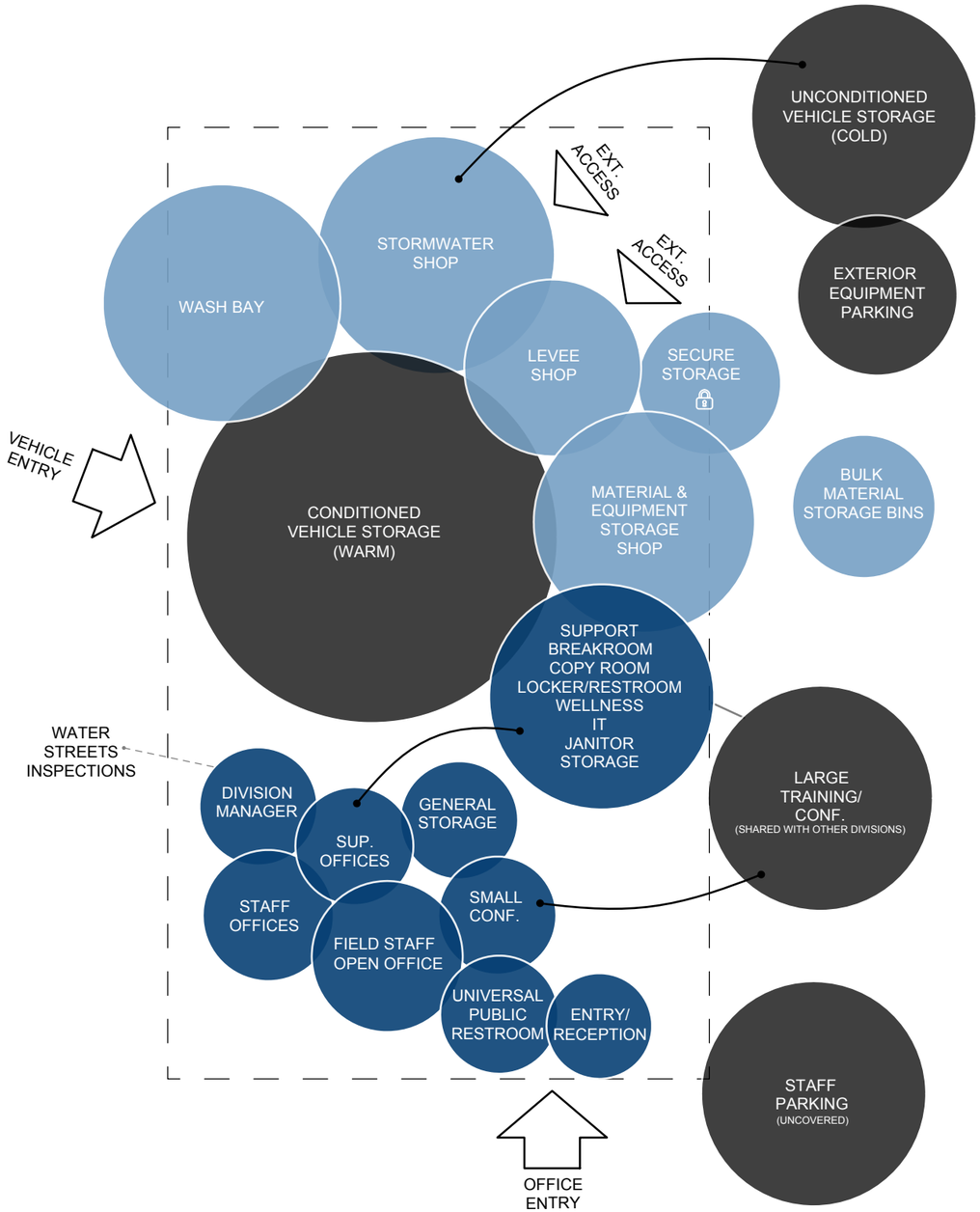
UNCONDITIONED VEHICLE STORAGE (COLD)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	0	0	
Medium Space	288	12'x24'	5	1,382	
Pickup Space	200	10'x20'	11	2,160	
VEHICLE PARKING SUBTOTAL	3,542				
DOUBLE TRAFFIC LANE STORAGE INCREASE	4,251			7,793	Parking plus traffic lane serving parking
Mezzanine Storage				2,598	Maximum 1/3 of open storage area (IBC)
General Storage area				974	Area created by angled parking, used for small implement storage
UNCONDITIONED VEHICLE STORAGE SUBTOTAL SF				7,793	Parking plus traffic lane serving parking
CIRCULATION @ 15%				1,169	
UNCONDITIONED VEHICLE STORAGE TOTAL SF				9,936	Sum of parking and traffic lanes, plus additional circ and storage

SITE PROGRAM REQUIREMENTS	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Staff Parking and Drive Aisle	284	9' x 18'	16	4,536	1 per staff on largest shift
Exterior Equipment Parking Demands	288	12' x 24'	10	2,765	
ADA Space plus Aisle	306	9' x 18' +8' Aisle	1	306	
STWT.7 - Exterior Fleet Parking				0	
STWT.8 - Stormsewer Pipe and Precast Stock				0	
STWT.8 & .9 - Bulk Material Storage Bins	800	40' x 20'	8	6,400	
SITE PROGRAM REQUIREMENTS SUBTOTAL SF				9,471	
SITE CIRCULATION @ 150%				14,206	Accounts for access to all sides of separated site functions
SITE PROGRAM REQUIREMENTS TOTAL SF				23,677	

SITE AREA TOTALS					
MAIN BUILDING	59,545				
CIRCULATION AROUND BUILDING	14,886	25% of subtotal			
COLD STORAGE	9,936				
CIRCULATION AROUND BUILDING	2,484	25% of subtotal			
SITE PROGRAM REQUIREMENTS	23,677				
CIRCULATION AROUND BUILDING	5,919	25% of subtotal			
Program Totals	116,448				
25% GREEN SPACE	29,112				
Stormwater Management	29,112	25% of subtotal			
GRAND TOTAL SITE AREA SF	227,074	6.78			*Total squarefootage and acreage, plus added 30% of programmed acreage for drainage paths, easements, setbacks, etc.*

Stormwater Division (STWT)

Programming Summary



Stormwater Division

Adjacency Diagram

Wastewater Collections Division (WSWT)

Programming Summary

ADMINISTRATIVE	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
DIV.1a - Building Entry / Vestibule	100	10'x10'	1	100	
DIV.1b - Reception	100	10' x 10'	0	0	
DIV.2 - Division Manager Office	180	12' x 15'	1	180	
DIV.3 - Supervisor Office	150	10' x 15'	1	150	
DIV.4 - Staff Office	120	12' x 10'	1	120	
DIV.5 - Field Staff Workstation / Open Office	468	6'x6' x (FTE+1/2PTE)	1	468	
DIV.6a - Small Conference Room	120	12' x 10'	1	120	
DIV.7 - Large Conference Room-Training Room	500	20' x 25'	1	500	
DIV.8 - Copy Area / Document Work Room	216	12' x 18'	1	288	
DIV.9 - Breakroom	400	25 sf x Staff #	1	400	
DIV.10a - Universal Public Restroom	72	8' x 9'	2	144	
DIV.10b - Men's Locker and Restroom	340	Varies	1	340	
DIV.10c - Women's Locker and Restroom	260	Varies	1	260	
DIV.10d - Wellness Room	168	12' x 14'	1	168	
DIV.10e - IT Closet	48	6' x 8'	1	48	
DIV.10f - Janitorial	63	7' x 9'	1	63	
DIV.11 - General Storage / Supply Closets	100	10' x 10'	1	100	
DIV.12 - Mud Room / Wash Area	96	8' x 12'	1	96	
DIV.10g - Mechanical and Electrical Room	502	15% of supported	1	502	
ADMINISTRATIVE SUBTOTAL SF				4,047	
CIRCULATION @ 30%				1,214	
ADMINISTRATIVE TOTAL SF				5,262	

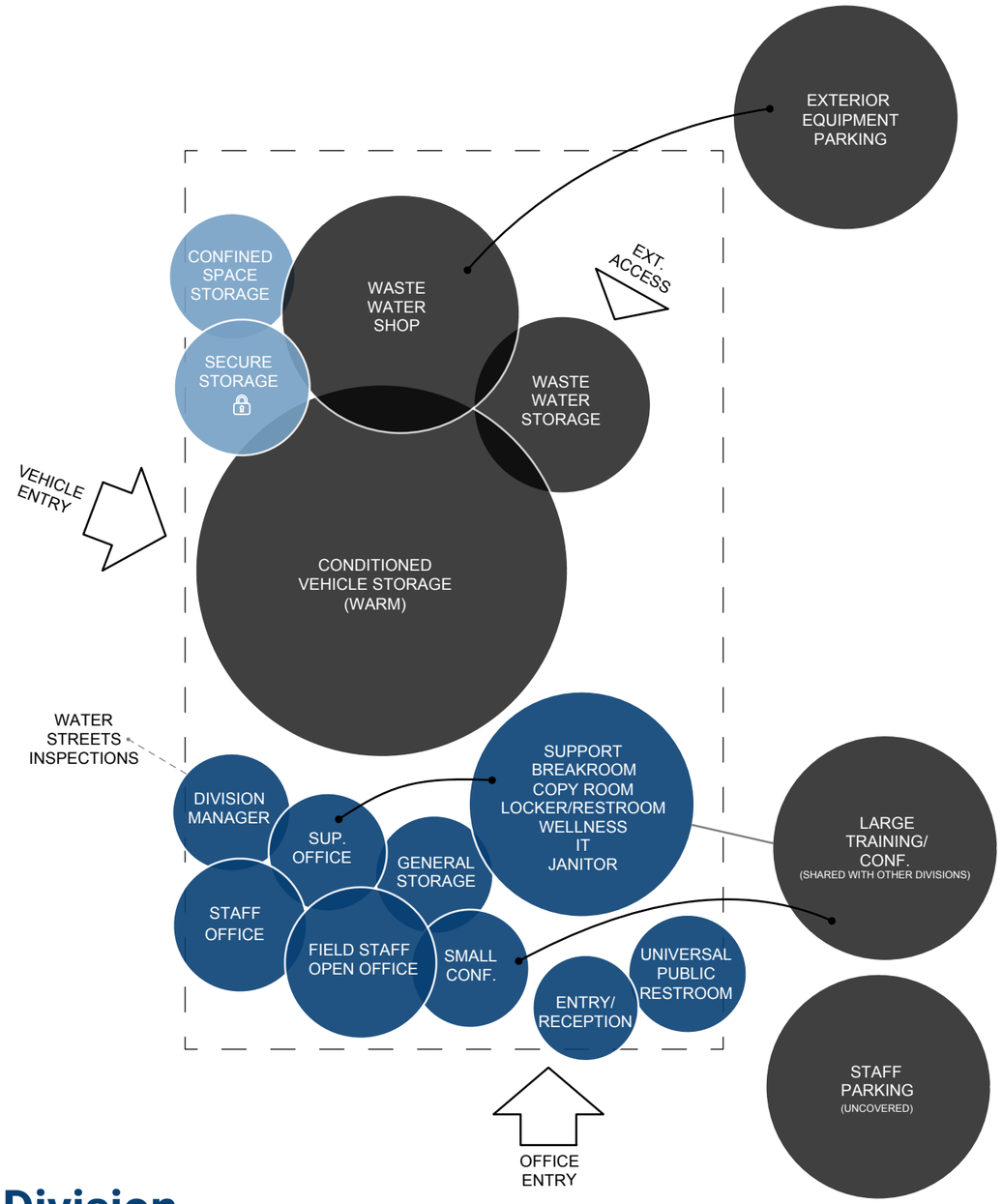
CONDITIONED VEHICLE STORAGE (WARM)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	3	2,880	
Medium Space	288	12'x24'	11	3,226	
Pickup Space	200	10'x20'	0	0	
VEHICLE PARKING SUBTOTAL	6,106				
DOUBLE TRAFFIC LANE STORAGE INCREASE	7,327			13,432	Parking plus traffic lane serving parking
Mezzanine Storage				4,477	Maximum 1/3 of open storage area (IBC)
General Storage area				1,679	Area created by angled parking, used for small implement storage
CONDITIONED VEHICLE STORAGE SUBTOTAL SF				13,432	Parking plus traffic lane serving parking
CIRCULATION @ 15%				2,015	
CONDITIONED VEHICLE STORAGE TOTAL SF				17,126	Sum of parking and traffic lanes, plus additional circ and storage

DIVISION OPERATION CRITICAL SPACES	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
WSWT.2 - Wastewater Shop	400	20' x 20'	1	400	
WSWT.3 - Wastewater Storage Area	200	20' x 10'	1	200	
WSWT.4 - Secure Storage	256	16' x 16'	1	256	
WSWT.5 - Confined Space Storage Unit	64	8' x 8'	1	64	
WSWT Division Opertion Critical Spaces	920				
DIVISION OPERATION CRITICAL SPACES SUBTOTAL SF				920	
CIRCULATION @ 30%				276	
DIVISION OPERATION CRITICAL SPACES TOTAL SF				1,196	

UNCONDITIONED VEHICLE STORAGE (COLD)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	0	0	
Medium Space	288	12'x24'	0	0	
Pickup Space	200	10'x20'	0	0	
VEHICLE PARKING SUBTOTAL	0				
DOUBLE TRAFFIC LANE STORAGE INCREASE	0			0	Parking plus traffic lane serving parking
Mezzanine Storage				0	Maximum 1/3 of open storage area (IBC)
General Storage area				0	Area created by angled parking, used for small implement storage
UNCONDITIONED VEHICLE STORAGE SUBTOTAL SF				0	Parking plus traffic lane serving parking
CIRCULATION @ 15%				0	
UNCONDITIONED VEHICLE STORAGE TOTAL SF				0	Sum of parking and traffic lanes, plus additional circ and storage

SITE PROGRAM REQUIREMENTS	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Staff Parking and Drive Aisle	284	9' x 18'	16	4,536	1 per staff on largest shift
Exterior Equipment Parking Demands	288	12' x 24'	0	0	
ADA Space plus Aisle	306	9' x 18' +8' Aisle	1	306	
SITE PROGRAM REQUIREMENTS SUBTOTAL SF				4,842	
SITE CIRCULATION @ 150%				7,263	Accounts for access to all sides of separated site functions
SITE PROGRAM REQUIREMENTS TOTAL SF				12,105	

SITE AREA TOTALS					
MAIN BUILDING	23,584				
CIRCULATION AROUND BUILDING	5,896	25% of subtotal			
COLD STORAGE	0				
CIRCULATION AROUND BUILDING	0	25% of subtotal			
SITE PROGRAM REQUIREMENTS	12,105				
CIRCULATION AROUND BUILDING	3,026	25% of subtotal			
Program Totals	44,611				
25% GREEN SPACE	11,153				
Stormwater Management	11,153	25% of subtotal			
GRAND TOTAL SITE AREA SF	86,991	2.60			*Total squarefootage and acreage, plus added 30% of programmed acreage for drainage paths, easements, setbacks, etc.*



Wastewater Collections Division

Adjacency Diagram

ADMINISTRATIVE	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
DIV.1a - Building Entry / Vestibule	100	10'x10'	1	100	
DIV.1b - Reception	100	10' x 10'	0	0	
DIV.2 - Division Manager Office	180	12' x 15'	2	360	
DIV.3 - Supervisor Office	150	10' x 15'	6	900	
DIV.4 - Staff Office	120	12' x 10'	1	120	
DIV.5 - Field Staff Workstation / Open Office	1,519	6'x6' x (FTE+1/2PTE)	1	1,519	
DIV.6a - Small Conference Room	120	12' x 10'	0	0	
DIV.6b - Standard Conference Room	240	12' x 20'	2	480	
DIV.7 - Large Conference Room-Training Room	500	20' x 25'	1	500	
DIV.8 - Copy Area / Document Work Room	216	12' x 18'	2	461	
DIV.9 - Breakroom	1,280	25 sf x Staff #	1	1,280	
DIV.10a - Universal Public Restroom	72	8' x 9'	4	288	
DIV.10b - Men's Locker and Restroom	604	Varies	1	604	
DIV.10c - Women's Locker and Restroom	348	Varies	1	348	
DIV.10d - Wellness Room	168	12' x 14'	2	336	
DIV.10e - IT Closet	48	6' x 8'	1	48	
DIV.10f - Janitorial	63	7' x 9'	1	63	
DIV.11 - General Storage / Supply Closets	100	10' x 10'	1	100	
DIV.12 - Mud Room / Wash Area	96	8' x 12'	1	96	
DIV.13 - General Computer Area	NA			-	Central Computer area - See Also DIV.5 - Field Staff / Open Office
DIV.10g - Mechanical and Electrical Room	1,140	15% of supported	1	1,140	
ADMINISTRATIVE SUBTOTAL SF				8,743	
CIRCULATION @ 30%				2,623	
ADMINISTRATIVE TOTAL SF				11,366	

CONDITIONED VEHICLE STORAGE (WARM)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	6	5,760	
Medium Space	288	12'x24'	18	5,069	
Pickup Space	200	10'x20'	36	7,280	
VEHICLE PARKING SUBTOTAL	18,109				
DOUBLE TRAFFIC LANE STORAGE INCREASE	21,731			39,839	Parking plus traffic lane serving parking
Mezzanine Storage				13,280	Maximum 1/3 of open storage area (IBC)
General Storage area				4,980	Area created by angled parking, used for small implement storage
CONDITIONED VEHICLE STORAGE SUBTOTAL SF				39,839	Parking plus traffic lane serving parking
CIRCULATION @ 15%				5,976	
CONDITIONED VEHICLE STORAGE TOTAL SF				50,795	Sum of parking and traffic lanes, plus additional circ and storage

DIVISION OPERATION CRITICAL SPACES	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
WTDT.2 - Field Shop	6,890	106' x 65'	1	6,890	
WTDT.3 - Water Distribution Shop	1,248	48' x 26'	1	1,248	
WTDT.4 - Secure Storage	256	16' x 16'	1	256	
WTDT.5 - Hazardous Storage	36	6' x 6'	3	108	
WTDT Division Opertion Critical Spaces	8,502				
DIVISION OPERATION CRITICAL SPACES SUBTOTAL SF				8,502	
CIRCULATION @ 30%				2,551	
DIVISION OPERATION CRITICAL SPACES TOTAL SF				11,053	

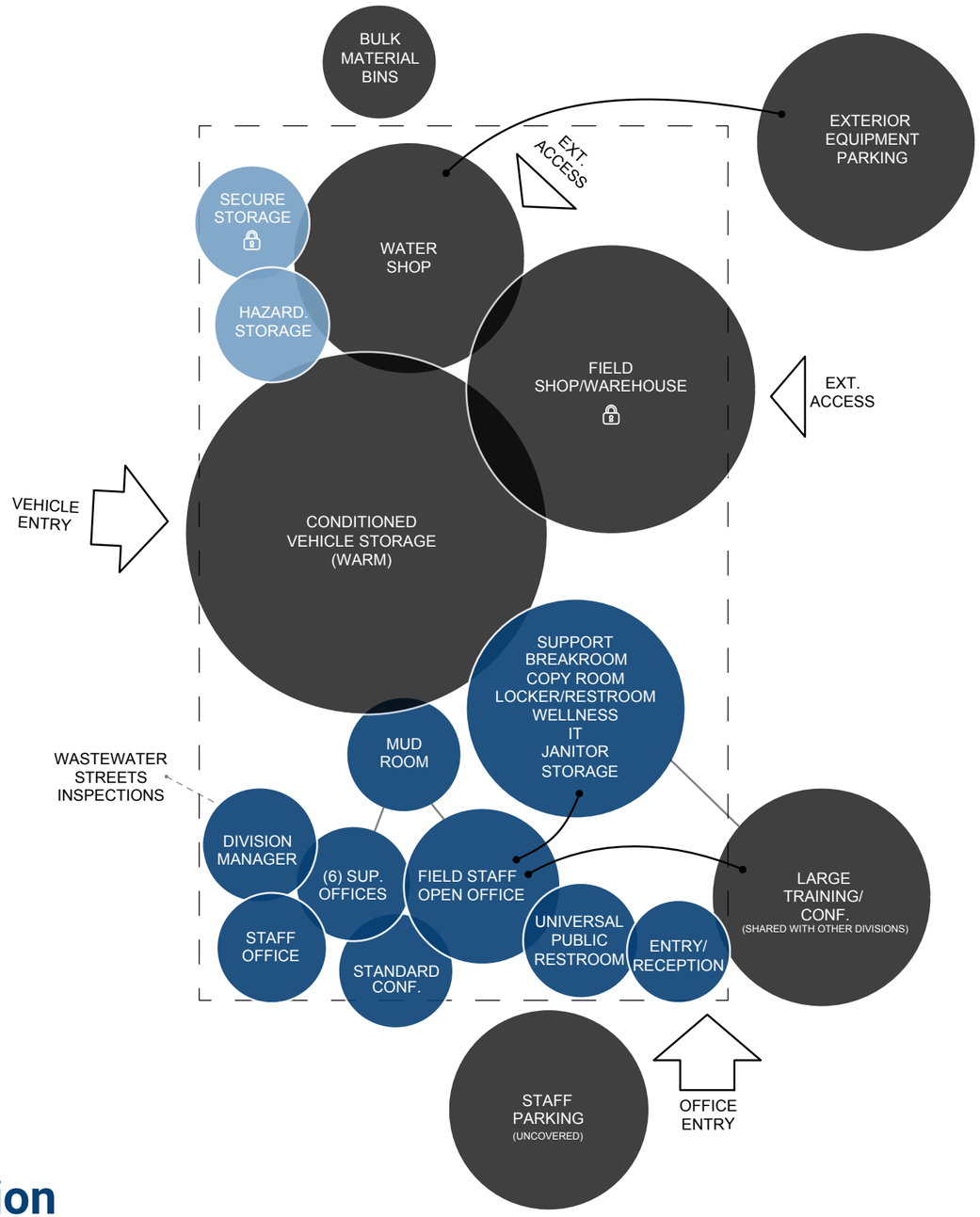
UNCONDITIONED VEHICLE STORAGE (COLD)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	0	0	
Medium Space	288	12'x24'	0	0	
Pickup Space	200	10'x20'	0	0	
VEHICLE PARKING SUBTOTAL	0				
DOUBLE TRAFFIC LANE STORAGE INCREASE	0			0	Parking plus traffic lane serving parking
Mezzanine Storage				0	Maximum 1/3 of open storage area (IBC)
General Storage area				0	Area created by angled parking, used for small implement storage
UNCONDITIONED VEHICLE STORAGE SUBTOTAL SF				0	Parking plus traffic lane serving parking
CIRCULATION @ 15%				0	
UNCONDITIONED VEHICLE STORAGE TOTAL SF				0	Sum of parking and traffic lanes, plus additional circ and storage

SITE PROGRAM REQUIREMENTS	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Staff Parking and Drive Aisle	284	9' x 18'	51	14,515	1 per staff on largest shift
Exterior Equipment Parking Demands	288	12' x 24'	0	0	
ADA Space plus Aisle	306	9' x 18' +8' Aisle	2	627	
WTDT.7 - Bulk Material Bins	750	30' x 25'	3	2,250	
SITE PROGRAM REQUIREMENTS SUBTOTAL SF				17,392	
SITE CIRCULATION @ 150%				26,088	Accounts for access to all sides of separated site functions
SITE PROGRAM REQUIREMENTS TOTAL SF				43,480	

SITE AREA TOTALS					
MAIN BUILDING	73,214				
CIRCULATION AROUND BUILDING	18,304	25% of subtotal			
COLD STORAGE	0				
CIRCULATION AROUND BUILDING	0	25% of subtotal			
SITE PROGRAM REQUIREMENTS	43,480				
CIRCULATION AROUND BUILDING	10,870	25% of subtotal			
Program Totals	145,867				
25% GREEN SPACE	36,467				
Stormwater Management	36,467	25% of subtotal			
GRAND TOTAL SITE AREA SF	284,442	8			*Total squarefootage and acreage, plus added 30% of programmed acreage for drainage paths, easements, setbacks, etc.*

Water Distribution Division (WTDT)

Programming Summary



Water Distribution Division

Adjacency Diagram

ADMINISTRATIVE	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
DIV.1a - Building Entry / Vestibule	100	10'x10'	1	100	
DIV.1b - Reception	NA			-	
DIV.2 - Division Manager Office	180	12' x 15'	1	180	
DIV.3 - Supervisor Office	NA			-	
DIV.4 - Staff Office	120	12' x 10'	1	120	
DIV.5 - Field Staff Workstation / Open Office	516	6'x6' x (FTE+1/2PTE)	1	516	
DIV.6a - Small Conference Room	NA			-	
DIV.6b - Standard Conference Room	NA			-	
DIV.7 - Large Conference Room-Training Room	NA			-	
DIV.8 - Copy Area / Document Work Room	216	12' x 18'	1	259	
DIV.9 - Breakroom	360	25 sf x Staff #	1	360	
DIV.10a - Universal Public Restroom	72	8' x 9'	2	144	
DIV.10b - Men's Locker and Restroom	364	TBD	1	364	
DIV.10c - Women's Locker and Restroom	256	TBD	1	256	
DIV.10d - Wellness Room	168	12' x 14'	1	168	
DIV.10e - IT Closet	48	6' x 8'	1	48	
DIV.10f - Janitorial	63	7' x 9'	1	63	
DIV.11 - General Storage / Supply Closets	200	20' x 10'	1	200	
DIV.12 - Mud Room / Wash Area	96	8' x 12'	1	96	
DIV.13 - General Computer Area	NA			-	Central Computer area - See Also DIV.5 - Field Staff / Open Office
DIV.14 - Laundry Facility	NA			-	
DIV.10g - Mechanical and Electrical Room	431	15% of supported	1	-	
ADMINISTRATIVE SUBTOTAL SF				2,875	
CIRCULATION @ 30%				862	
ADMINISTRATIVE TOTAL SF				3,737	

CONDITIONED VEHICLE STORAGE (WARM)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	0	0	
Medium Space	288	12'x24'	0	0	
Pickup Space	200	10'x20'	14	2,880	
VEHICLE PARKING SUBTOTAL	2,880				
DOUBLE TRAFFIC LANE STORAGE INCREASE	3,456			6,336	Parking plus traffic lane serving parking
Mezzanine Storage				2,112	Maximum 1/3 of open storage area (IBC)
General Storage area				792	Area created by angled parking, used for small implement storage
CONDITIONED VEHICLE STORAGE SUBTOTAL SF				6,336	Parking plus traffic lane serving parking
CIRCULATION @ 15%				950	
CONDITIONED VEHICLE STORAGE TOTAL SF				8,078	Sum of parking and traffic lanes, plus additional circ and storage

DIVISION OPERATION CRITICAL SPACES	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
INS.1 - Open Work Shop	750	25' x 30'	1	750	
INS.2 - Surveyor Office - (See DIV.3)				0	
INS.3 - Common Office Area (See DIV.5)				0	
INS Division Opertion Critical Spaces	750				
DIVISION OPERATION CRITICAL SPACES SUBTOTAL SF				750	
CIRCULATION @ 30%				225	
DIVISION OPERATION CRITICAL SPACES TOTAL SF				975	

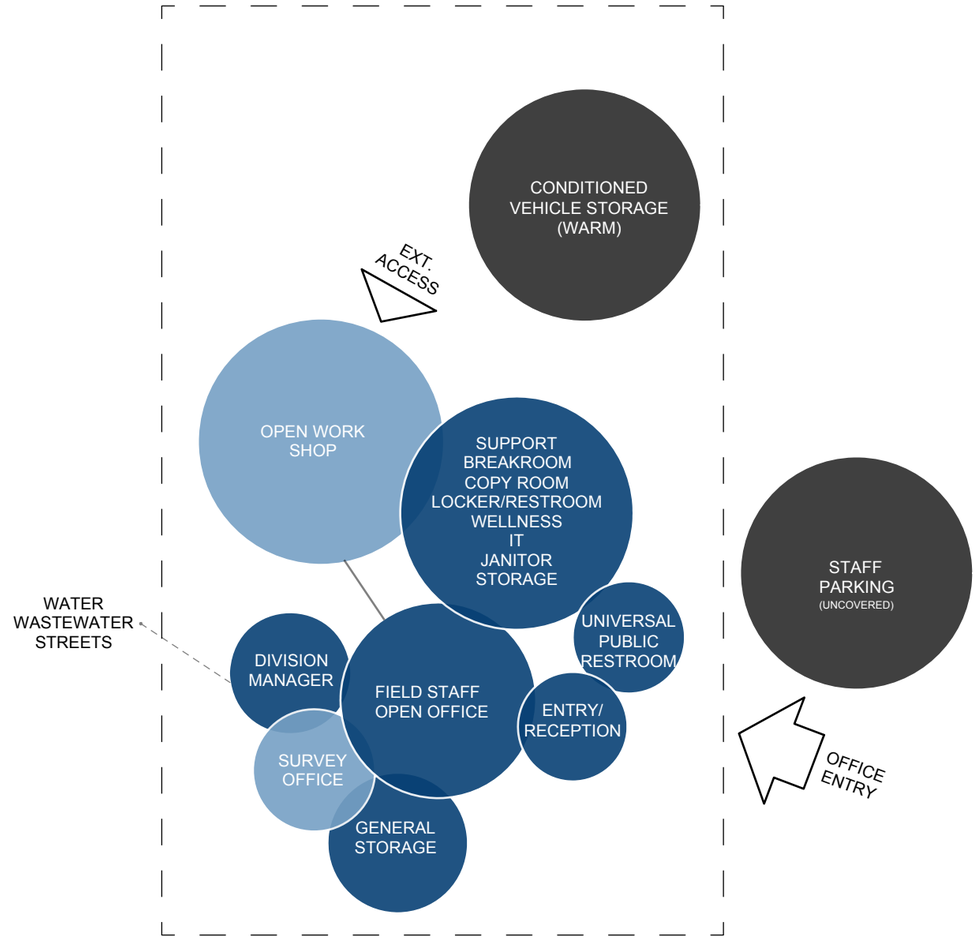
UNCONDITIONED VEHICLE STORAGE (COLD)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	0	0	
Medium Space	288	12'x24'	0	0	
Pickup Space	200	10'x20'	0	0	
VEHICLE PARKING SUBTOTAL	0				
DOUBLE TRAFFIC LANE STORAGE INCREASE	0			0	Parking plus traffic lane serving parking
Mezzanine Storage				0	Maximum 1/3 of open storage area (IBC)
General Storage area				0	Area created by angled parking, used for small implement storage
UNCONDITIONED VEHICLE STORAGE SUBTOTAL SF				0	Parking plus traffic lane serving parking
CIRCULATION @ 15%				0	
UNCONDITIONED VEHICLE STORAGE TOTAL SF				0	Sum of parking and traffic lanes, plus additional circ and storage

SITE PROGRAM REQUIREMENTS	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Staff Parking and Drive Aisle	284	9' x 18'	14	4,082	1 per staff on largest shift
Exterior Equipment Parking Demands	288	12' x 24'	0	0	
ADA Space plus Aisle	306	9' x 18' +8' Aisle	1	306	
SITE PROGRAM REQUIREMENTS SUBTOTAL SF				4,388	
SITE CIRCULATION @ 150%				6,583	Accounts for access to all sides of separated site functions
SITE PROGRAM REQUIREMENTS TOTAL SF				10,971	

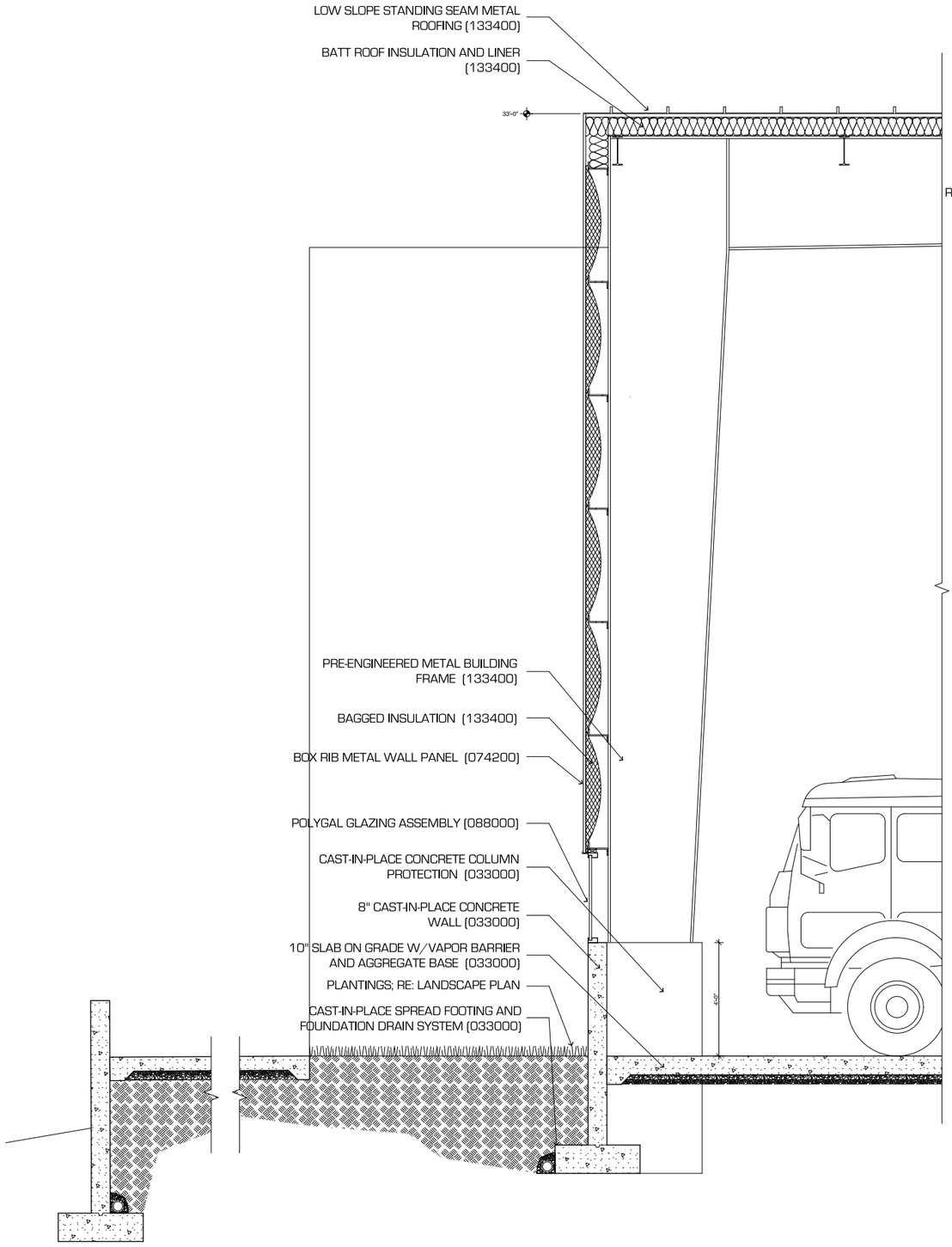
SITE AREA TOTALS					
MAIN BUILDING	12,790				
CIRCULATION AROUND BUILDING	3,198	25% of subtotal			
COLD STORAGE	0				
CIRCULATION AROUND BUILDING	0	25% of subtotal			
SITE PROGRAM REQUIREMENTS	10,971				
CIRCULATION AROUND BUILDING	2,743	25% of subtotal			
Program Totals	29,702				
25% GREEN SPACE	7,425				
Stormwater Management	7,425	25% of subtotal			
GRAND TOTAL SITE AREA SF	57,918	1.73			Total squarefootage and acreage, plus added 30% of programmed acreage for drainage paths, easements, setbacks, etc.

Inspections Division (INS)

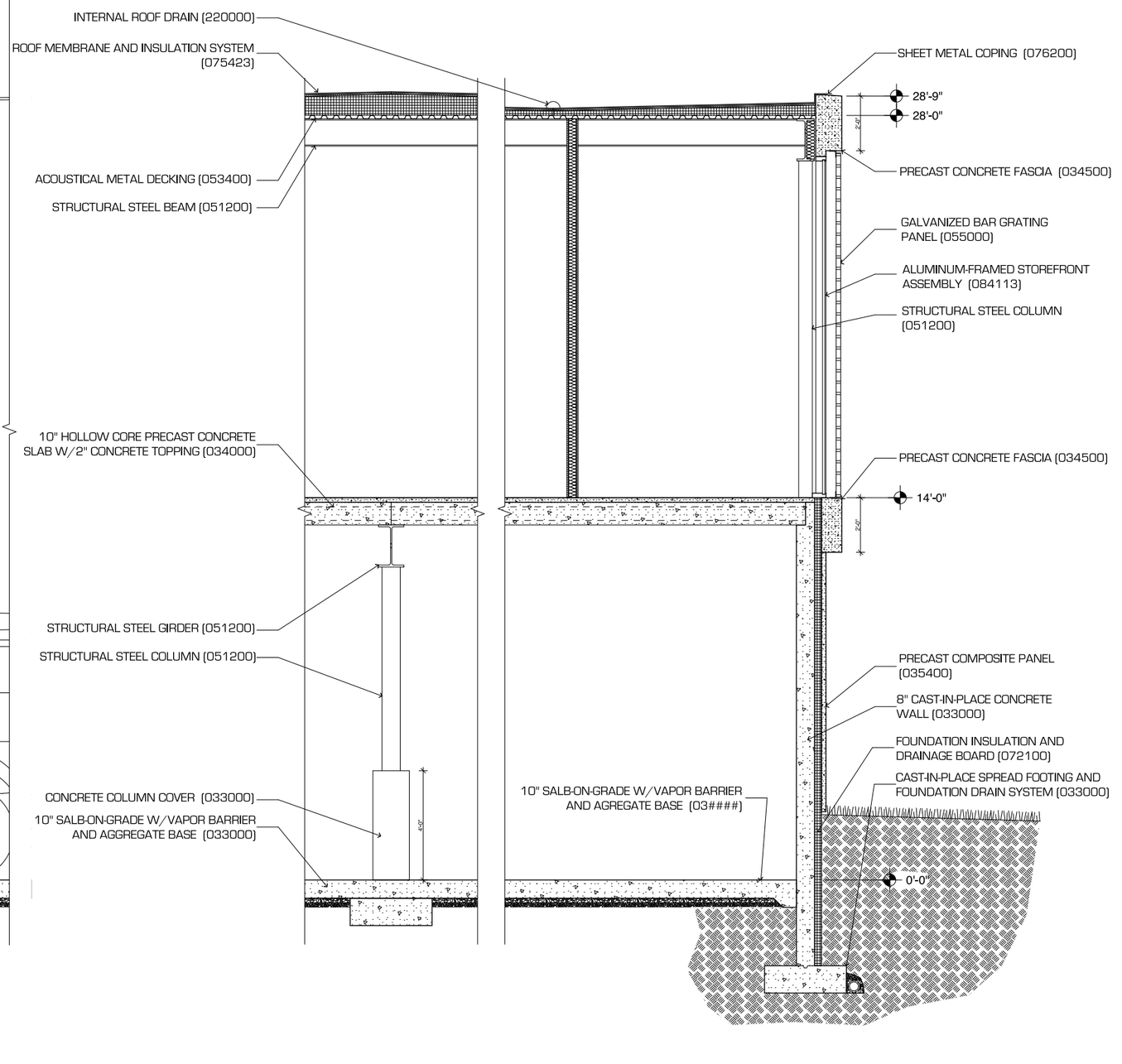
Programming Summary



Inspections Division
Adjacency Diagram



MSO West Wall Section at Conditioned Storage, lkg north



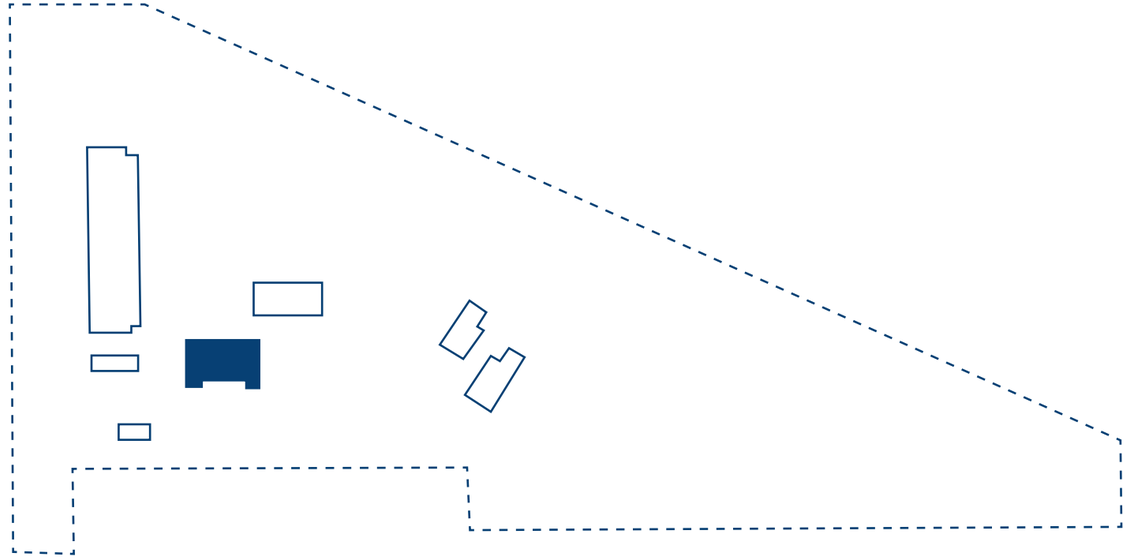
MSO East Wall Section @ Building B, lkg north

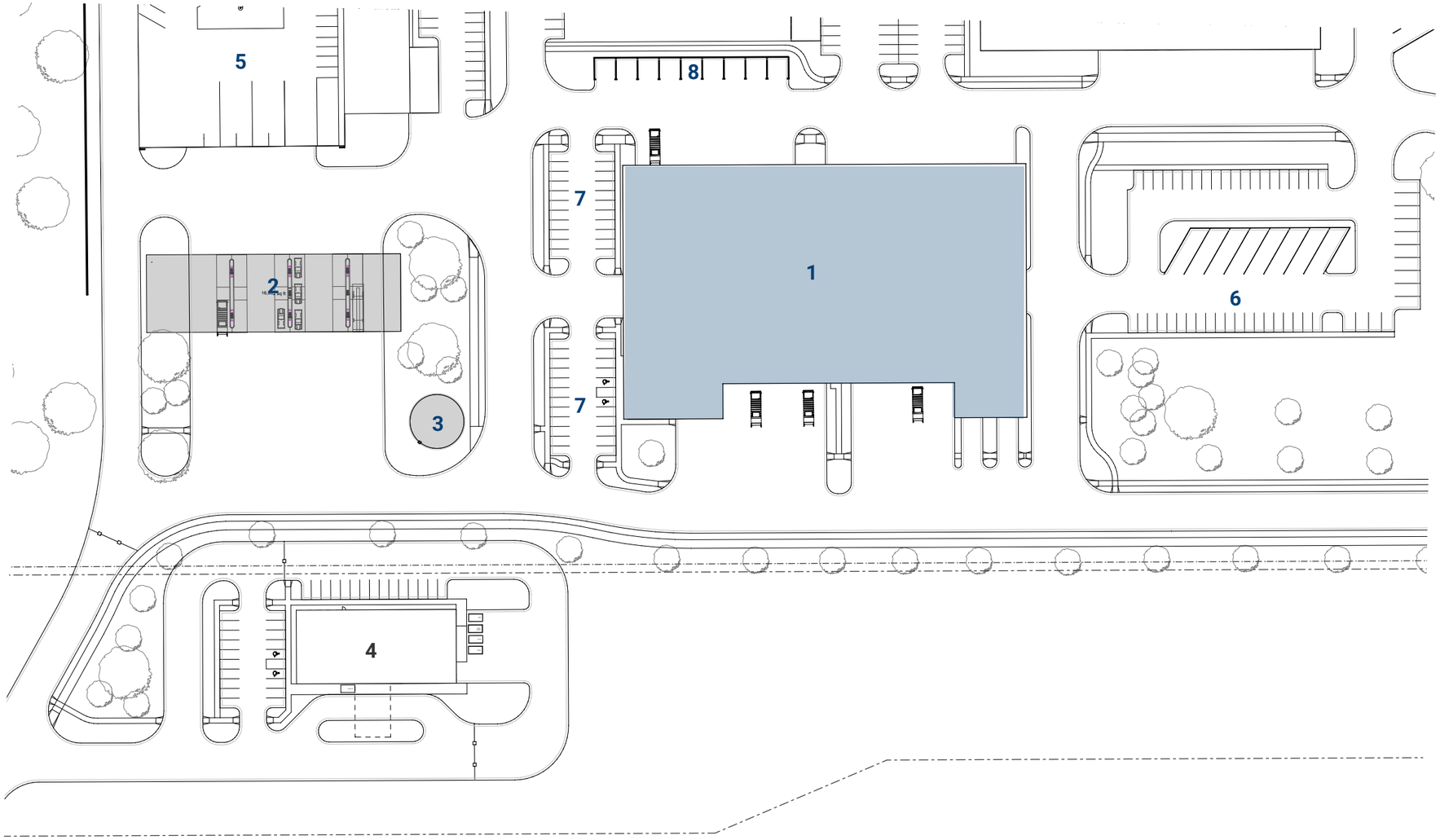
0 4 8

MSO Building: View Looking South

5

Central Maintenance Garage





1. Central Maintenance Garage
2. Fuel Island
3. Rainwater Collection Tank
4. Household Hazardous Waste Facility
5. MSO Building
6. Fleet Vehicle Staging Area
7. Employee Parking
8. Bulk Material Bins

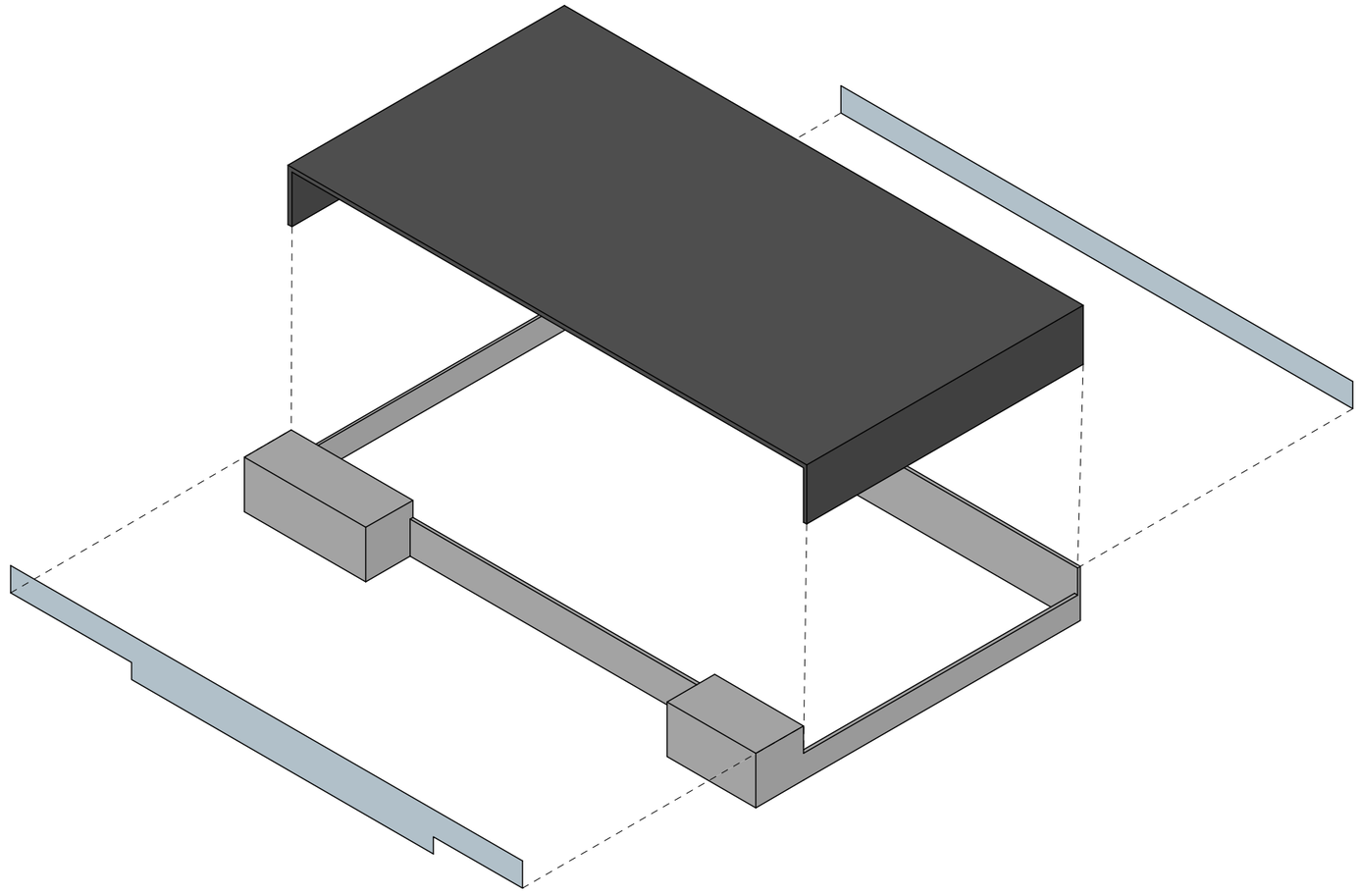
Site Plan

0 40 80 160 320’

Architectural Narrative

The Central Maintenance Garage is designed be a highly durable structure with great natural daylight. Concrete is used as a strong base to accommodate the high number of fleet vehicles entering and exiting the building. Clerestory windows on the North and South facades will filter ample daylight into work areas and offices. The entire structure is then wrapped in a light metal skin.

Operationally, a properly sized and outfitted Central Maintenance Garage will improve the lifespan of all serviced vehicles, reducing turnover costs. The most dramatic efficiencies are related to large and specialized vehicles. The new facility could add a potential average of four years to the life to large/ specialized vehicles, thus saving approximately $500,000 per year in reduced equipment replacement costs. Note that if the City does switch to a majority electric fleet, replacement schedules and maintenance activities will shift significantly. In this case, future efficiencies would be realized by appropriating flexible service bays within CMG to allow ease of adaptation to changing technologies.



1. Entry Vestibule
2. Mud Room
3. Restroom
4. Women's Locker Room
5. Men's Locker Room
6. Break Room
7. IT Closet
8. Janitor
9. Storage and Mechanical
10. Shop Foreman's Office
11. Wash Bay
12. Small Service Bays
13. Large Service Bays
14. Tire Bay
15. Storage
16. Welding and Fabrication Bay
17. Central Drive Lane
18. Parts Office
19. Parts Storage
20. Bulk Fluids - Virgin
21. Bulk Fluids - Used
22. Tool Storage
23. Inventory and Receiving
24. Large Training Room
25. Open Office
26. Small Conference Room
27. Division Supervisor's Office
28. Mechanical
29. Division Manager's Office
30. Patio
31. IT Closet
32. Janitor

Lower Level Plan

0 10 20 40 80'

1. Entry Vestibule
2. Mud Room
3. Restroom
4. Women's Locker Room
5. Men's Locker Room
6. Break Room
7. IT Closet
8. Janitor
9. Storage and Mechanical
10. Shop Foreman's Office
11. Wash Bay
12. Small Service Bays
13. Large Service Bays
14. Tire Bay
15. Storage
16. Welding and Fabrication Bay
17. Central Drive Lane
18. Parts Office
19. Parts Storage
20. Bulk Fluids - Virgin
21. Bulk Fluids - Used
22. Tool Storage
23. Inventory and Receiving
24. Large Training Room
25. Open Office
26. Small Conference Room
27. Staff Office
28. Staff Office
29. Division Manager's Office
30. Patio
31. IT Closet
32. Janitor

Upper Level Plan

0 10 20 40 80'

ADMINISTRATIVE	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
DIV.1a - Building Entry / Vestibule	100	10' x 10'	4	400	
DIV.1b - Reception	100	10' x 10'	1	100	
DIV.2 - Division Manager Office	180	12' x 15'	1	180	
DIV.3 - Supervisor Office	150	10' x 15'	2	300	
DIV.4 - Staff Office	120	12' x 10'	1	120	
DIV.5 - Field Staff Workstation / Open Office	634	6'x6' x (FTE+1/2PTE)	1	634	
DIV.6a - Small Conference Room	120	12' x 10'	1	120	
DIV.6b - Standard Conference Room	NA			-	
DIV.7 - Large Conference Room-Training Room	500	20' x 25'	1	500	
DIV.8 - Copy Area / Document Work Room	216	12' x 18'	2	367	
DIV.9 - Breakroom	665	25 sf x Staff #	1	665	
DIV.10a - Universal Public Restroom	72	8' x 9'	2	144	
DIV.10b - Men's Locker and Restroom	420	TBD	1	420	
DIV.10c - Women's Locker and Restroom	243	TBD	1	243	
DIV.10d - Wellness Room	168	12' x 14'	1	168	
DIV.10e - IT Closet	48	6' x 8'	1	48	
DIV.10f - Janitorial	63	7' x 9'	2	126	
DIV.11 - General Storage / Supply Closets	100	10' x 10'	1	100	
DIV.12 - Mud Room / Wash Area	96	8' x 12'	1	96	
DIV.13 - General Computer Area	NA			-	Central Computer area - See Also DIV.5 - Field Staff / Open Office
DIV.10g - Mechanical and Electrical Room	709	15% of supported	1.0	709	
ADMINISTRATIVE SUBTOTAL SF				5,439	
CIRCULATION @ 30%				1,632	
ADMINISTRATIVE TOTAL SF				7,071	

CONDITIONED VEHICLE STORAGE (WARM)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	0	0	
Medium Space	288	12'x24'	2	634	
Pickup Space	200	10'x20'	2	440	
VEHICLE PARKING SUBTOTAL	1,074				
DOUBLE TRAFFIC LANE STORAGE INCREASE	1,288			2,362	Parking plus traffic lane serving parking
Mezzanine Storage				787	Maximum 1/3 of open storage area (IBC)
General Storage area				295	Area created by angled parking, used for small implement storage
CONDITIONED VEHICLE STORAGE SUBTOTAL SF				2,362	Parking plus traffic lane serving parking
CIRCULATION @ 15%				354	
CONDITIONED VEHICLE STORAGE TOTAL SF				3,011	Sum of parking and traffic lanes, plus additional circulation and general storage

Central Maintenance Garage

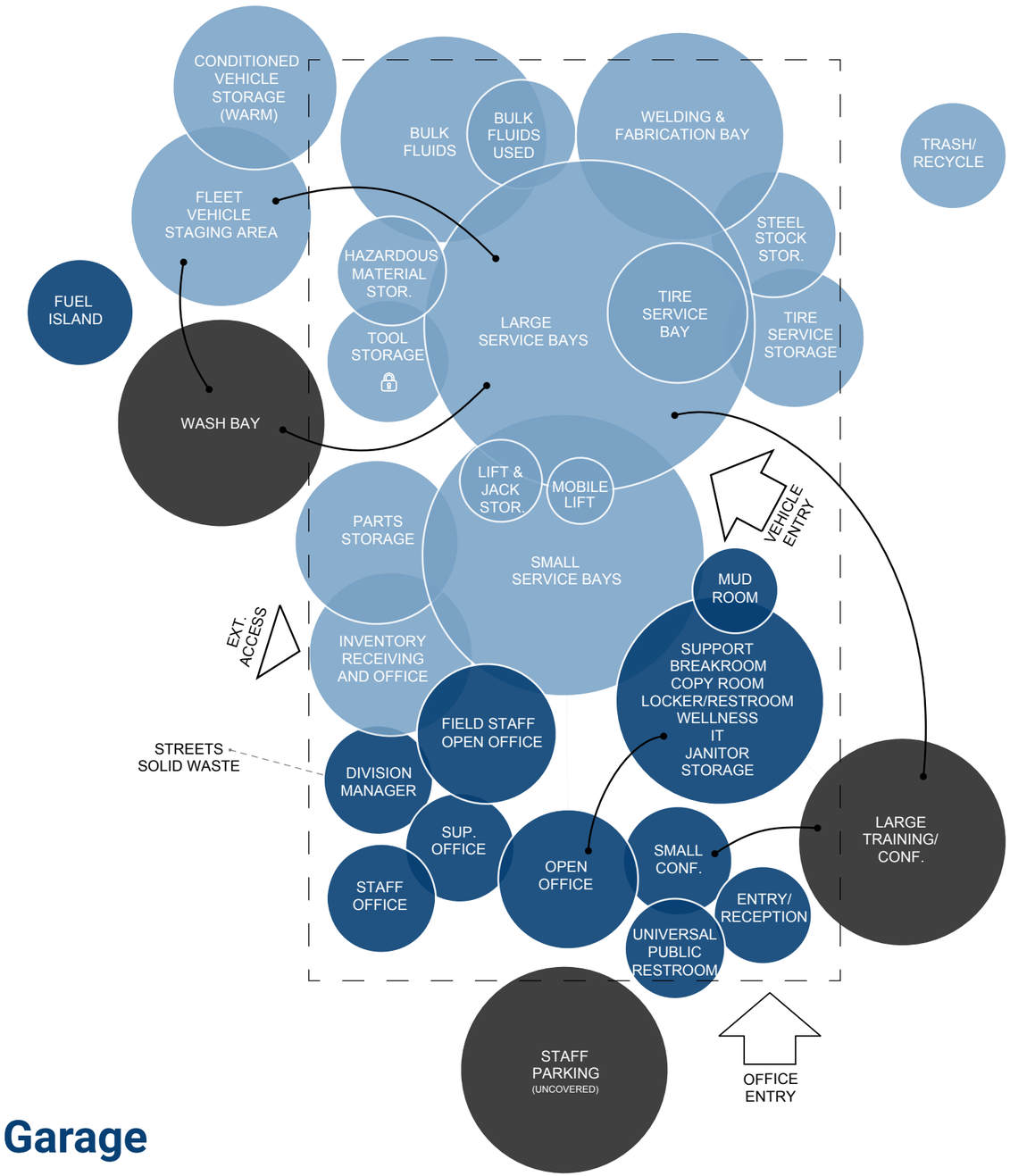
Programming Summary

DIVISION OPERATION CRITICAL SPACES	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
CMG.1a - Large Service Bay	1,456	28' x 52'	13	18,928	Bays based on Projected Fleet & Vehicles per Mechanic
CMG.1b - Small Service Bay	704	22' x 32'	17	11,968	Bays based on Projected Fleet & Vehicles per Mechanic
CMG.2 - Welding and Fabrication Bay	2,560	32' x 80'	2	5,120	
CMG.2b - Steel Stock Storage	200	10' x 20'	2	400	
CMG.3a - Tire Service Bay	960	24' x 40'	1	960	
CMG.3b - Tire Service Storage	800	20' x 40'	1	800	
CMG4.a - Bulk Fluids Room - Waste Oil	180	15' x 12'	1	180	
CMG.4b - Bulk Fluids Room - Virgin Fluids	2,000	50'x40'	1	2,000	
CMG.5 - Parts Storage	1,500	50' x 30'	1	1,500	
CMG.6 - Tool Storage	450	15' x 30'	1	450	
CMG.7 - Mobile Lift and Jack Storage	64	8' x 8'	5	320	
CMG.8 - Hazardous Material Storage	150	15' x 10'	1	150	
CMG.9 - Inventory Receiving Area and Office	300	15' x 20'	1	390	
CMG.10 - Wash Bay - Degreasing Bay	1,680	56' x 30'	1	1,680	
CMG Division Operation Critical Spaces	44,846				
DIVISION OPERATION CRITICAL SPACES SUBTOTAL SF				44,846	
CIRCULATION @ 30%				13,454	
DIVISION OPERATION CRITICAL SPACES TOTAL SF				58,300	

UNCONDITIONED VEHICLE STORAGE (COLD)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	0	0	
Medium Space	288	12'x24'	0	0	
Pickup Space	200	10'x20'	0	0	
VEHICLE PARKING SUBTOTAL	0				
DOUBLE TRAFFIC LANE STORAGE INCREASE	0			0	Parking plus traffic lane serving parking
Mezzanine Storage				0	Maximum 1/3 of open storage area (IBC)
General Storage area				0	Area created by angled parking, used for small implement storage
UNCONDITIONED VEHICLE STORAGE SUBTOTAL SF				0	Parking plus traffic lane serving parking
CIRCULATION @ 15%				0	
UNCONDITIONED VEHICLE STORAGE TOTAL SF				0	Sum of parking and traffic lanes, plus additional circ and storage

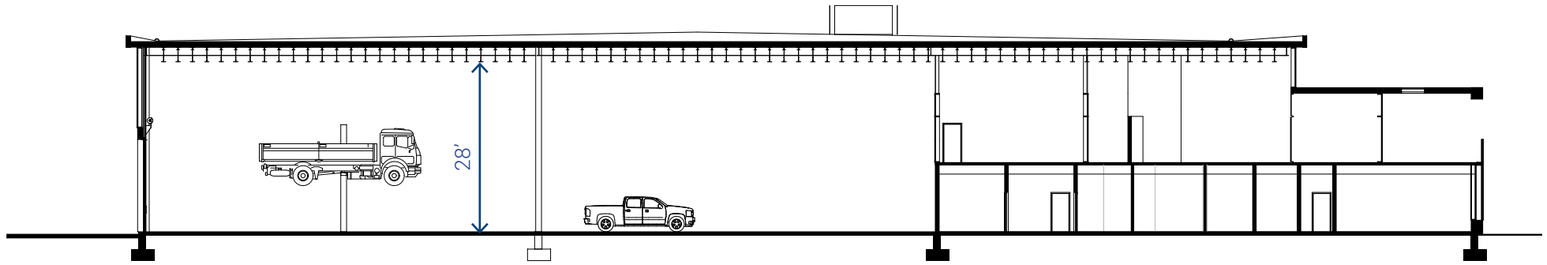
SITE PROGRAM REQUIREMENTS	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Staff Parking and Drive Aisle	284	9' x 18' +1/2 of 27' Drive	27	7,541	1 per staff on largest shift
Exterior Equipment Parking Demands	288	12' x 24'	0	0	
ADA Space plus Aisle	306	9' x 18' +8' Aisle	1	326	
DIV.15 - Trash / Reycling Area	900	30'x30' (can vary)	1	900	
CMG.11 - Fleet Vehicle Staging Area	900	20' x 45'	6	5,400	
Fuel Island	1,500	30' x 50'	1	1,500	
SITE PROGRAM REQUIREMENTS SUBTOTAL SF				8,126	
SITE CIRCULATION @ 150%				12,188	Accounts for access to all sides of separated site functions
SITE PROGRAM REQUIREMENTS TOTAL SF				20,314	

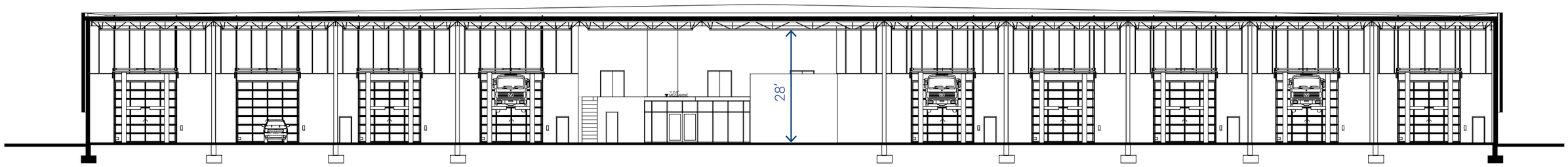
SITE AREA SF TOTALS					
MAIN BUILDING	68,382				
CIRCULATION AROUND BUILDING	14,575	25% of subtotal			
COLD STORAGE	0				
CIRCULATION AROUND BUILDING	0	25% of subtotal			
SITE PROGRAM REQUIREMENTS	20,314				
CIRCULATION AROUND BUILDING	5,078	25% of subtotal			
Program SF Totals	108,350				
25% GREEN SPACE	27,087				
Stormwater Management	27,087	25% of subtotal			
GRAND TOTAL SITE AREA SF	211,282	6.31			*Total squarefootage and acreage, plus added 30% of programmed acreage for drainage paths, easements, setbacks, etc.*



Central Maintenance Garage

Adjacency Diagram

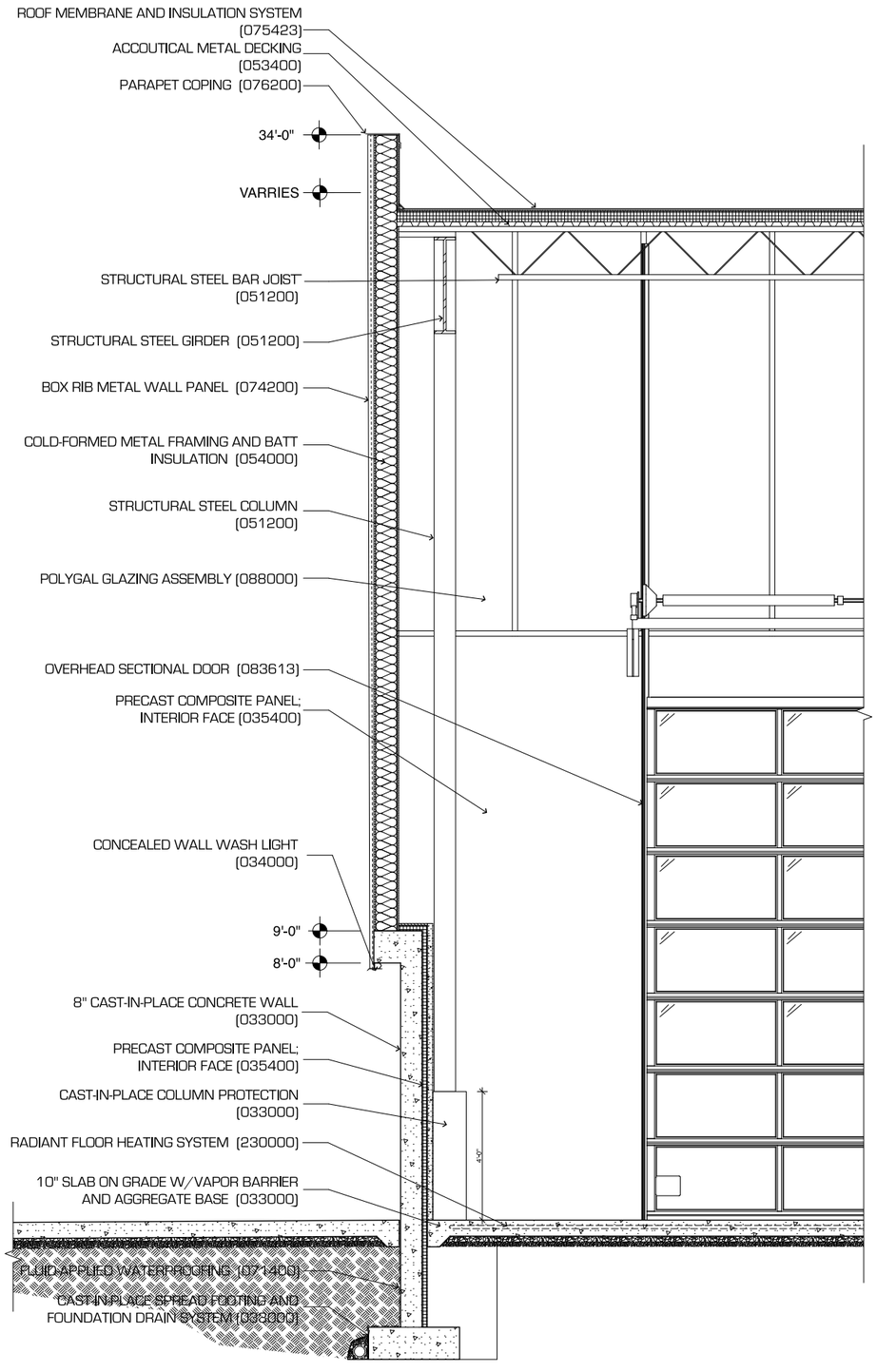




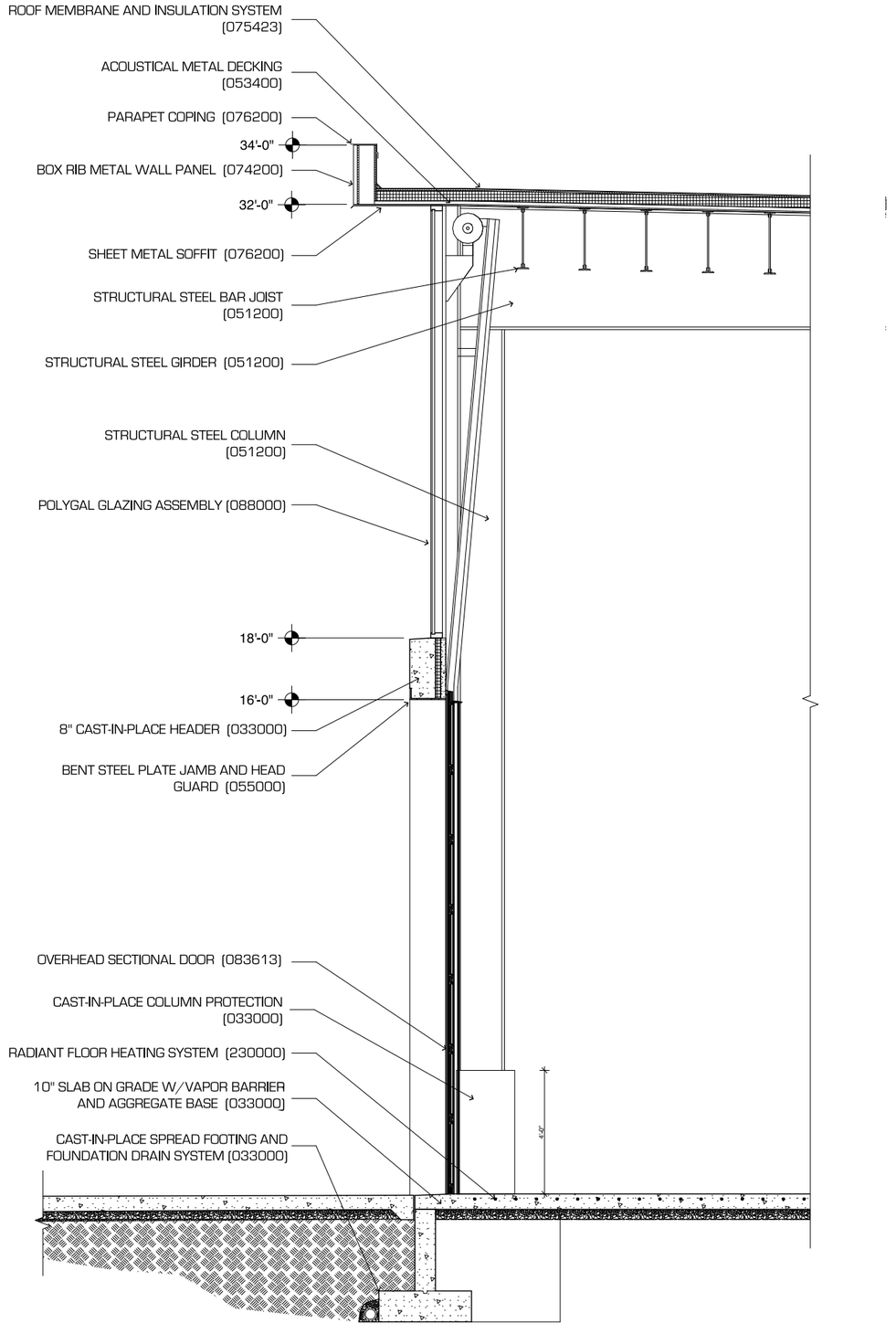
CMG Building Sections

0 10 20 40 80'

View from central drive isle looking east

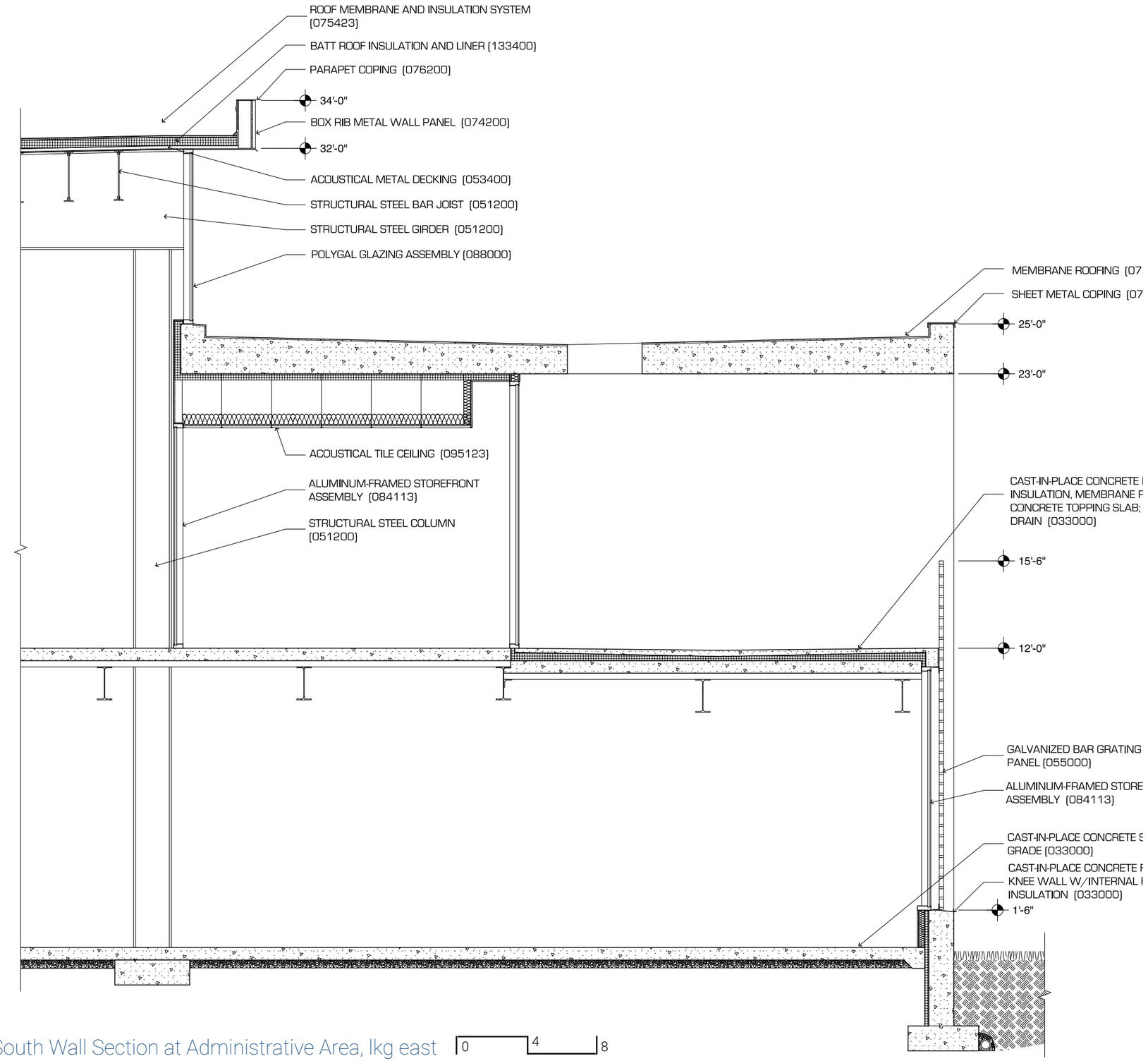


CMG West Wall Section at Service Bays, lkg north



CMG North Wall Section at Service Bays, lkg east

0 4 8



CMG South Wall Section at Administrative Area, lkg east

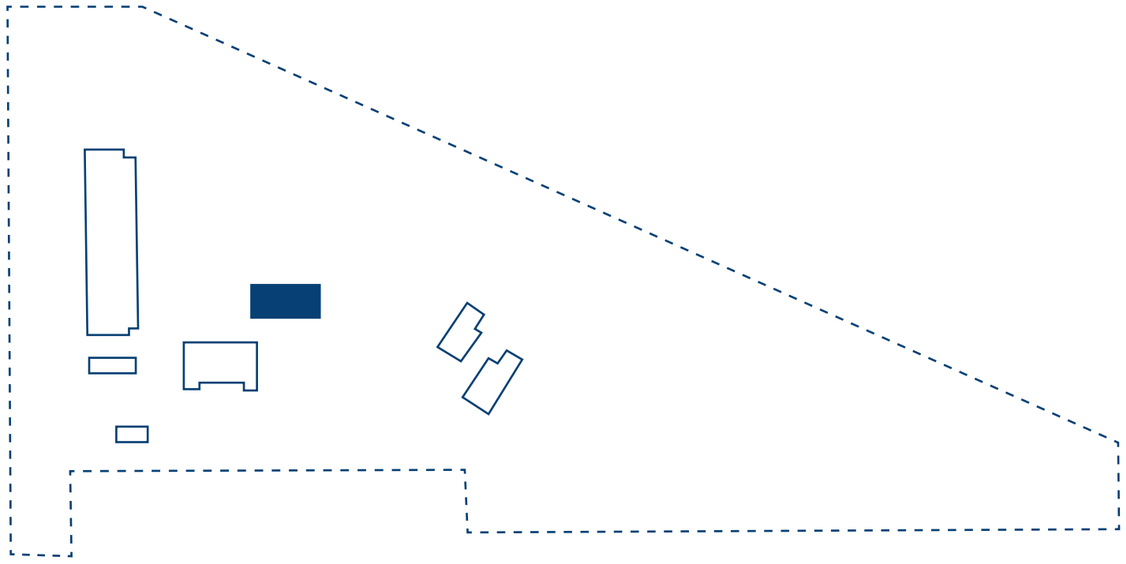
0 4 8

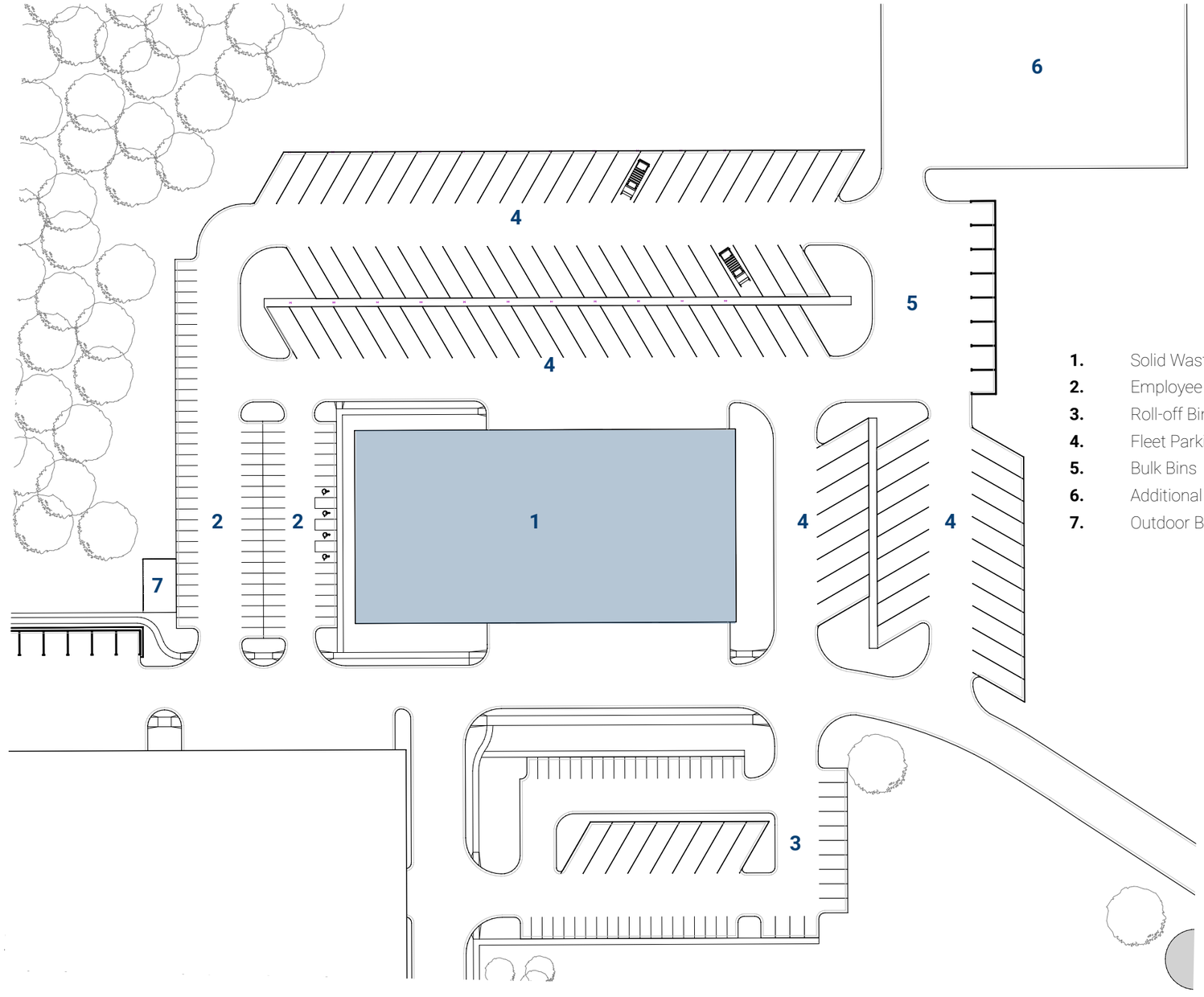
CMG: View Looking East

CMG: View Looking West

7

Solid Waste

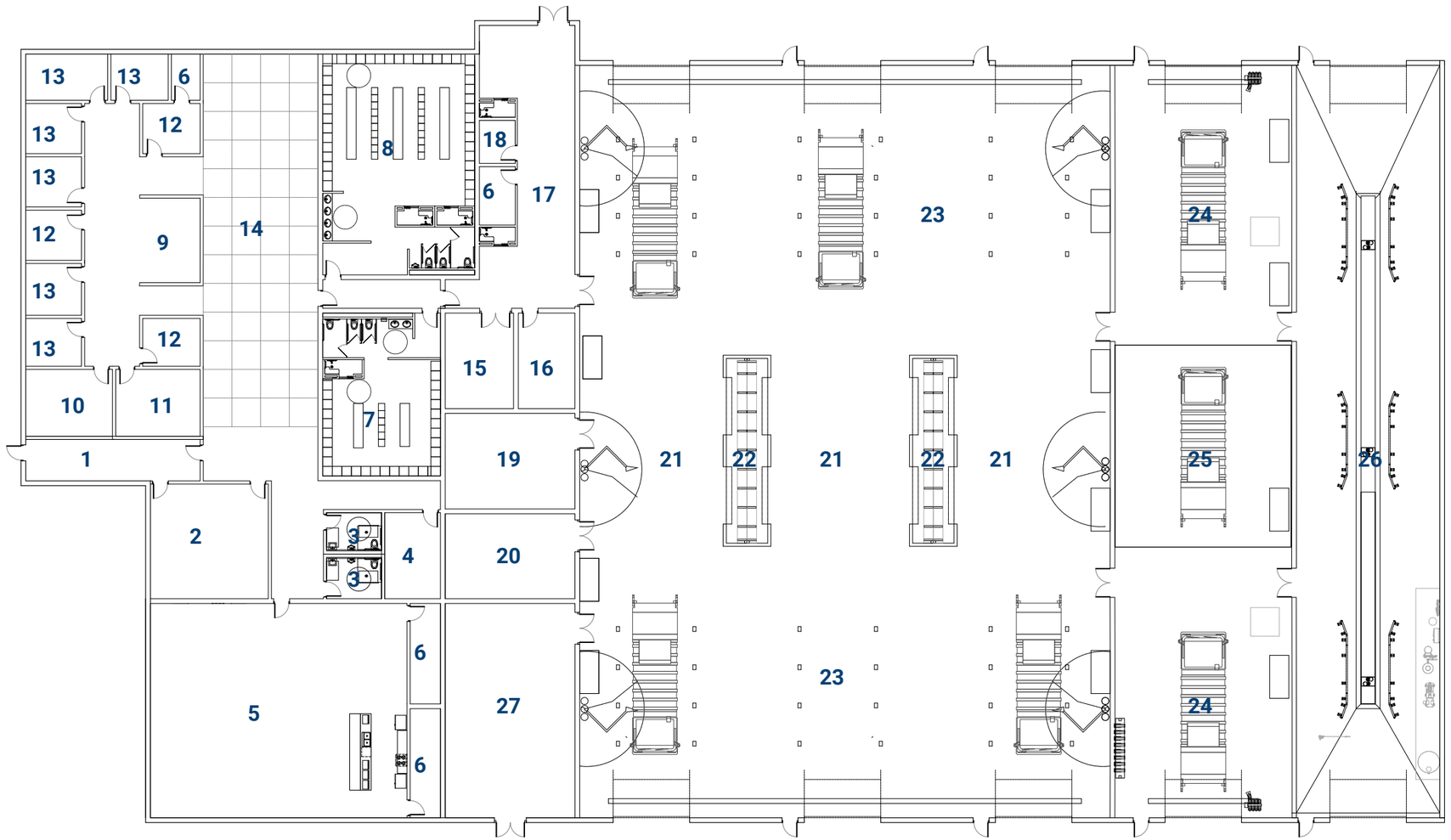




1. Solid Waste Division
2. Employee Parking
3. Roll-off Bin Storage and Cart Staging Area
4. Fleet Parking
5. Bulk Bins
6. Additional Site Storage (Future)
7. Outdoor Break Area

Site Plan

0 40 80 160 320'



1. Entry Vestibule
2. Large Conference Room
3. Restroom
4. Wellness Room
5. Break Room/Training Room
6. General Storage
7. Women's Locker Room
8. Men's Locker Room
9. Copy Room/Work Area/Storage
10. Division Supervisor's Office
11. Division Manager's Office
12. Small Conference Room
13. Staff Office
14. Open Office/ Computer Area
15. Laundry Room
16. PPE Storage
17. Mud Room/Decontamination Area
18. Janitor
19. Material Storage
20. Tool Storage
21. Small Welding Area
22. Welding Stock Storage
23. Fabrication/Welding Bays
24. Maintenance Bay
25. Paint Booth
26. Wash Bay
27. Mechanical

Floor Plan

0 10 20 40 80'

ADMINISTRATIVE	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
DIV.1a - Building Entry / Vestibule	100	10'x10'	1	100	
DIV.1b - Reception	NA			-	
DIV.2 - Division Manager Office	180	12' x 15'	1	180	
DIV.3 - Supervisor Office	150	10' x 15'	1	150	
DIV.4 - Staff Office	120	12' x 10'	7	840	
DIV.5 - Field Staff Workstation / Open Office	2,048	4' x 4' x Staff	1	2,048	
DIV.6a - Small Conference Room	120	12' x 10'	3	360	
DIV.6b - Standard Conference Room	NA			-	
DIV.7 - Large Conference Room-Training Room	500	20' x 25'	1	500	
DIV.8 - Copy Area / Document Work Room	216	12' x 18'	3	648	
DIV.9 - Breakroom	3,200	25 sf x Staff #	1	3,200	
DIV.10a - Universal Public Restroom	72	8' x 9'	2	144	
DIV.10b - Men's Locker and Restroom	988	Varies	1	988	
DIV.10c - Women's Locker and Restroom	732	Varies	1	732	
DIV.10d - Wellness Room	168	12' x 14'	3	504	
DIV.10e - IT Closet	48	6' x 8'	1	48	
DIV.10f - Janitorial	63	7' x 9'	4	252	
DIV.11 - General Storage / Supply Closets	100	10' x 10'	3	300	
DIV.12 - Mud Room / Wash Area	160	16' x 10'	1	160	
DIV.13 - General Computer Area	NA			-	Central Computer area - See Also DIV.5 - Field Staff / Open Office
DIV.14 - Laundry Facility	225	15' X 15'	1	225	
DIV.10g - Mechanical and Electrical Room	1,707	15% of supported	1	1,707	
ADMINISTRATIVE SUBTOTAL SF				13,086	
CIRCULATION @ 30%				3,926	
ADMINISTRATIVE TOTAL SF				17,012	

CONDITIONED VEHICLE STORAGE (WARM)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	0	0	
Medium Space	288	12'x24'	0	0	
Pickup Space	200	10'x20'	0	0	
VEHICLE PARKING SUBTOTAL	0				
DOUBLE TRAFFIC LANE STORAGE INCREASE	0			0	Parking plus traffic lane serving parking
Mezzanine Storage				0	Maximum 1/3 of open storage area (IBC)
General Storage area				0	Area created by angled parking, used for small implement storage
CONDITIONED VEHICLE STORAGE SUBTOTAL SF				0	Parking plus traffic lane serving parking
CIRCULATION @ 15%				0	
CONDITIONED VEHICLE STORAGE TOTAL SF				0	Sum of parking and traffic lanes, plus additional circ and storage

DIVISION OPERATION CRITICAL SPACES	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
SWD.2 - Welding and Fabrication Bay	2,560	32' x 80'	5	12,800	
SWD.3 - General Maintenance Bay	1,680	30' x 56'	1	1,680	
SWD.4 - Paint Bay / Booth	1,680	30' x 56'	1	1,680	
SWD.5 - Wash Bay	1,680	30' x 56'	2	3,360	
SWD.6 - Container Maintenance Wash Bay	1,680	56' x 30'	1	1,680	
SWD.7 - General Materials Storage	448	16' x 28'	1	448	
SWD.8 - General Tool Storage	448	16' x 28'	1	448	
SWD.9 - Steel Stock Storage	200	10' x 20'	2	400	
SWD.10 - Personal Protective Equipment Storage	80	8' x 10'	1	80	
SWD Division Opertion Critical Spaces	22,576				
DIVISION OPERATION CRITICAL SPACES SUBTOTAL SF				22,576	
CIRCULATION @ 30%				6,773	
DIVISION OPERATION CRITIICAL SPACES TOTAL SF				29,349	

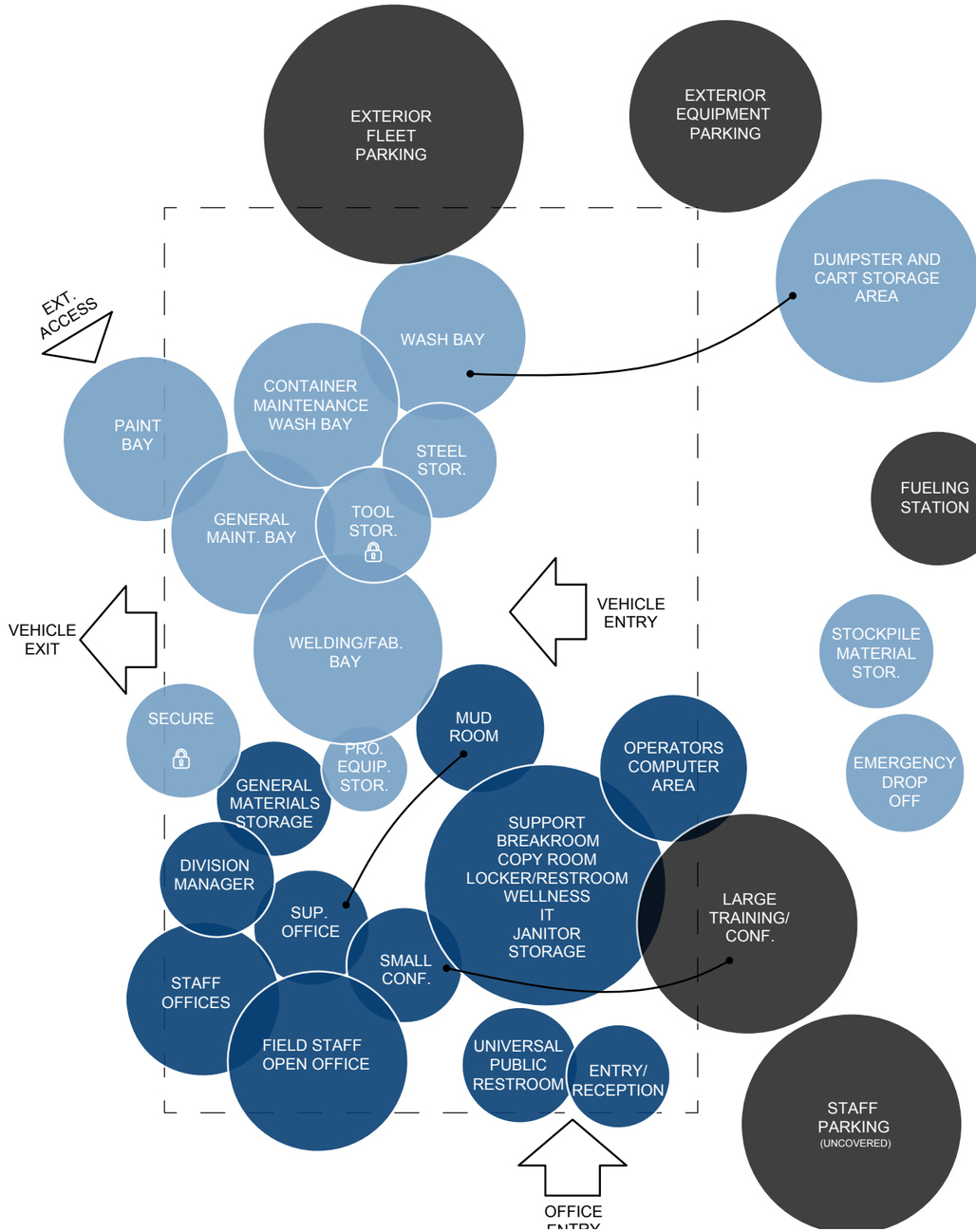
UNCONDITIONED VEHICLE STORAGE (COLD)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	54	48,600	
Medium Space	288	12'x24'	3	864	
Pickup Space	200	10'x20'	9	1,800	
VEHICLE PARKING SUBTOTAL	51,264				
DOUBLE TRAFFIC LANE STORAGE INCREASE	61,517			112,781	Parking plus traffic lane serving parking
Mezzanine Storage				37,594	Maximum 1/3 of open storage area (IBC)
General Storage area				14,098	Area created by angled parking, used for small implement storage
UNCONDITIONED VEHICLE STORAGE SUBTOTAL SF				112,781	Parking plus traffic lane serving parking
CIRCULATION @ 15%				16,917	
UNCONDITIONED VEHICLE STORAGE TOTAL SF				143,796	Sum of parking and traffic lanes, plus additional circ and storage

SITE PROGRAM REQUIREMENTS	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Staff Parking and Drive Aisle	284	9' x 18'	80	22,680	1 per staff on largest shift
Exterior Equipment Parking Demands	288	12' x 24'	86	24,883	
ADA Space plus Aisle	306	9' x 18' +8' Aisle	3	979	
SWD.13 - Dumpster and Cart Storage Area	48,000	160' x 300'	1	48,000	
SWD.14 - Roll-Off Dumpster Storage				0	Exterior - Off Site
SWD.15/16 - Stock Pile Material Storage Bins	800	40' x 20'	2	1,600	
SWD. 17 - Emergency Container Drop Off	6,400	80' x 80'	1	6,400	
Fuel Island	1,500	30' x 50'	1	1,500	
SITE PROGRAM REQUIREMENTS SUBTOTAL SF				57,500	
SITE CIRCULATION @ 150%				86,250	Accounts for access to all sides of separated site functions
SITE PROGRAM REQUIREMENTS TOTAL SF				143,750	

SITE AREA TOTALS					
MAIN BUILDING	46,360				
CIRCULATION AROUND BUILDING	11,590	25% of subtotal			
COLD STORAGE	143,796				
CIRCULATION AROUND BUILDING	17,974	12.5% of subtotal			
SITE PROGRAM REQUIREMENTS	143,750				
CIRCULATION AROUND BUILDING	17,969	12.5% of subtotal			
Program Totals	381,439				
25% GREEN SPACE	95,360				
Stormwater Management	95,360	25% of subtotal			
GRAND TOTAL SITE AREA SF	743,806	22.20			*Total squarefootage and acreage, plus added 30% of programmed acreage for drainage paths, easements, setbacks, etc.*

Solid Waste Division (SWD)

Programming Summary

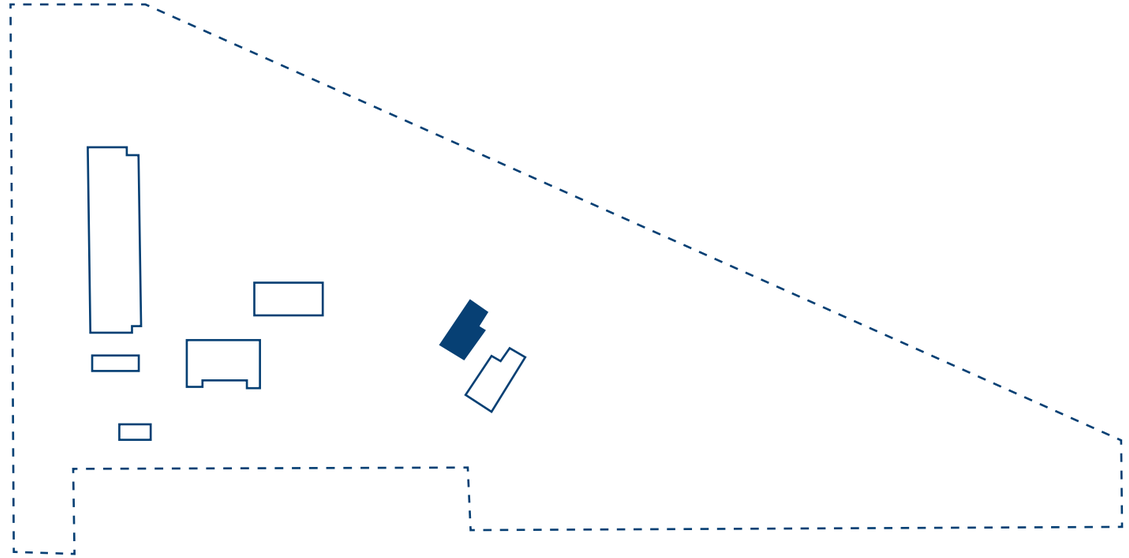


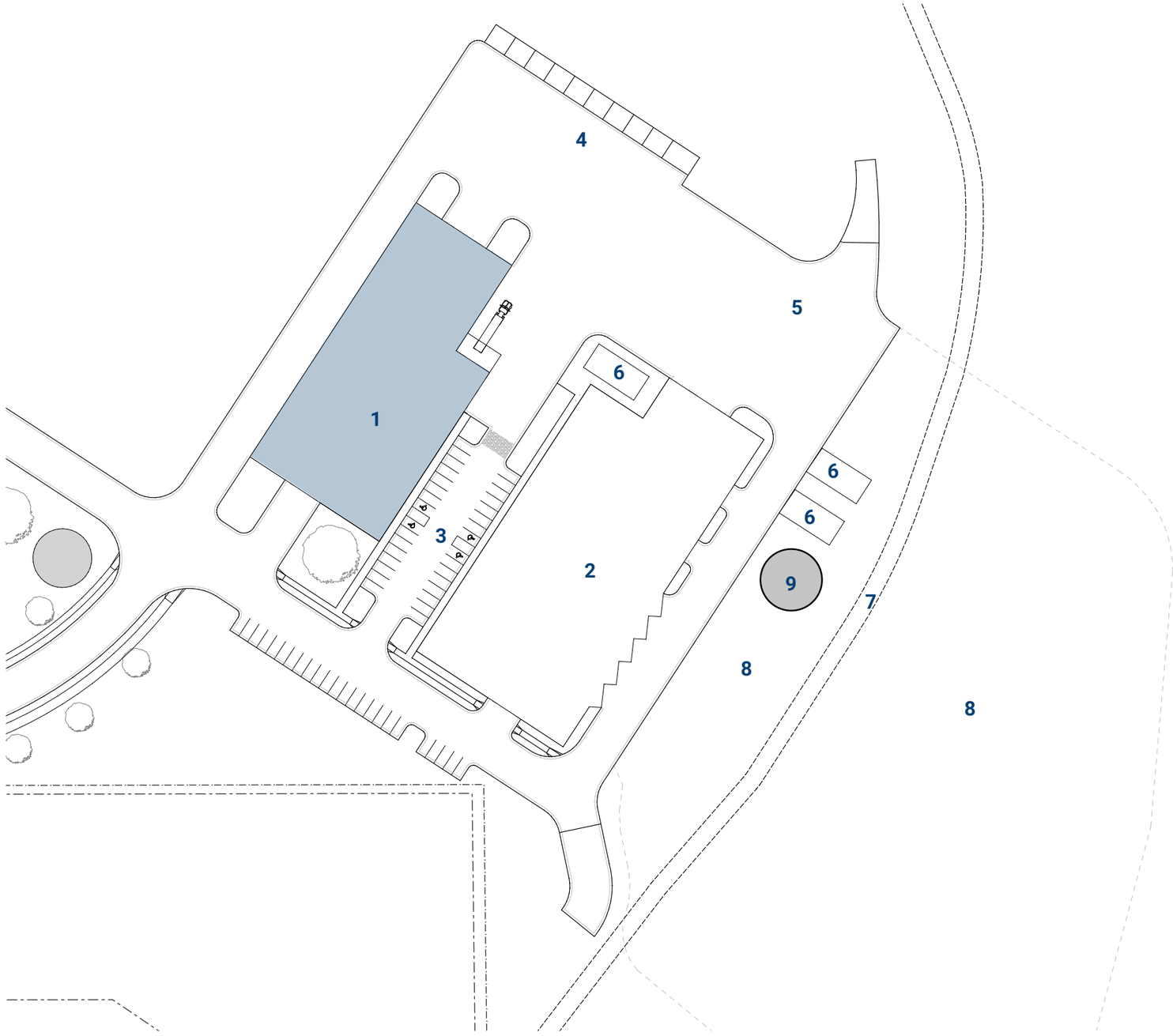
Solid Waste Division (SWD)

Adjacency Diagram

8

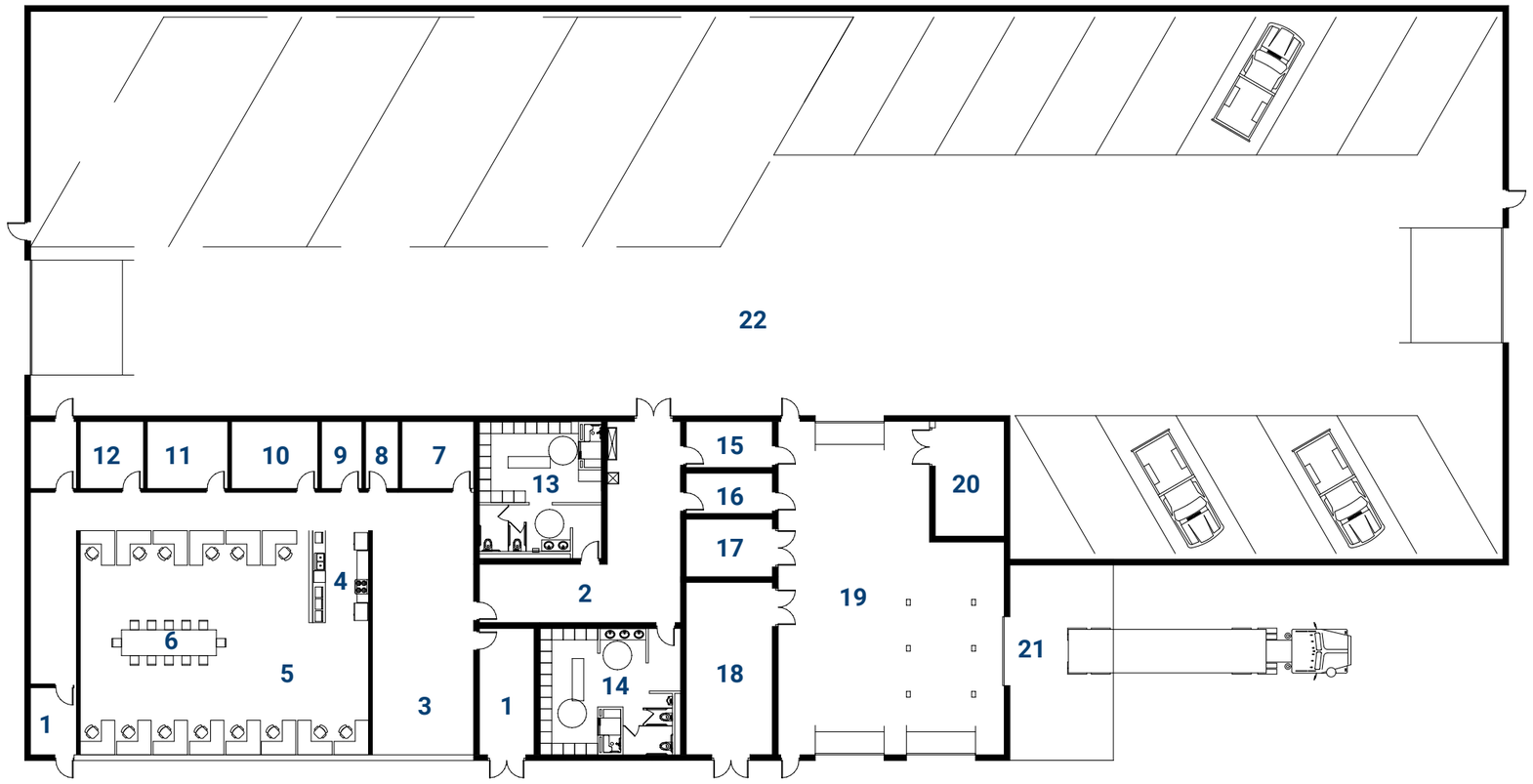
Facilities





1. Facilities Maintenance Division
2. Forestry and Horticulture Divisions
3. Staff Parking
4. Bulk Material Storage
5. Woodlot
6. Greenhouse
7. Railroad Spur
8. Nursery
9. Rainwater Collection Tank

Site Plan



1. Entry Vestibule
2. Mud Room
3. Copy Room/Work Area
4. Break Room
5. Open Office
6. Large Conference Room
7. Wellness Room
8. IT Room
9. Janitor
10. Division Supervisor's Office
11. Division Manager's Office
12. Small Conference Room
13. Women's Locker Room
14. Men's Locker Room
15. General Storage
16. PPE Storage
17. Refrigerant and Compressed Gas Storage
18. Shelving/Racking Storage
19. Open Workshop
20. Secure Tool/Parts Storage
21. Loading Dock
22. Conditioned Vehicle Storage

Floor Plan

0 10 20 40 80'

ADMINISTRATIVE	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
DIV.1a - Building Entry / Vestibule	100	10'x10'	1	100	
DIV.1b - Reception	100	10' x 10'	0	0	
DIV.2 - Division Manager Office	180	12' x 15'	1	180	
DIV.3 - Supervisor Office	150	10' x 15'	1	150	
DIV.4 - Staff Office	NA			-	
DIV.5 - Field Staff Workstation / Open Office	574	6'x6' x (FTE+1/2PTE)	1	574	
DIV.6a - Small Conference Room	120	12' x 10'	1	120	
DIV.6b - Standard Conference Room	NA			-	
DIV.7 - Large Conference Room-Training Room	500	20' x 25'	1	500	
DIV.8 - Copy Area / Document Work Room	216	12' x 18'	1	317	
DIV.9 - Breakroom	420	25 sf x Staff #	1	420	
DIV.10a - Universal Public Restroom	72	8' x 9'	1	72	
DIV.10b - Men's Locker and Restroom	348	TBD	1	348	
DIV.10c - Women's Locker and Restroom	252	TBD	1	252	
DIV.10d - Wellness Room	168	12' x 14'	1	168	
DIV.10e - IT Closet	48	6' x 8'	1	48	
DIV.10f - Janitorial	63	7' x 9'	1	63	
DIV.11 - General Storage / Supply Closets	NA			-	
DIV.12 - Mud Room / Wash Area	96	8' x 12'	1	96	
DIV.13 - General Computer Area	NA			-	Central Computer area - See Also DIV.5 - Field Staff / Open Office
DIV.14 - Laundry Facility	NA			-	
DIV.10g - Mechanical and Electrical Room	497	10' x 10'	1	497	
ADMINISTRATIVE SUBTOTAL SF				3,905	
CIRCULATION @ 30%				1,171	
ADMINISTRATIVE TOTAL SF				5,076	

CONDITIONED VEHICLE STORAGE (WARM)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	5	4,320	
Medium Space	288	12'x24'	14	4,147	
Pickup Space	200	10'x20'	5	1,040	
VEHICLE PARKING SUBTOTAL	9,507				
DOUBLE TRAFFIC LANE STORAGE INCREASE	11,409			20,916	Parking plus traffic lane serving parking
Mezzanine Storage				6,972	Maximum 1/3 of open storage area (IBC)
General Storage area				2,614	Area created by angled parking, used for small implement storage
CONDITIONED VEHICLE STORAGE SUBTOTAL SF				20,916	Parking plus traffic lane serving parking
CIRCULATION @ 15%				3,137	
CONDITIONED VEHICLE STORAGE TOTAL SF				26,668	Sum of parking and traffic lanes, plus additional circ and storage

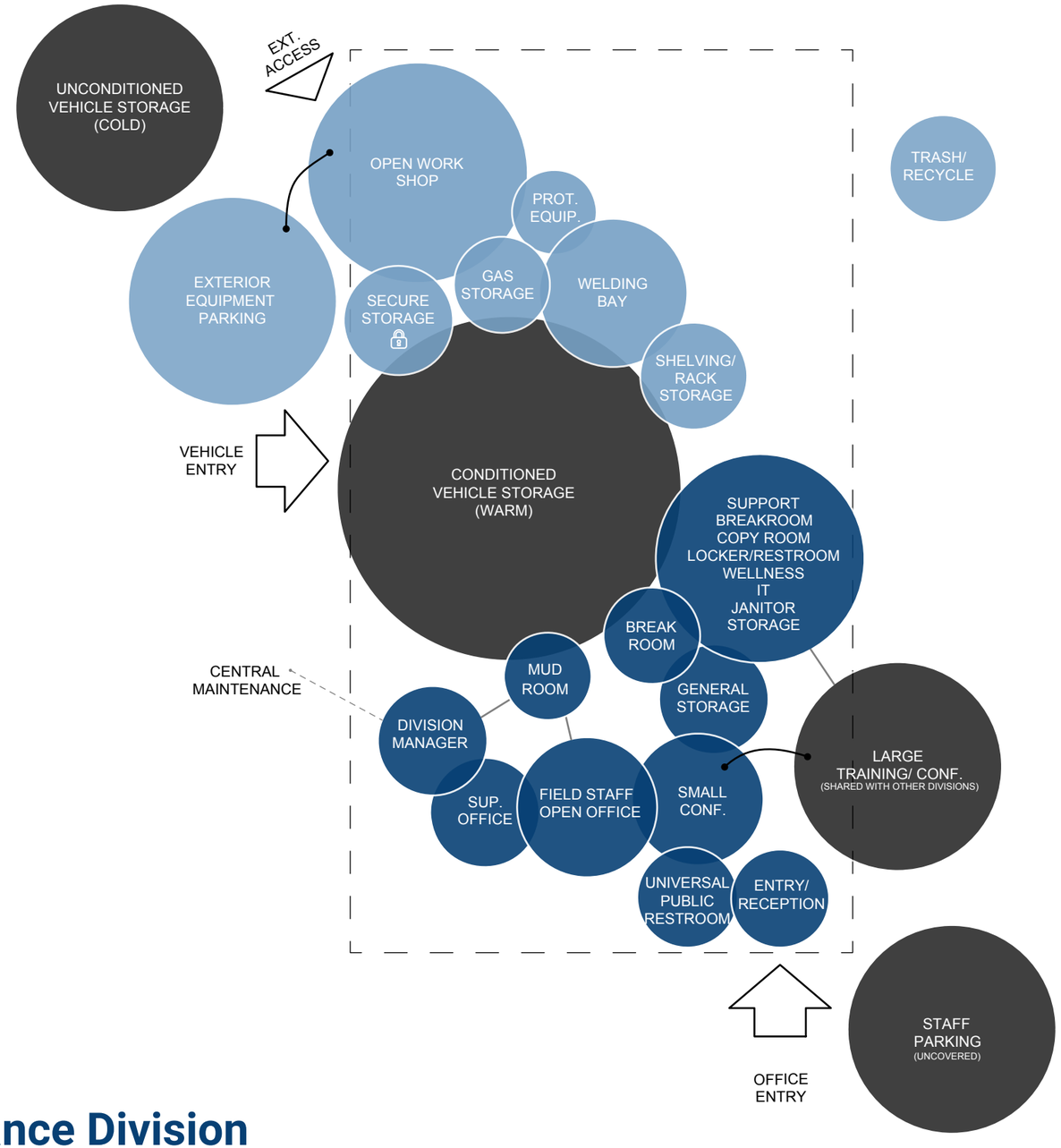
DIVISION OPERATION CRITICAL SPACES	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
FAC.2 - Open Work Shop	750	25' x 30'	1	750	
FAC.3 - Welding Bay	384	32' x 12'	1	384	
FAC.4 - Shelving and Racking Storage	450	15' x 30'	1	450	
FAC.5 - Personal Protective Equipment Storage	80	8' x 10'	1	80	
FAC.6 - Secure Tool/Parts/Material Storage	240	20' x 12'	1	240	
FAC.7 - Refrigerant and Compressed Gas Storage	150	15' x 10'	1	150	
FAC Division Operation Critical Spaces	2,054				
DIVISION OPERATION CRITICAL SPACES SUBTOTAL SF				2,054	
CIRCULATION @ 30%				616	
DIVISION OPERATION CRITICAL SPACES TOTAL SF				2,670	

UNCONDITIONED VEHICLE STORAGE (COLD)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	0	0	
Medium Space	288	12'x24'	0	0	
Pickup Space	200	10'x20'	16	3,200	
VEHICLE PARKING SUBTOTAL	3,200				
DOUBLE TRAFFIC LANE STORAGE INCREASE	3,840			7,040	Parking plus traffic lane serving parking
Mezzanine Storage				2,347	Maximum 1/3 of open storage area (IBC)
General Storage area				880	Area created by angled parking, used for small implement storage
UNCONDITIONED VEHICLE STORAGE SUBTOTAL SF				7,040	Parking plus traffic lane serving parking
CIRCULATION @ 15%				1,056	
UNCONDITIONED VEHICLE STORAGE TOTAL SF				8,976	Sum of parking and traffic lanes, plus additional circ and storage

SITE PROGRAM REQUIREMENTS	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Staff Parking and Drive Aisle	284	9' x 18'	18	4,990	1 per staff on largest shift
Exterior Equipment Parking Demands	288	12' x 24'	0	0	
ADA Space plus Aisle	306	9' x 18' +8' Aisle	1	306	
DIV.15 - Trash Area	900	30'x30' (can vary)	1	900	
SITE PROGRAM REQUIREMENTS SUBTOTAL SF				6,196	
SITE CIRCULATION @ 150%				9,293	Accounts for access to all sides of separated site functions
SITE PROGRAM REQUIREMENTS TOTAL SF				15,489	

SITE AREA TOTALS					
MAIN BUILDING	34,414				
CIRCULATION AROUND BUILDING	8,603	25% of subtotal			
COLD STORAGE	8,976				
CIRCULATION AROUND BUILDING	4,488	25% of subtotal			
SITE PROGRAM REQUIREMENTS	15,489				
CIRCULATION AROUND BUILDING	7,745	25% of subtotal			
Program Totals	79,715				
25% GREEN SPACE	19,929				
Stormwater Management	19,929	25% of subtotal			
GRAND TOTAL SITE AREA SF	155,444	4.64			*Total squarefootage and acreage, plus added 30% of programmed acreage for drainage paths, easements, setbacks, etc.*

Facility Maintenance Division (FAC)
Programming Summary

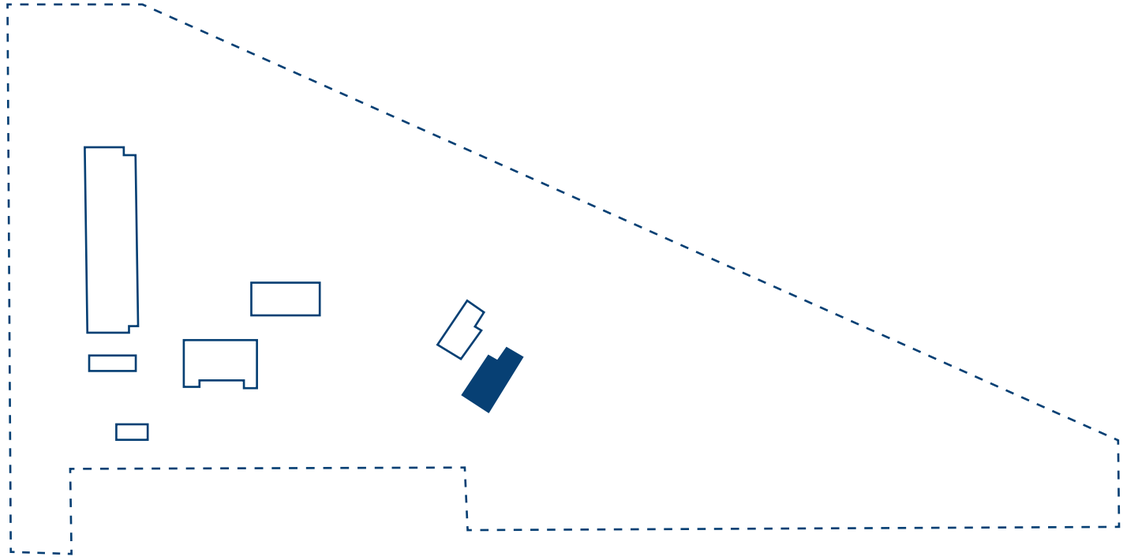


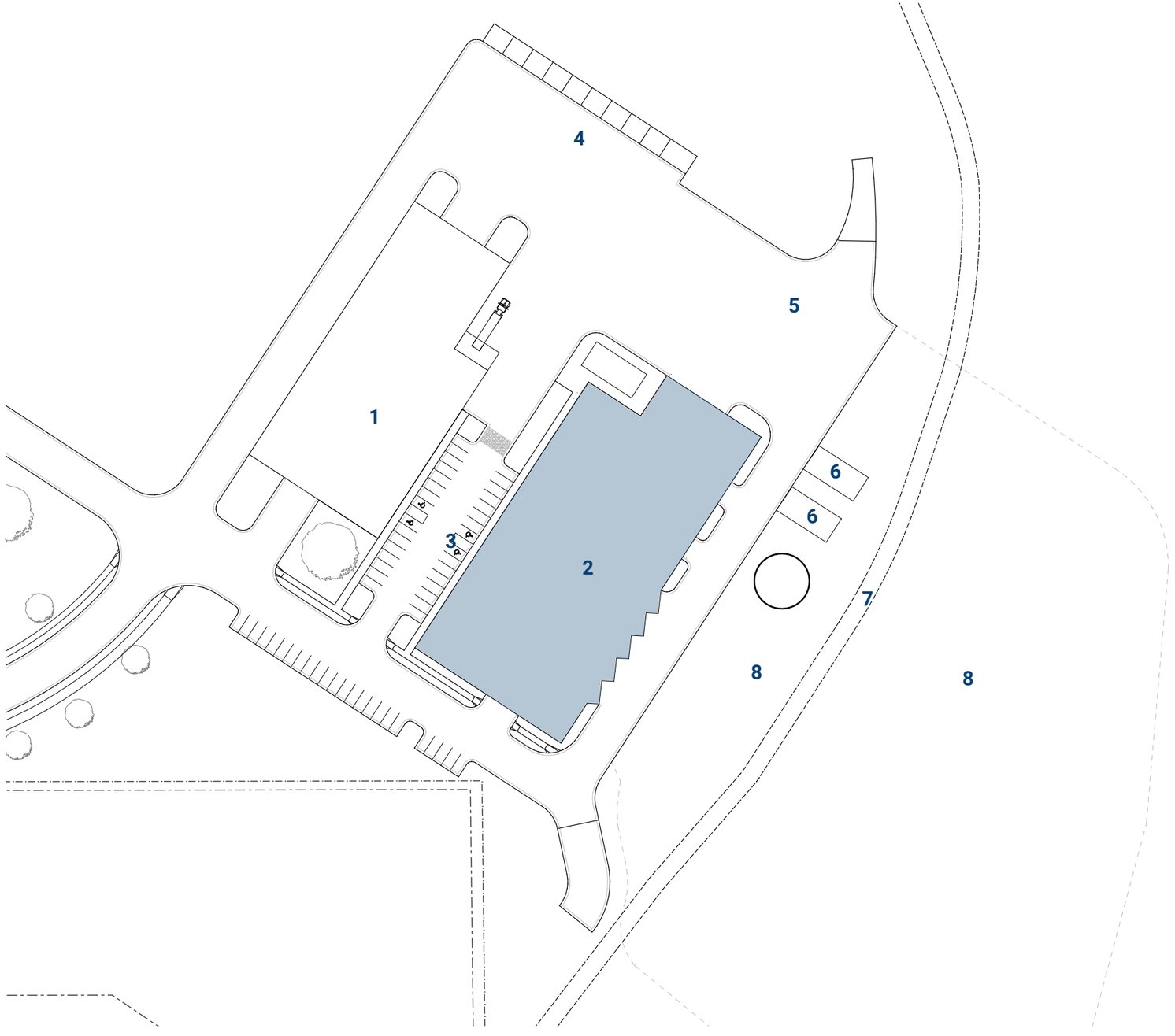
Facility Maintenance Division

Adjacency Diagram

9

Forestry & Horticulture

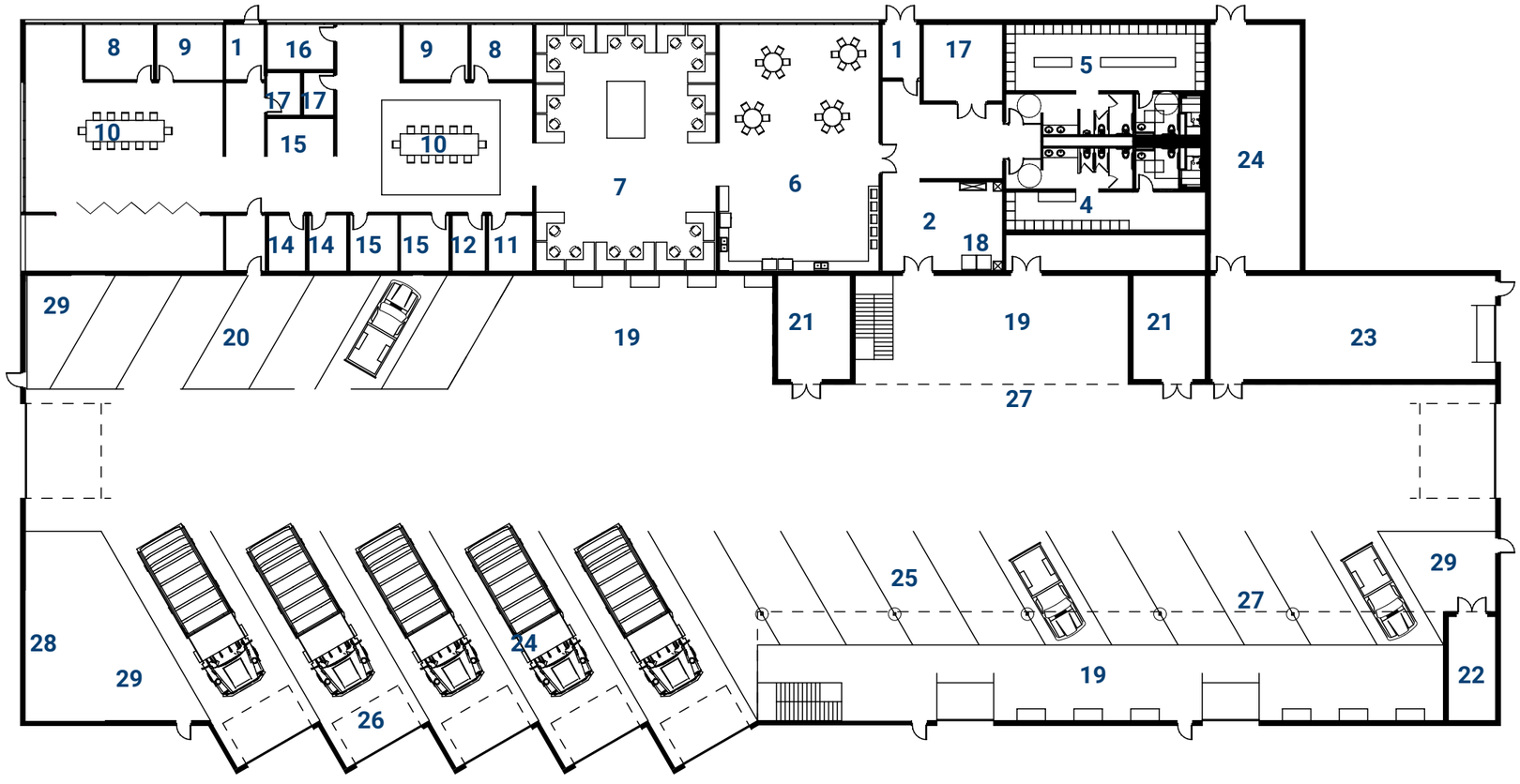




1. Facilities Maintenance Division
2. Forestry and Horticulture Divisions
3. Staff Parking
4. Bulk Material Storage
5. Woodlot
6. Green House
7. Railroad Spur
8. Nursery
9. Rainwater Collection Tank

Site Plan

0 40 80 160 320'



1. Entry Vestibule
2. Mud Room
3. Seasonal Staff Lockers
4. Women's Locker Room
5. Men's Locker Room
6. Break Room
7. Open Office
8. Division Supervisor's Office
9. Division Manager's Office
10. Large Conference Room
11. IT Closet
12. Janitor
13. Copy Room/Work Area
14. Restroom
15. Wellness Room
16. Small Conference Room
17. Storage
18. Laundry
19. Open Workshop/Bench Space
20. Forestry Small Parking Spaces
21. Secure Tool/Part Storage
22. Hazardous Storage
23. Interior Green House
24. Mechanical
25. Forestry Medium Parking Spaces
26. Large Parking Spaces
27. Mezzanine Storage Above
28. Potential Pallet Rack Location
29. Flexible Storage Area

Floor Plan

0 10 20 40 80'

ADMINISTRATIVE	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
DIV.1a - Building Entry / Vestibule	100	10'x10'	1	100	
DIV.1b - Reception	100	10' x 10'	0	0	
DIV.2 - Division Manager Office	180	12' x 15'	1	180	
DIV.3 - Supervisor Office	150	10' x 15'	1	150	
DIV.4 - Staff Office	120	12' x 10'	0	0	
DIV.5 - Field Staff Workstation / Open Office	374	6'x6' x (FTE+1/2PTE)	1	374	
DIV.6a - Small Conference Room	120	12' x 10'	1	120	
DIV.6b - Standard Conference Room	NA			-	
DIV.7 - Large Conference Room-Training Room	500	20' x 25'	1	500	
DIV.8 - Copy Area / Document Work Room	216	12' x 18'	1	230	
DIV.9 - Breakroom	260	25 sf x Staff #	1	260	
DIV.10a - Universal Public Restroom	72	8' x 9'	1	72	
DIV.10b - Men's Locker and Restroom	298	TBD	1	298	
DIV.10c - Women's Locker and Restroom	246	Varies	1	246	
DIV.10d - Wellness Room	168	12' x 14'	1	168	
DIV.10e - IT Closet	48	6' x 8'	1	48	
DIV.10f - Janitorial	63	7' x 9'	2	126	
DIV.11 - General Storage / Supply Closets	100	10' x 10'	1	100	
DIV.12 - Mud Room / Wash Area	96	8' x 12'	1	96	
DIV.13 - General Computer Area	NA			-	Central Computer area - See Also DIV.5 - Field Staff / Open Office
DIV.14 - Laundry Facility	NA			-	
DIV.10g - Mechanical and Electrical Room	460	15% of supported	1	460	
ADMINISTRATIVE SUBTOTAL SF				3,529	
CIRCULATION @ 30%				1,059	
ADMINISTRATIVE TOTAL SF				4,588	

CONDITIONED VEHICLE STORAGE (WARM)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	5	4,320	
Medium Space	288	12'x24'	3	922	
Pickup Space	200	10'x20'	8	1,600	
VEHICLE PARKING SUBTOTAL	6,842				
DOUBLE TRAFFIC LANE STORAGE INCREASE	8,210			15,052	Parking plus traffic lane serving parking
Mezzanine Storage				5,017	Maximum 1/3 of open storage area (IBC)
General Storage area				1,881	Area created by angled parking, used for small implement storage
CONDITIONED VEHICLE STORAGE SUBTOTAL SF				15,052	Parking plus traffic lane serving parking
CIRCULATION @ 15%				2,258	
CONDITIONED VEHICLE STORAGE TOTAL SF				19,191	Sum of parking and traffic lanes, plus additional circ and storage

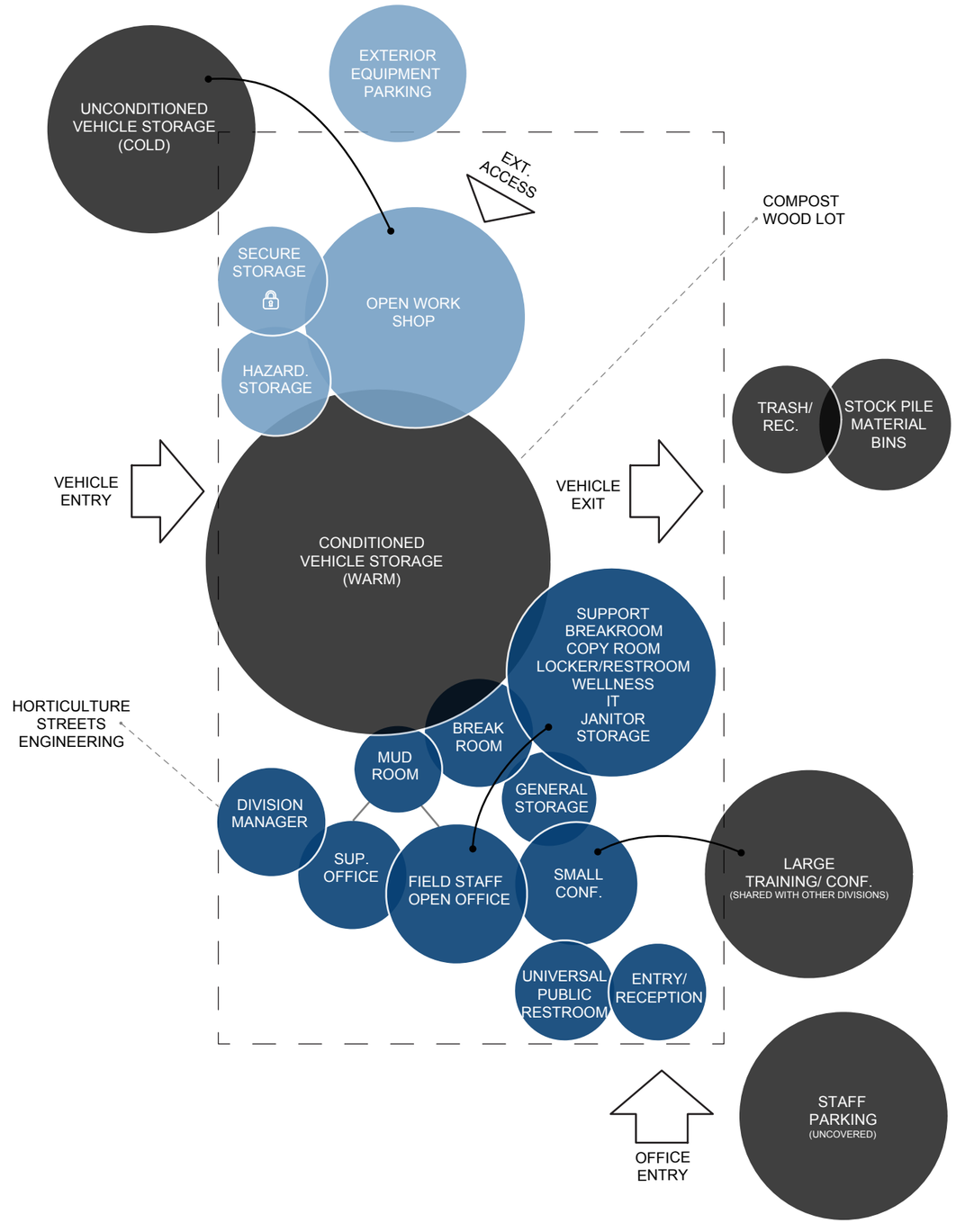
DIVISION OPERATION CRITICAL SPACES	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
FOR.2 - Open Work Shop	875	25' x 35'	1	875	
FOR.3 - Secure Tool/Parts/Material Storage	240	20' x 12'	1	240	
FOR.4 - Hazardous Storage	150	15' x 10'	1	150	
FOR.5 - Exterior Fleet Parking	0	0	0	0	
FOR Division Opertion Critical Spaces	1,265				
DIVISION OPERATION CRITICAL SPACES SUBTOTAL SF				1,265	
CIRCULATION @ 30%				380	
DIVISION OPERATION CRITICAL SPACES TOTAL SF				1,645	

UNCONDITIONED VEHICLE STORAGE (COLD)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	0	0	
Medium Space	288	12'x24'	0	0	
Pickup Space	200	10'x20'	3	640	
VEHICLE PARKING SUBTOTAL	640				
DOUBLE TRAFFIC LANE STORAGE INCREASE	768			1,408	Parking plus traffic lane serving parking
Mezzanine Storage				469	Maximum 1/3 of open storage area (IBC)
General Storage area				176	Area created by angled parking, used for small implement storage
UNCONDITIONED VEHICLE STORAGE SUBTOTAL SF				1,408	Parking plus traffic lane serving parking
CIRCULATION @ 15%				211	
UNCONDITIONED VEHICLE STORAGE TOTAL SF				1,795	Sum of parking and traffic lanes, plus additional circ and storage

SITE PROGRAM REQUIREMENTS	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Staff Parking and Drive Aisle	284	9' x 18'	8	2,268	1 per staff on largest shift
Exterior Equipment Parking Demands	288	12' x 24'	0	0	
ADA Space plus Aisle	306	9' x 18' +8' Aisle	1	306	
DIV.15 - Trash Area	900	30'x30' (can vary)	1	900	
DIV.16 - Stock Pile Material Bins	800	40' x 20'	1	800	
SITE PROGRAM REQUIREMENTS SUBTOTAL SF				4,274	
SITE CIRCULATION @ 150%				6,411	Accounts for access to all sides of separated site functions
SITE PROGRAM REQUIREMENTS TOTAL SF				10,685	

SITE AREA TOTALS					
MAIN BUILDING	25,423				
CIRCULATION AROUND BUILDING	6,356	25% of subtotal			
COLD STORAGE	1,795				
CIRCULATION AROUND BUILDING	449	25% of subtotal			
SITE PROGRAM REQUIREMENTS	10,685				
CIRCULATION AROUND BUILDING	2,671	25% of subtotal			
Program Totals	47,379				
25% GREEN SPACE	11,845				
Stormwater Management	11,845	25% of subtotal			
GRAND TOTAL SITE AREA SF	92,389	2.76			*Total squarefootage and acreage, plus added 30% of programmed acreage for drainage paths, easements, setbacks, etc.*

Forestry Division (FOR)
Programming Summary



Forestry Division

Adjacency Diagram

ADMINISTRATIVE	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
DIV.1a - Building Entry / Vestibule	100	10'x10'	1	100	
DIV.1b - Reception	100	10' x 10'	0	0	
DIV.2 - Division Manager Office	180	12' x 15'	1	180	
DIV.3 - Supervisor Office	150	10' x 15'	1	150	
DIV.4 - Staff Office	NA			-	
DIV.5 - Field Staff Workstation / Open Office	574	6'x6' x (FTE+1/2PTE)	1	574	
DIV.6a - Small Conference Room	120	12' x 10'	1	120	
DIV.6b - Standard Conference Room	NA			-	
DIV.7 - Large Conference Room-Training Room	500	20' x 25'	1	500	
DIV.8 - Copy Area / Document Work Room	216	12' x 18'	1	317	
DIV.9 - Breakroom	420	25 sf x Staff #	1	420	
DIV.10a - Universal Public Restroom	72	8' x 9'	1	72	
DIV.10b - Men's Locker and Restroom	348	TBD	1	348	
DIV.10c - Women's Locker and Restroom	252	TBD	1	252	
DIV.10d - Wellness Room	168	12' x 14'	1	168	
DIV.10e - IT Closet	48	6' x 8'	1	48	
DIV.10f - Janitorial	63	7' x 9'	1	63	
DIV.11 - General Storage / Supply Closets	NA			-	
DIV.12 - Mud Room / Wash Area	96	8' x 12'	1	96	
DIV.13 - General Computer Area	NA			-	Central Computer area - See Also DIV.5 - Field Staff / Open Office
DIV.14 - Laundry Facility	NA			-	
DIV.10g - Mechanical and Electrical Room	497	10' x 10'	1	497	
ADMINISTRATIVE SUBTOTAL SF				3,905	
CIRCULATION @ 30%				1,171	
ADMINISTRATIVE TOTAL SF				5,076	

CONDITIONED VEHICLE STORAGE (WARM)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	5	4,320	
Medium Space	288	12'x24'	14	4,147	
Pickup Space	200	10'x20'	5	1,040	
VEHICLE PARKING SUBTOTAL	9,507				
DOUBLE TRAFFIC LANE STORAGE INCREASE	11,409			20,916	Parking plus traffic lane serving parking
Mezzanine Storage				6,972	Maximum 1/3 of open storage area (IBC)
General Storage area				2,614	Area created by angled parking, used for small implement storage
CONDITIONED VEHICLE STORAGE SUBTOTAL SF				20,916	Parking plus traffic lane serving parking
CIRCULATION @ 15%				3,137	
CONDITIONED VEHICLE STORAGE TOTAL SF				26,668	Sum of parking and traffic lanes, plus additional circ and storage

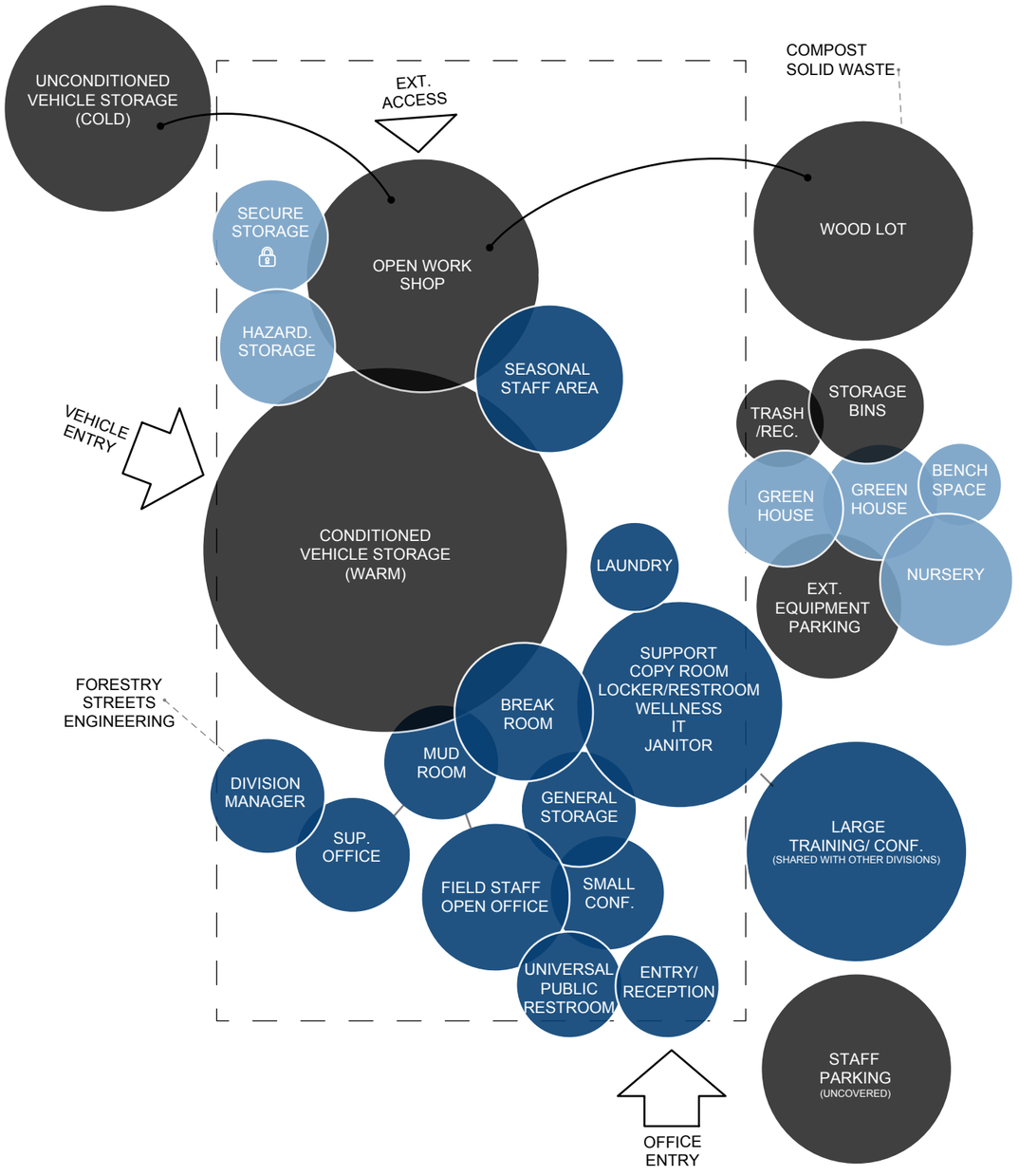
DIVISION OPERATION CRITICAL SPACES	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
FAC.2 - Open Work Shop	750	25' x 30'	1	750	
FAC.3 - Welding Bay	384	32' x 12'	1	384	
FAC.4 - Shelving and Racking Storage	450	15' x 30'	1	450	
FAC.5 - Personal Protective Equipment Storage	80	8' x 10'	1	80	
FAC.6 - Secure Tool/Parts/Material Storage	240	20' x 12'	1	240	
FAC.7 - Refrigerant and Compressed Gas Storage	150	15' x 10'	1	150	
FAC Division Operation Critical Spaces	2,054				
DIVISION OPERATION CRITICAL SPACES SUBTOTAL SF				2,054	
CIRCULATION @ 30%				616	
DIVISION OPERATION CRITICAL SPACES TOTAL SF				2,670	

UNCONDITIONED VEHICLE STORAGE (COLD)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	0	0	
Medium Space	288	12'x24'	0	0	
Pickup Space	200	10'x20'	16	3,200	
VEHICLE PARKING SUBTOTAL	3,200				
DOUBLE TRAFFIC LANE STORAGE INCREASE	3,840			7,040	Parking plus traffic lane serving parking
Mezzanine Storage				2,347	Maximum 1/3 of open storage area (IBC)
General Storage area				880	Area created by angled parking, used for small implement storage
UNCONDITIONED VEHICLE STORAGE SUBTOTAL SF				7,040	Parking plus traffic lane serving parking
CIRCULATION @ 15%				1,056	
UNCONDITIONED VEHICLE STORAGE TOTAL SF				8,976	Sum of parking and traffic lanes, plus additional circ and storage

SITE PROGRAM REQUIREMENTS	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Staff Parking and Drive Aisle	284	9' x 18'	18	4,990	1 per staff on largest shift
Exterior Equipment Parking Demands	288	12' x 24'	0	0	
ADA Space plus Aisle	306	9' x 18' +8' Aisle	1	306	
DIV.15 - Trash Area	900	30'x30' (can vary)	1	900	
SITE PROGRAM REQUIREMENTS SUBTOTAL SF				6,196	
SITE CIRCULATION @ 150%				9,293	Accounts for access to all sides of separated site functions
SITE PROGRAM REQUIREMENTS TOTAL SF				15,489	

SITE AREA TOTALS					
MAIN BUILDING	34,414				
CIRCULATION AROUND BUILDING	8,603	25% of subtotal			
COLD STORAGE	8,976				
CIRCULATION AROUND BUILDING	4,488	25% of subtotal			
SITE PROGRAM REQUIREMENTS	15,489				
CIRCULATION AROUND BUILDING	7,745	25% of subtotal			
Program Totals	79,715				
25% GREEN SPACE	19,929				
Stormwater Management	19,929	25% of subtotal			
GRAND TOTAL SITE AREA SF	155,444	4.64			*Total squarefootage and acreage, plus added 30% of programmed acreage for drainage paths, easements, setbacks, etc.*

Horticulture Division (HOR)
Programming Summary



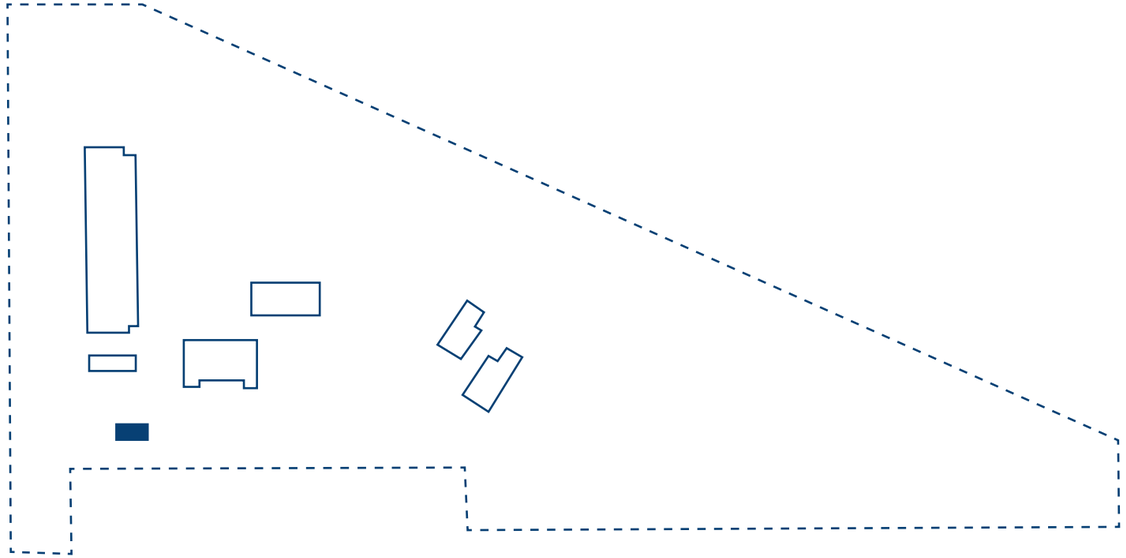
Horticulture Division

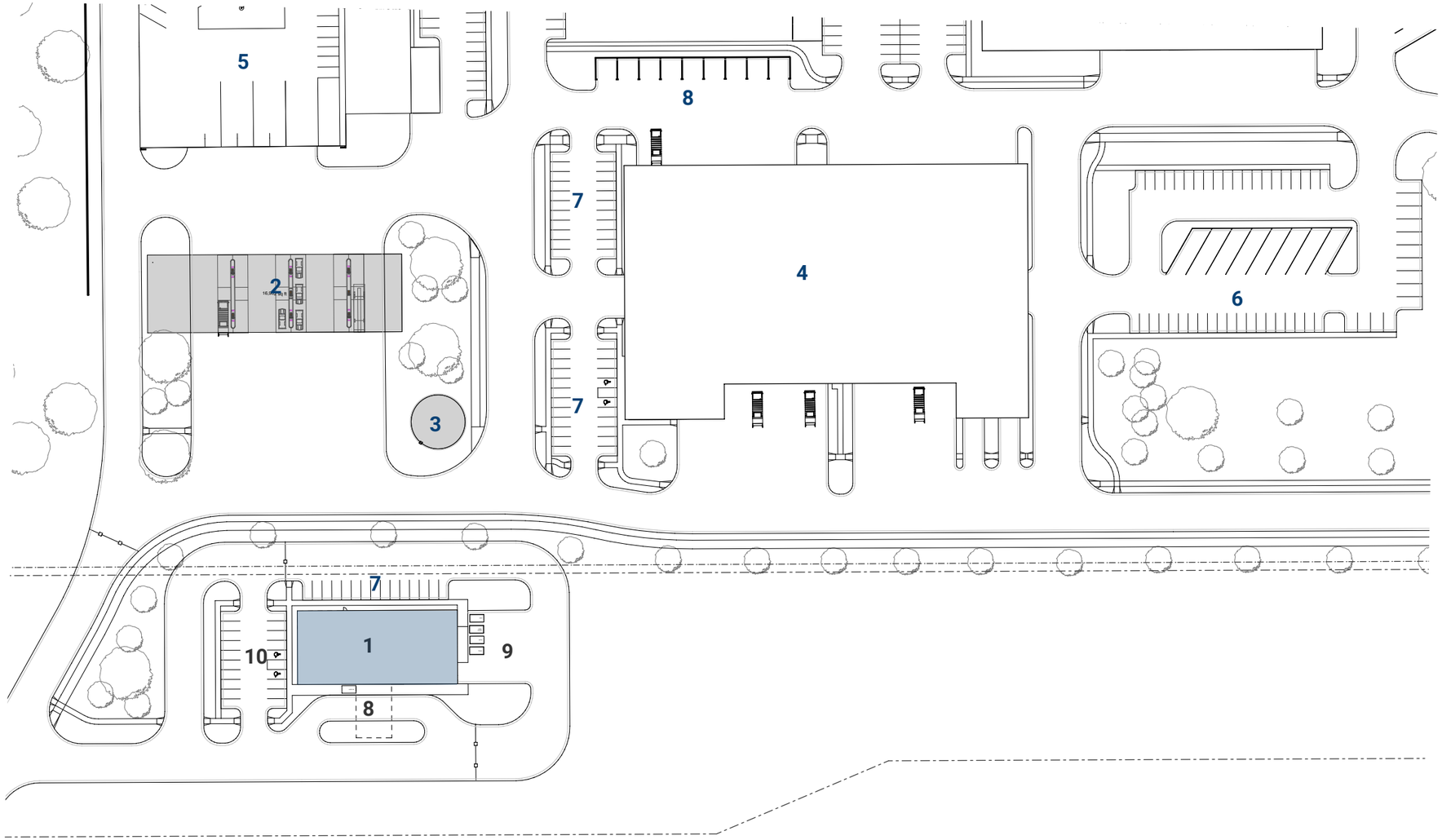
Adjacency Diagram

MAX
Bgara
ORIGINAL

10

Household Hazardous Waste

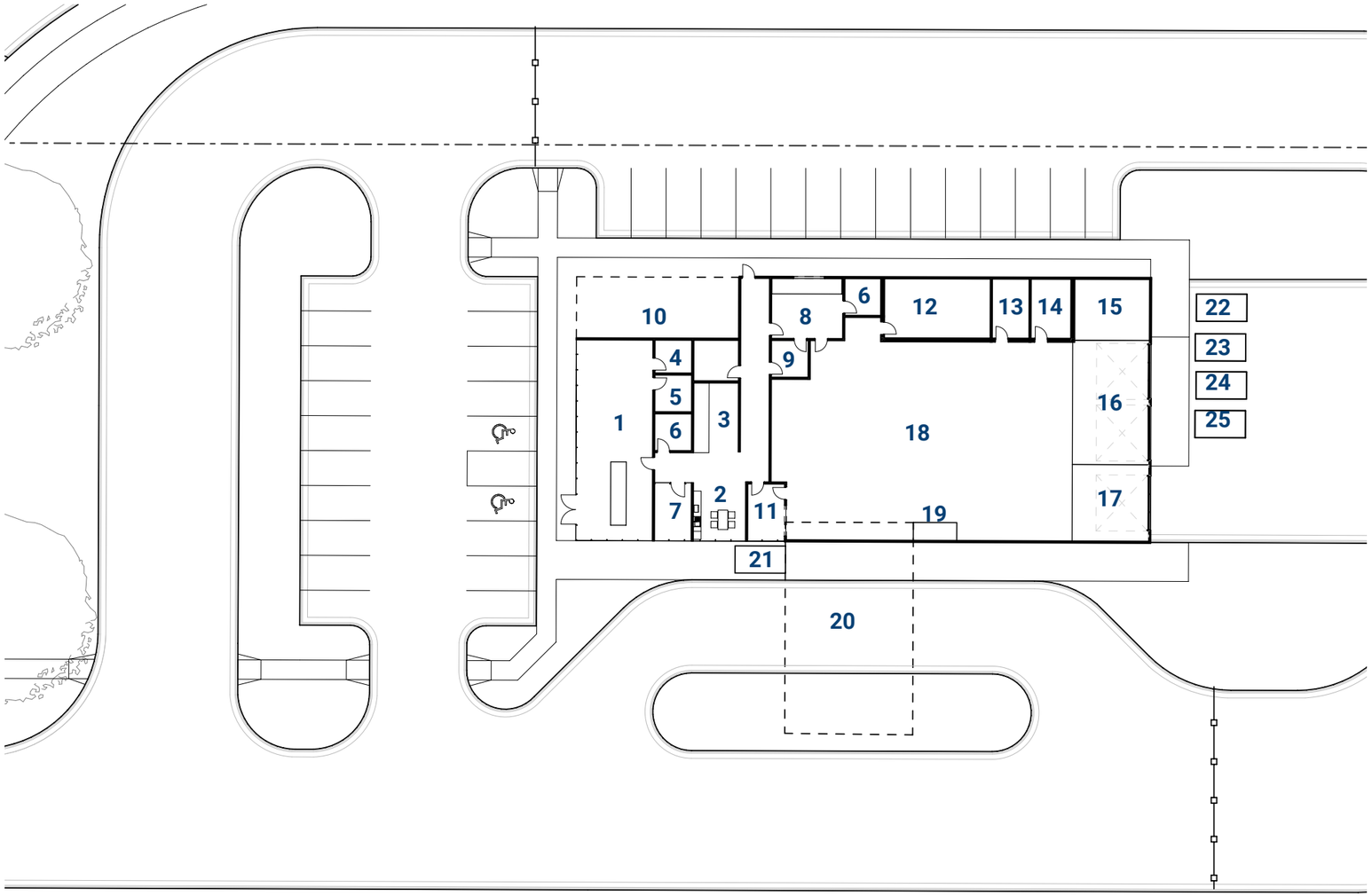




1. Household Hazardous Waste
2. Fuel Island
3. Rainwater Collection Tank
4. Central Maintenance Garage
5. MSO Building
6. Fleet Vehicle Staging Area
7. Employee Parking
8. Customer Drive Thru
9. Deliveries/ Pick-up
10. Public Parking

Site Plan

0 40 80 160 320'



1. Reuse Retail Area
2. Break Room
3. Copy Room/Work Area
4. Restroom
5. Utilities
6. Storage
7. Division Supervisor's Office
8. Testing Lab
9. PPE Storage
10. Future Public Storm Shelter
11. Material Processing Office
12. Explosion and Fireproof Room
13. Mechanical
14. Bulk Fluids Storage
15. Corrosives and Reactive Storage
16. General Storage
17. Loading Dock
18. Material Storage and Processing
19. Testing
20. Customer Drive Thru
21. Used Oil Storage
22. Misc. Dumpster
23. Cardboard Dumpster
24. Metal Dumpster
25. Trash Dumpster

Floor Plan

0 10 20 40 80'

ADMINISTRATIVE	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
DIV.1a - Building Entry / Vestibule	100	10'x10'	1	100	
DIV.1b - Reception	NA			-	
DIV.2 - Division Manager Office	NA			-	
DIV.3 - Supervisor Office	150	10' x 15'	1	150	
DIV.4 - Staff Office	NA			-	
DIV.5 - Field Staff Workstation / Open Office	137	6'x6' x (FTE+1/2PTE)	1	137	
DIV.6a - Small Conference Room	NA			-	
DIV.6b - Standard Conference Room	NA			-	
DIV.7 - Large Conference Room-Training Room	NA			-	
DIV.8 - Copy Area / Document Work Room	216	12' x 18'	1	144	
DIV.9 - Breakroom	120	25 sf x Staff #	1	120	
DIV.10a - Universal Public Restroom	72	8' x 9'	3	216	
DIV.10b - Men's Locker and Restroom				-	
DIV.10c - Women's Locker and Restroom				-	
DIV.10d - Wellness Room	NA			-	
DIV.10e - IT Closet	48	6' x 8'	1	48	
DIV.10f - Janitorial	63	7' x 9'	2	126	
DIV.11 - General Storage / Supply Closets	100	10' x 10'	1	100	
DIV.12 - Mud Room / Wash Area	NA			-	
DIV.13 - General Computer Area	NA			-	Central Computer area - See Also DIV.5 - Field Staff / Open Office
DIV.14 - Laundry Facility	NA			-	
DIV.10g - Mechanical and Electrical Room	171	15% of supported	1	171	
ADMINISTRATIVE SUBTOTAL SF				1,312	
CIRCULATION @ 30%				394	
ADMINISTRATIVE TOTAL SF				1,705	

CONDITIONED VEHICLE STORAGE (WARM)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	0	0	
Medium Space	288	12'x24'	0	0	
Pickup Space	200	10'x20'	2	400	
VEHICLE PARKING SUBTOTAL	400				
DOUBLE TRAFFIC LANE STORAGE INCREASE	480			880	Parking plus traffic lane serving parking
Mezzanine Storage				293	Maximum 1/3 of open storage area (IBC)
General Storage area				110	Area created by angled parking, used for small implement storage
CONDITIONED VEHICLE STORAGE SUBTOTAL SF				880	Parking plus traffic lane serving parking
CIRCULATION @ 15%				132	
CONDITIONED VEHICLE STORAGE TOTAL SF				1,122	Sum of parking and traffic lanes, plus additional circ and storage

Household Hazardous Waste (HHW)

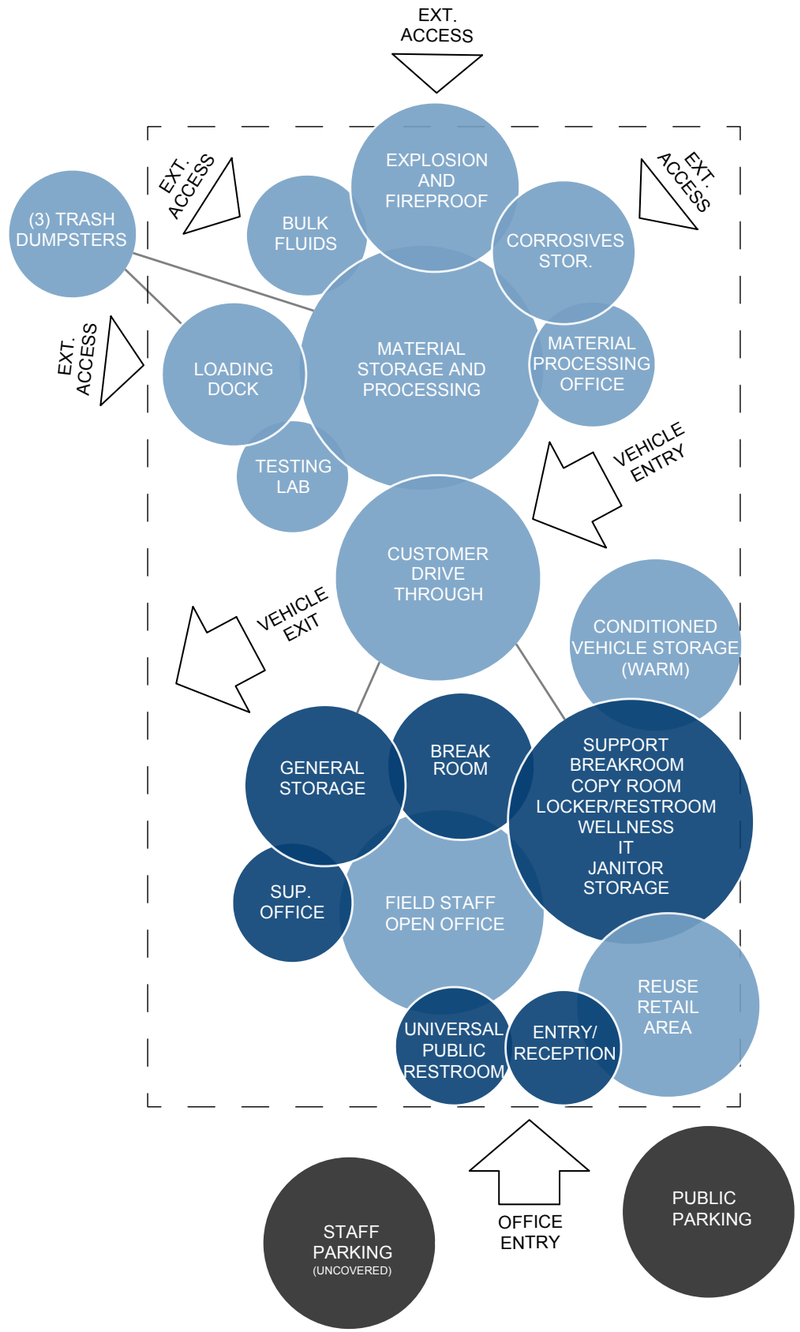
Programming Summary

DIVISION OPERATION CRITICAL SPACES	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
HHW.1 - Material Storage and Processing	4,096	64' x 64'	1	4,096	
HHW.2 - Customer Drive Through	225	15' x 15' min.	1	225	
HHW.3 - Testing Lab	224	14' x 16'	1	224	
HHW.4 - Material Processing Office	48	8' x 6'	1	48	
HHW.5 - Corrosives and Water Reactive Storage	224	16' x 14'	1	224	
HHW.6 - Explosion and Fire Proof Room	448	16' x 28'	1	448	
HHW.7 - Bulk Fluids Room - Waste fluids	180	15' x 12'	1	180	
HHW.8 - Loading Dock	225	15' x 15'	2	450	
HHW.9 - Staff Work Area (See DIV.5)				0	
HHW.10 - Reuse Retail Area	1,000	20' x 50'	1	1,000	
HHW.11 - Customer Restrooms (See Div.10a)				0	
HHW.12 - General Operational Storage	600	30' x 20'	1	600	
HHW Division Opertion Critical Spaces	7,495				
DIVISION OPERATION CRITICAL SPACES SUBTOTAL SF				7,495	
CIRCULATION @ 30%				2,249	
DIVISION OPERATION CRITICAL SPACES TOTAL SF				9,744	

UNCONDITIONED VEHICLE STORAGE (COLD)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	0	0	
Medium Space	288	12'x24'	0	0	
Pickup Space	200	10'x20'	0	0	
VEHICLE PARKING SUBTOTAL	0				
DOUBLE TRAFFIC LANE STORAGE INCREASE	0			0	Parking plus traffic lane serving parking
Mezzanine Storage				0	Maximum 1/3 of open storage area (IBC)
General Storage area				0	Area created by angled parking, used for small implement storage
UNCONDITIONED VEHICLE STORAGE SUBTOTAL SF				0	Parking plus traffic lane serving parking
CIRCULATION @ 15%				0	
UNCONDITIONED VEHICLE STORAGE TOTAL SF				0	Sum of parking and traffic lanes, plus additional circ and storage

SITE PROGRAM REQUIREMENTS	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Staff Parking and Drive Aisle	284	9' x 18'	8	2,268	1 per staff on largest shift
Public Visitors	284	9' x 18'	17	4,725	
Exterior Equipment Parking Demands	288	12' x 24'	0	0	
ADA Space plus Aisle	306	9' x 18' +8' Aisle	1	306	
HHW.13 - Dumpster Containers	104	8' x 13'	3	312	
SITE PROGRAM REQUIREMENTS SUBTOTAL SF				7,611	
SITE CIRCULATION @ 150%				11,417	Accounts for access to all sides of separated site functions
SITE PROGRAM REQUIREMENTS TOTAL SF				19,028	

SITE AREA TOTALS					
MAIN BUILDING	12,571				
CIRCULATION AROUND BUILDING	4,872	50% of subtotal			
COLD STORAGE	0				
CIRCULATION AROUND BUILDING	0	25% of subtotal			
SITE PROGRAM REQUIREMENTS	19,028				
CIRCULATION AROUND BUILDING	9,514	50% of subtotal			
Program Totals	45,984				
25% GREEN SPACE	11,496				
Stormwater Management	11,496	25% of subtotal			
GRAND TOTAL SITE AREA SF	89,669	2.68			*Total squarefootage and acreage, plus added 30% of programmed acreage for drainage paths, easements, setbacks, etc.*



Household Hazardous Waste

Adjacency Diagram

11

Sustainability Strategy

The design process for the Lawrence Field Operations Campus Master Plan has been centered around ten measures for sustainable performance. These measures look broadly at sustainability, and were derived from the American Institute of Architect's Committee on the Environment.

In July, a sustainability workshop was conducted with attendees including city staff, sustainability experts and the Design Team. The group looked collectively at these ten measures to discuss benchmark goals and establish which held primary and secondary importance for campus.

Design for Integration

The Design Team has been working throughout the Master Planning process to ensure that the City's sustainability goals are integrated into overall design goals for the Lawrence Field Operations Campus. During the sustainability workshop, the discussion around this category was centered around the high priority goals of designing for operational efficiencies as well as remediating site contamination. The reuse and repurposing of existing City facilities was also discussed.

This measure was designated as a primary imperative by those who attended the Sustainability Workshop.

Design for Community

Due to its location adjacent to residential areas, the design team has been working with the City to ensure that the Lawrence Field Operations Campus integrates closely with the community. This measure was designated as a primary imperative by those who attended the Sustainability Workshop. Sensitivity to the surrounding neighborhoods including: mindful traffic impacts, noise management and light pollution management were discussed and designated as high priority topics.

In addition, the group discussed repurposing opportunities for existing facility sites, public art, educational opportunities, as well as the potential for an outdoor meeting space and trail systems.

Design for Ecology

Responding, connecting and contributing to the surrounding ecosystem have been important topics surrounding the overarching goal of remediating contaminants present on the Farmland Site. The proposed landscaping for the Campus Master Plan includes deep rooted native plants, which will assist in absorbing ground water before it reaches contaminated zones below the surface. During the Sustainability Workshop, the group began to set baseline goals for ecosystem services like planting one new tree for every mature tree that is removed during construction.

Design for Water

Rainwater Management is a critical component in the remediation process. During the Sustainability Workshop, the importance of establishing a stormwater control plan, capturing and reusing rainwater, as well as reducing the amount of water used on site was discussed.

Design for Economy

The consolidation of City Divisions onto a centralized campus will result in countless efficiencies related to time and expense. The importance of having an efficient layout without compromising pandemic response was discussed during the Workshop. In addition to the operational efficiencies that will come as a result of consolidating services, conducting a Life Cycle Analysis to ensure the longevity of the Campus was established as a high priority goal.

Design for Energy

In an effort to align with the City's goal in transitioning to 100% renewable energy, the Lawrence Field Operations Campus Master Plan proposes the use of photovoltaic panels for the production of on-site renewable energy. Creating a phased solar plan was discussed to ensure that each building on Campus is solar ready.

This measure was designated as a primary imperative by those who attended the Sustainability Workshop.

Design for Wellness

Enhancing working conditions to ensure employee health and wellness is an essential part of creating a consolidated Field Operations Campus. Natural daylight, air quality and ventilation were discussed as high priority topics during the sustainability workshop.

Design For Resources

Decisions about materials, especially regarding their carbon footprint, can have a major impact on a project. Material durability was highlighted as a high priority goal during the Sustainability Workshop. The group also discussed on-site resources like the Bag and Bulk Warehouses, as well as the large rubble pile and its potential to be crushed and reused as construction fill.

Design for Change

The recent COVID-19 pandemic has sparked conversations about the resilience and flexibility of City owned buildings. City staff are considered essential workers, and their ability to continue work during times of crisis is critical. Risk management and assessment was brought up during the Sustainability Workshop as a topic of high importance.

The group also discussed the importance of moving essential workers out of their unsafe and inefficient facilities that are currently located in the floodway. This measure was designated as a primary imperative by those who attended the Sustainability Workshop.

Design for Discovery

The construction timeline for the Lawrence Field Operations Campus stretches over several years. During the Sustainability Workshop, the group discussed conducting a pre-occupancy and post-occupancy analysis after the construction of each building. This will allow for the documentation of how each building is functioning, and will provide the framework for any changes that need to be made moving forward.

Design for Integration

Design for Community

Design for Ecology

Design for Water

Design for Economy

Design for Energy

Design for Wellness

Design for Resources

Design for Change

Design for Discovery

Framework for Sustainable Performance

LEED

It was determined that the City would like to pursue LEED Silver certification or equivalent. The requirements for LEED largely overlap with the Ten Measures for Sustainable Performance.

Through an initial LEED analysis and assessment, a number of sustainable design strategies and goals were determined under the following categories:

Sustainable Sites:

The Lawrence Field Operations Campus Master Plan is designed to maintain as much of the existing vegetation on site as possible. Open areas will be landscaped with native deep-rooted plants, which will not only help restore natural habitats, but will also assist in the water management efforts that are a necessary part of the remediation strategy.

Water Efficiency:

A number of strategies will be implemented to reduce indoor and outdoor water usage. A primary strategy will include harvesting rainwater from the roofs of each building. The collected water will be reused in vehicle wash bays and in irrigation operations necessary for Forestry and Horticulture Divisions. The landscaping throughout the campus will be designed in a way that does not require a permanent irrigation system.

Water conserving fixtures and equipment will be installed wherever possible, including all break room kitchens. Water metering strategies will be implemented after the construction of each building to assess water usage throughout the campus and provide data to help determine additional opportunities for water reduction.

Energy and Atmosphere:

Energy performance goals will be established in the initial design phase of each building and whole-building energy simulations will be conducted. After determining a baseline standard, the campus will be designed to achieve at least a 22% reduction in energy use.

10% of the energy across the campus will be renewable energy produced on site. The roofs of each building will be utilized for the proposed installation of photovoltaic panels.

Energy metering strategies will be implemented after the construction of each building to assess energy usage throughout the campus and provide data to help determine additional opportunities for energy reduction.

Materials and Resources:

A detailed life cycle analysis will be conducted for each building in an effort to optimize the environmental performance of building materials. Each material and product will be carefully chosen based on its carbon footprint and durability.

The large existing rubble pile on site will be crushed and reused as construction fill. This strategy is not only cost effective, but will prevent a substantial amount of construction waste. A construction plan will be created and implemented to divert at least 75% of construction waste and demolition material from the landfill.

Indoor Environmental Quality

Promoting indoor environmental quality through natural daylight, adequate ventilation, and visual connection to exterior spaces is proven to have long lasting and drastic effects on human health and wellness. These strategies promote comfort, increase productivity and encourage a sense of overall well-being for inhabitants.

Each building on site will be designed to have great natural daylight in every regularly occupied space. Daylighting analysis will be conducted early in the design process to determine the exact placement of windows and other openings.

Mechanical systems will be implemented to filter and prevent the cross-contamination of exhaust and other fumes generation in work areas throughout each building. In addition, the option for natural ventilation will be provided wherever possible.

Landscaping and other natural features will be taken into consideration when determining the placement of glazing. A direct line of sight to the outdoors will be provided in at least 75% of regularly occupied floor area.

LEED v4 for BD+C: New Construction and Major Renovation

Project Checklist

Project Name: The Lawrence Field Operations Facility Campus
Date: 10/11/2020

Y	?	N			
	1		Credit	Integrative Process	1

0	4	12	Location and Transportation		16
		0	Credit	LEED for Neighborhood Development Location	16
	1		Credit	Sensitive Land Protection	1
	1	1	Credit	High Priority Site	2
		5	Credit	Surrounding Density and Diverse Uses	5
		5	Credit	Access to Quality Transit	5
		1	Credit	Bicycle Facilities	1
	1		Credit	Reduced Parking Footprint	1
	1		Credit	Green Vehicles	1

0	9	1	Sustainable Sites		10
Y			Prereq	Construction Activity Pollution Prevention	Required
	1		Credit	Site Assessment	1
	2		Credit	Site Development - Protect or Restore Habitat	2
	1		Credit	Open Space	1
	2	1	Credit	Rainwater Management	3
	2		Credit	Heat Island Reduction	2
	1		Credit	Light Pollution Reduction	1

0	4	7	Water Efficiency		11
Y			Prereq	Outdoor Water Use Reduction	Required
Y			Prereq	Indoor Water Use Reduction	Required
Y			Prereq	Building-Level Water Metering	Required
	2		Credit	Outdoor Water Use Reduction	2
	1	5	Credit	Indoor Water Use Reduction	6
		2	Credit	Cooling Tower Water Use	2
	1		Credit	Water Metering	1

0	20	13	Energy and Atmosphere		33
Y			Prereq	Fundamental Commissioning and Verification	Required
Y			Prereq	Minimum Energy Performance	Required
Y			Prereq	Building-Level Energy Metering	Required
Y			Prereq	Fundamental Refrigerant Management	Required
	6		Credit	Enhanced Commissioning	6
	9	9	Credit	Optimize Energy Performance	18
	1		Credit	Advanced Energy Metering	1
		2	Credit	Demand Response	2
	3		Credit	Renewable Energy Production	3
		1	Credit	Enhanced Refrigerant Management	1
	1	1	Credit	Green Power and Carbon Offsets	2

0	5	8	Materials and Resources		13
Y			Prereq	Storage and Collection of Recyclables	Required
Y			Prereq	Construction and Demolition Waste Management Planning	Required
	3	2	Credit	Building Life-Cycle Impact Reduction	5
		2	Credit	Building Product Disclosure and Optimization - Environmental Product Declarations	2
		2	Credit	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
		2	Credit	Building Product Disclosure and Optimization - Material Ingredients	2
	2		Credit	Construction and Demolition Waste Management	2

0	13	3	Indoor Environmental Quality		16
Y			Prereq	Minimum Indoor Air Quality Performance	Required
Y			Prereq	Environmental Tobacco Smoke Control	Required
	2		Credit	Enhanced Indoor Air Quality Strategies	2
	3		Credit	Low-Emitting Materials	3
	1		Credit	Construction Indoor Air Quality Management Plan	1
	1	1	Credit	Indoor Air Quality Assessment	2
	1		Credit	Thermal Comfort	1
	1	1	Credit	Interior Lighting	2
	2	1	Credit	Daylight	3
	1		Credit	Quality Views	1
	1		Credit	Acoustic Performance	1

0	1	5	Innovation		6
		5	Credit	Innovation	5
	1		Credit	LEED Accredited Professional	1

0	4	0	Regional Priority		4
	1		Credit	Regional Priority: Specific Credit	1
	1		Credit	Regional Priority: Specific Credit	1
	1		Credit	Regional Priority: Specific Credit	1
	1	0	Credit	Regional Priority: Specific Credit	1

0	61	49	TOTALS	Possible Points:	110

Certified: 40 to 49 points, **Silver:** 50 to 59 points, **Gold:** 60 to 79 points, **Platinum:** 80 to 110

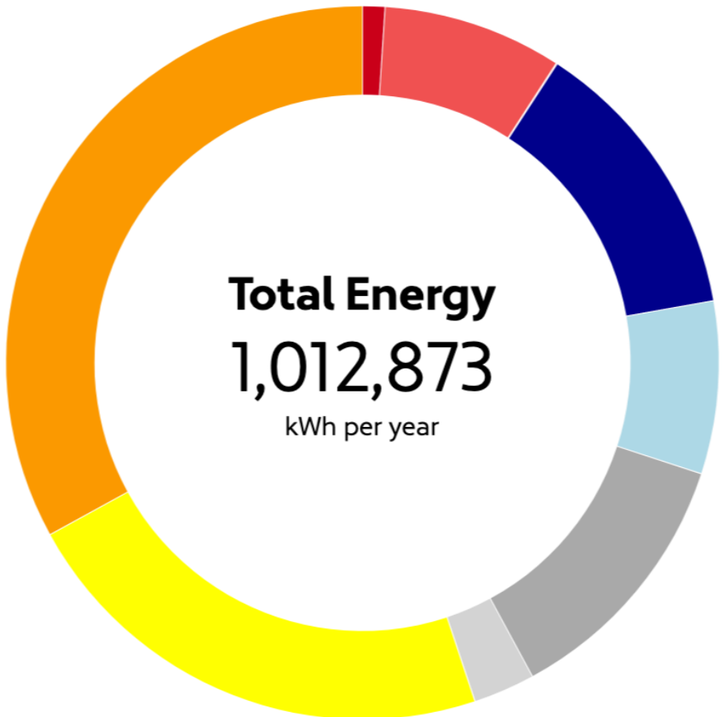
MSO Energy Analysis

2030 Challenge Baseline Energy Use Intensity (EUI): 78 kBtu/sq.ft./yr.

Number based on CBECS 2003/RECS 2001 but normalized by climate, building type, building size, occupancy, and schedule. The 2030 challenge has a goal for a 70% reduction in baseline EUI, resulting in a target goal of 24 EUI.

LEED Silver: As a part of our LEED strategy we are targeting 9 points in energy performance which equates to a 22% reduction in energy use compared to an ASHRAE baseline.

Modeled Baseline: Our model, tested with ASHRAE minimum U-value requirements, with a baseline VRF system used in the offices, and heating and ventilation only used in the Workshop areas, resulted in a pEUI of 37 kBtu/sq.ft./yr. To achieve LEED Silver, our goal will be to achieve 28.86 kBtu/sq.ft/yr in the final design. These numbers are based on preliminary design assumptions and will require more in-depth energy modeling in future phases.

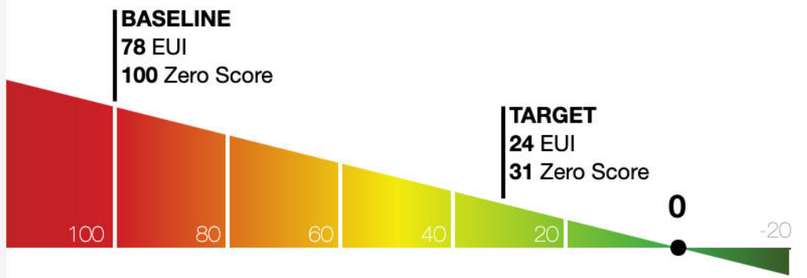


MSO Office + Workshop Spaces: 72,217 sq.ft., vrf system
Annual Energy Use Intensity (EUI)= 37 kBtu/sq.ft./yr

Annual Energy Use - Office + Workshop Spaces

Segment	kWh per year	% of total use
Heating	**93,134**	**9 %**
AHU	10,236	1 %
Zones	82,351	8 %
Humidification	547	0 %
Cooling	**211,074**	**21 %**
AHU	131,867	13 %
Heat Rejection	0	0 %
Zones	79,207	8 %
Fans	**150,469**	**15 %**
AHU	122,100	12 %
Zones	28,369	3 %
Interior	**558,196**	**55 %**
Lighting	223,991	22 %
Equipment	334,205	33 %
Pumps	**0**	**0 %**

Target EUI is 24 based on a 70% reduction



BUILDING SUMMARY

LOCATION	LAWRENCE, KS	66045
USES	Office	34,245 sq.ft (47.4%)
	Repair Services (Vehicle, Shoe Locksmith, etc.)	37,972 sq.ft (52.6%)

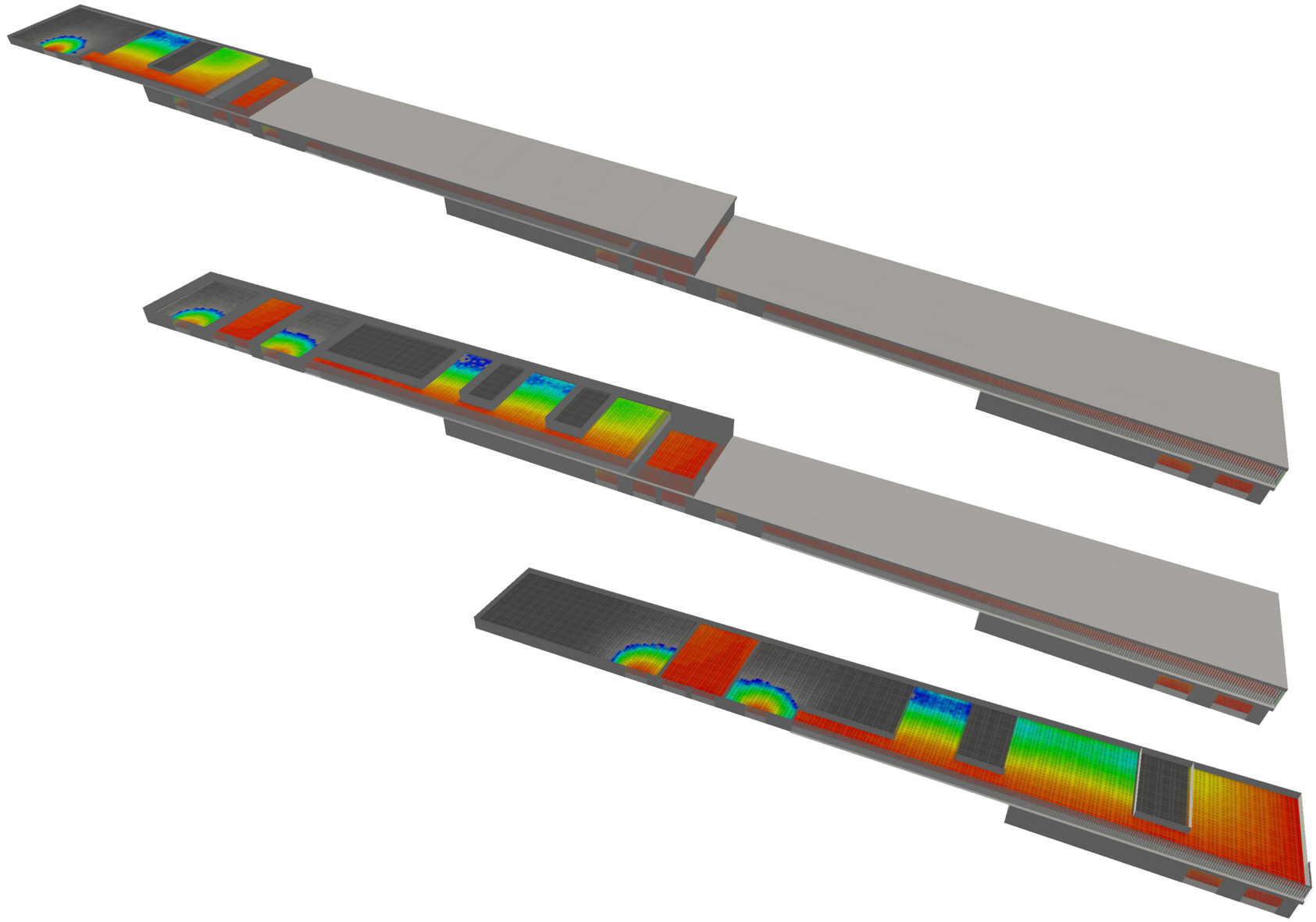
RESULTS	BASELINE	TARGET
EUI % Reduction from Baseline	0%	70%
Zero Score	100	31
Site EUI (kBtu/ft²/yr)	78	24
Source EUI (kBtu/ft²/yr)	151	46
Total GHG Emissions (metric tons CO_2e/yr)	748	225

MSO Daylight Analysis

The MSO building is comprised of office spaces, break areas, meeting spaces, and various workshops. All of these spaces benefit greatly from daylighting, which improves worker health, safety and comfort. Early in conceptual design for this building, the desire to get as much natural light into these spaces was identified as a high priority. The building has a north/south orientation, which allowed us to use the eastern facade with large spans of glazing with controlled screening to pull light through the circulation into the open offices spaces.

By controlling the screening and glazing types, the Design Team was able to achieve the recommended light levels between 30 and 50 foot candles in the space for at least 50% of the operating hours throughout the year. This allows daylighting to be the predominate lighting strategy throughout the building, creating a comfortable and efficient space that requires minimal artificial lighting.

The Annual Daylight Autonomy study shows spaces that would achieve a target of 40 foot candles for minimum of 50% of the working time throughout the year. The warmer the color, the more frequently the space will meet or exceed the target footcandles. This study shows that nearly 70% of the space, including the DOS work shops, achieve this light level goal with daylighting alone. Areas that do not achieve daylighting goals can be improved by skylights or other glazing strategies.



Percentage of analysis points ≥ 400 lux for ≥ 50% of occupied hours.

Below Above

CMG Energy Analysis

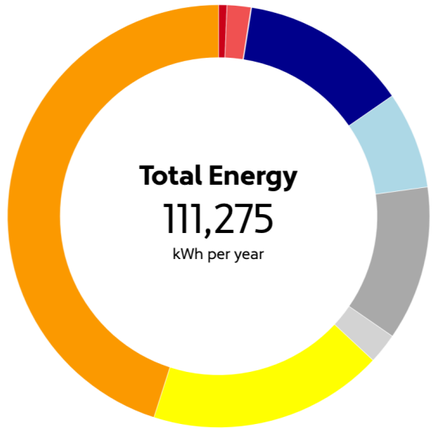
2030 Challenge Baseline Energy Use Intensity (EUI): 55 kBtu/sq.ft./yr.

Number based on CBECS 2003/RECS 2001, normalized by climate, building use type, building size, occupancy, and schedule. The 2030 Challenge has a goal of 70% reduction in baseline EUI, resulting in a target goal of 17 EUI.

LEED Silver: As a part of our LEED strategy we are targeting 9 points in energy performance which equates to a 22% reduction in energy use compared to an ASHRAE baseline.

Modeled Baseline: Our model, tested with ASHRAE minimum U-values, a baseline VRF system used in the offices, and heating and ventilation only used in the workshop resulted in a pEUI of 26.41 kBtu/sq.ft./yr. To achieve LEED Silver, our goal will be to achieve 20.6 kBtu/sq.ft/yr in the final design. These numbers are based on preliminary design assumptions. Moving further into the design phase will require more in-depth energy modeling to document achievement of LEED certification requirements.

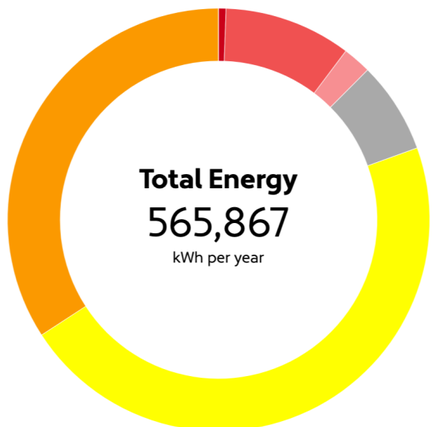
Average Annual EUI = ((37 x 9,800) + (25 x 73,600)) /83,400
= 26.41 kBtu/sq.ft./yr



Annual Energy Use - Office Spaces

Segment	kWh per year	% of total use
Heating	**2,791**	**3 %**
AHU	704	1 %
Zones	2,034	2 %
Humidification	53	0 %
Cooling	**22,564**	**20 %**
AHU	14,302	13 %
Heat Rejection	0	0 %
Zones	8,262	7 %
Fans	**15,751**	**14 %**
AHU	13,158	12 %
Zones	2,593	2 %
Interior	**70,169**	**63 %**
Lighting	20,048	18 %
Equipment	50,121	45 %
Pumps	**0**	**0 %**

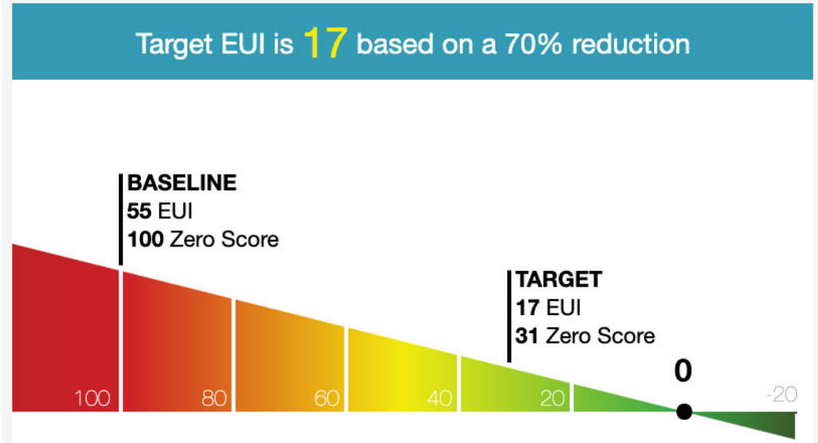
CMG Office : 9,800 sq.ft., vrf system
Annual Energy Use Intensity (EUI)= 37 kBtu/sq.ft./yr



Annual Energy Use - Workshop Spaces

Segment	kWh per year	% of total use
Heating	**70,572**	**12 %**
AHU	3,189	1 %
Zones	55,086	10 %
Humidification	12,297	2 %
Cooling	**0**	**0 %**
AHU	0	0 %
Heat Rejection	0	0 %
Zones	0	0 %
Fans	**39,683**	**7 %**
AHU	39,683	7 %
Zones	0	0 %
Interior	**455,489**	**80 %**
Lighting	262,251	46 %
Equipment	193,238	34 %
Pumps	**123**	**0 %**

CMG Workshop :73,600 sq.ft., heat and vent only
Annual Energy Use Intensity (EUI)= 25 kBtu/sq.ft./yr



BUILDING SUMMARY

LOCATION	LAWRENCE, KS	66045
USES	Repair Services (Vehicle, Shoe Locksmith, etc.)	73,600 sq.ft (88.3%)
	Office	9,800 sq.ft (11.8%)

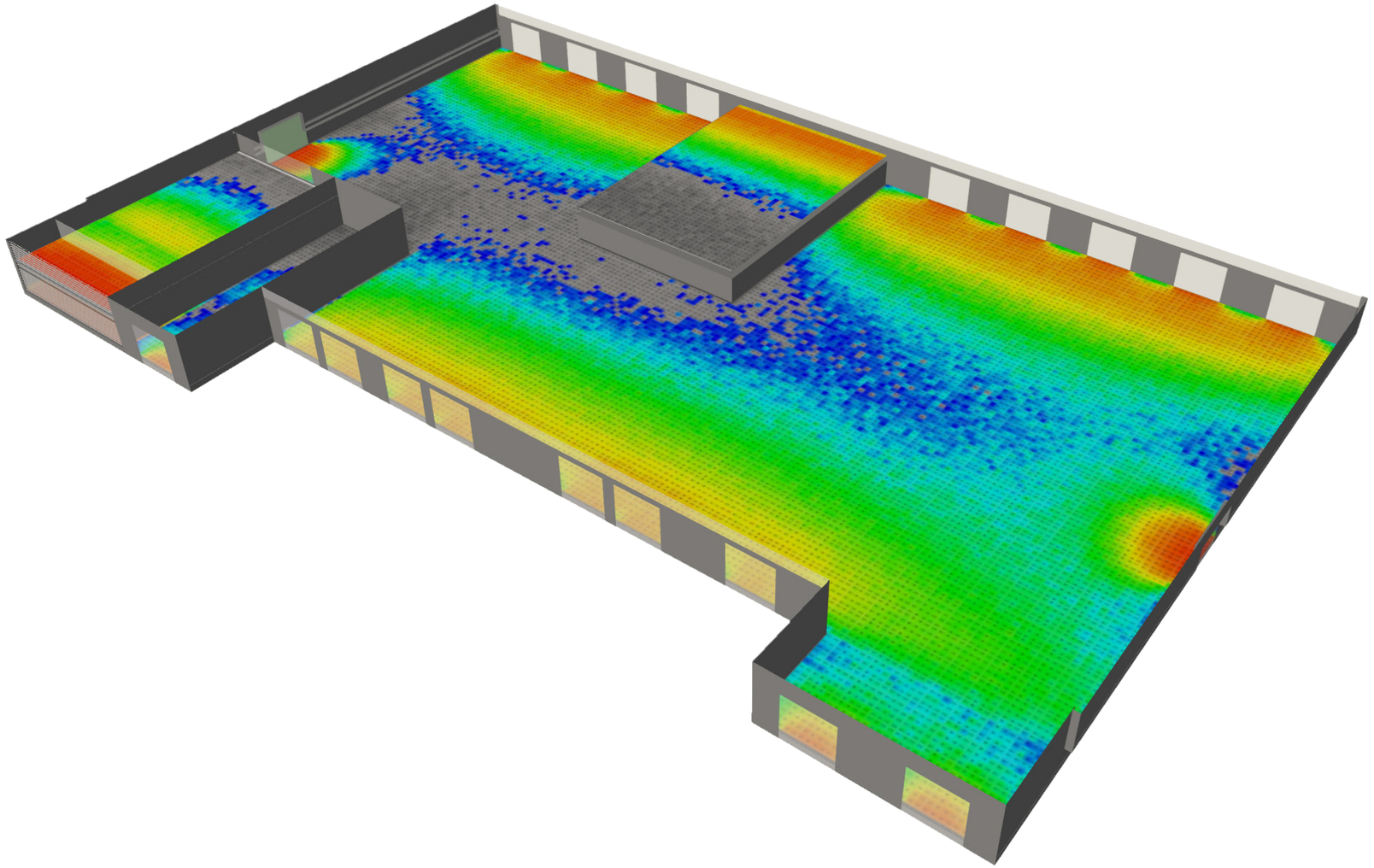
RESULTS	BASELINE	TARGET
EUI % Reduction from Baseline	0%	70%
Zero Score	100	31
Site EUI (kBtu/ft²/yr)	55	17
Source EUI (kBtu/ft²/yr)	107	33
Total GHG Emissions (metric tons CO_2e/yr)	612	184

CMG Daylight Analysis

Throughout the design process, the Design Team has worked to provide ample daylighting in all work areas. Daylighting design informs architectural expression as well performance objectives, namely to optimize occupant health and well being and reduce building energy use.

In early design stages for the Central Maintenance Garage, daylight became an important factor in the success of the vehicular work areas and the office areas. This resulted in large north and south facing clerestories that helped bring natural light deep into the space, providing a safe, healthy and comfortable work environment, as well as reducing the need for artificial lights. In the existing facilities, there was very little to no natural light brought into the spaces. Lighting studies were conducted to show the average daylight levels throughout the building. A range of 30-75 foot candles is the recommended light level for workshop work environments. Our daylight studies show that this goal is easily achievable without the need for artificial lights during the average day.

The Annual Daylight Autonomy study shows spaces that would achieve a target of 40 foot candles for minimum of 50% of the working time throughout the year. The warmer the color, the more frequently the space will meet or exceed the target footcandles. This study shows that nearly 70% of the space, including the DOS work shops, achieve this light level goal with daylighting alone. Areas that do not achieve daylighting goals can be improved by skylights or other glazing strategies.



Percentage of analysis points ≥ 400 lux for ≥ 50% of occupied hours.

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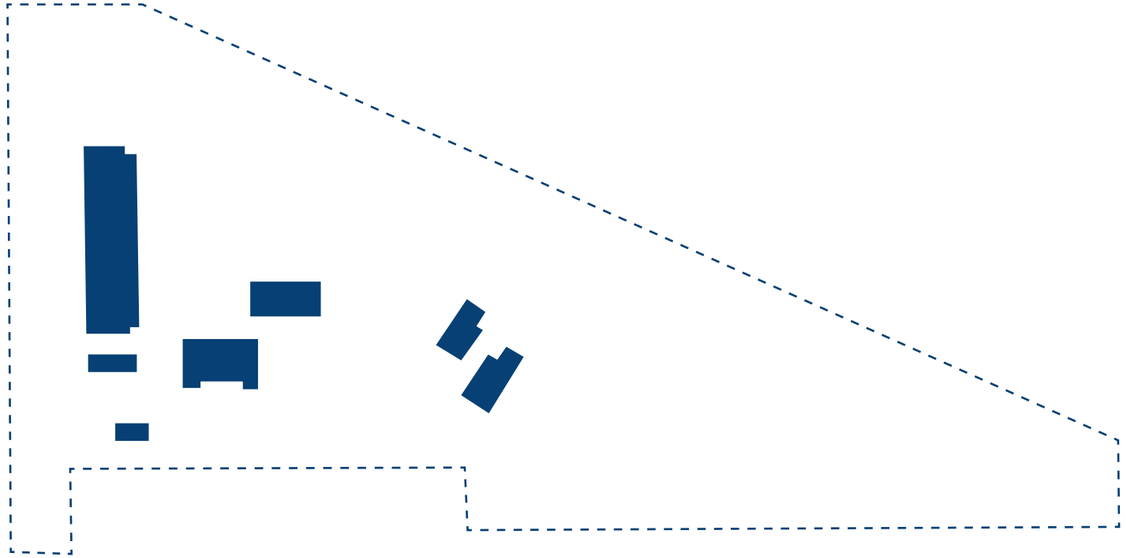
L350A
CASE

12

Construction Phasing



Phase **01**

Final phasing for the Lawrence Field Operations Campus will be determined. It is likely that either the Central Maintenance Garage, or the MSO Building, which would include Water, Wastewater, Streets, Stormwater, Traffic and Inspections Divisions. The following phasing analysis assumes the MSO Building would be developed first. If it is determined that Central Maintenance Garage should go first, an alternate phasing analysis will be developed--although later phases in both instances are similar.

Phase 01 is proposed to include the construction of an entry road to the site as well as a fuel island for use of City vehicles. Additionally, construction would include Administrative spaces, Division Operation Critical spaces, and necessary site paving for the MSO Building.

The Existing Bag Warehouse will receive minimal updates to patch the exterior envelope and update the electrical system as required. The Warehouse is proposed to provide storage for the Streets Division sander racks, Solid Waste Division overflow carts and bins, as well as general storage for all Divisions as needed.

Timing is currently being considered. Phase 01 is proposed to begin construction in 2024 and complete construction in 2025.

Projected Cost: $33M - $37M

1. Fuel Island
2. MSO Building: Water, Wastewater, Streets, Stormwater, Traffic & Inspections Divisions
3. Central Maintenance Garage
4. Solid Waste Division
5. Facility Maintenance Division
6. Forestry & Horticulture Divisions
7. Household Hazardous Waste Division

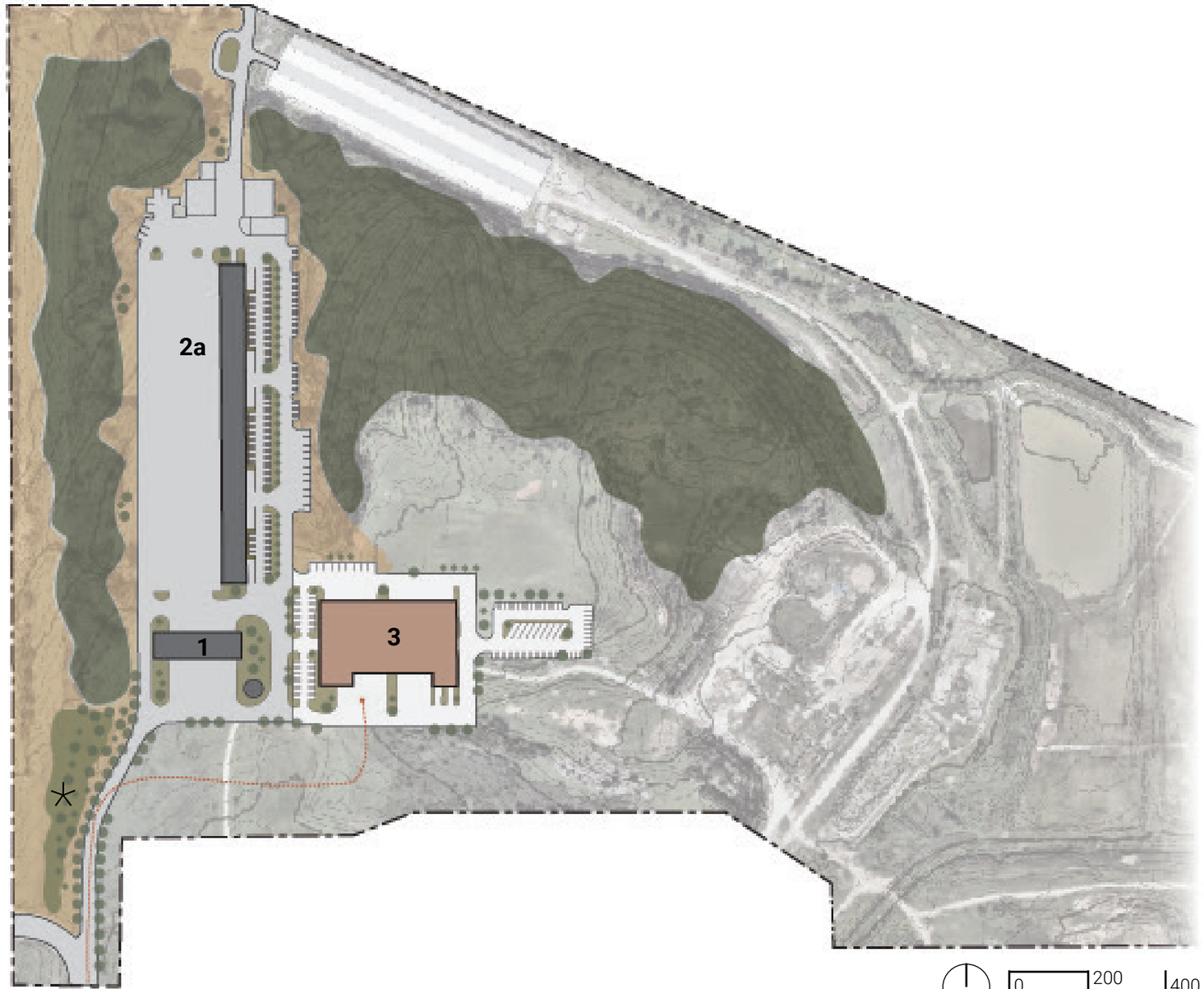
- Existing trees to remain
- Seeded prairie grass mix with fescue mow strip around all buildings and roads
- Interior campus landscaping to include shrub plantings and seeded prairie grass mix
- Proposed landscaping tree
- Berming and evergreen trees to contribute to noise attenuation

Phase **02**

Phase 02 is proposed to include the construction of the Central Maintenance Garage as well as site paving for staff vehicles and staging of city vehicles in need of maintenance. The Central Maintenance Garage will be constructed on contaminated soil that will need remediation. The soil removed during construction will be moved to the contaminated soil remediation area.

This phase is proposed to start construction in 2025 and be completed in 2027.

Projected Cost: $22M - $24M



1. Fuel Island
2. MSO Building: Water, Wastewater, Streets, Stormwater, Traffic & Inspections Divisions
3. Central Maintenance Garage
4. Solid Waste Division
5. Facility Maintenance Division
6. Forestry & Horticulture Divisions
7. Household Hazardous Waste Division

- Existing trees to remain
- Seeded prairie grass mix with fescue mow strip around all buildings and roads
- Interior campus landscaping to include shrub plantings and seeded prairie grass mix
- Proposed landscaping tree
- Berming and evergreen trees to contribute to noise attenuation

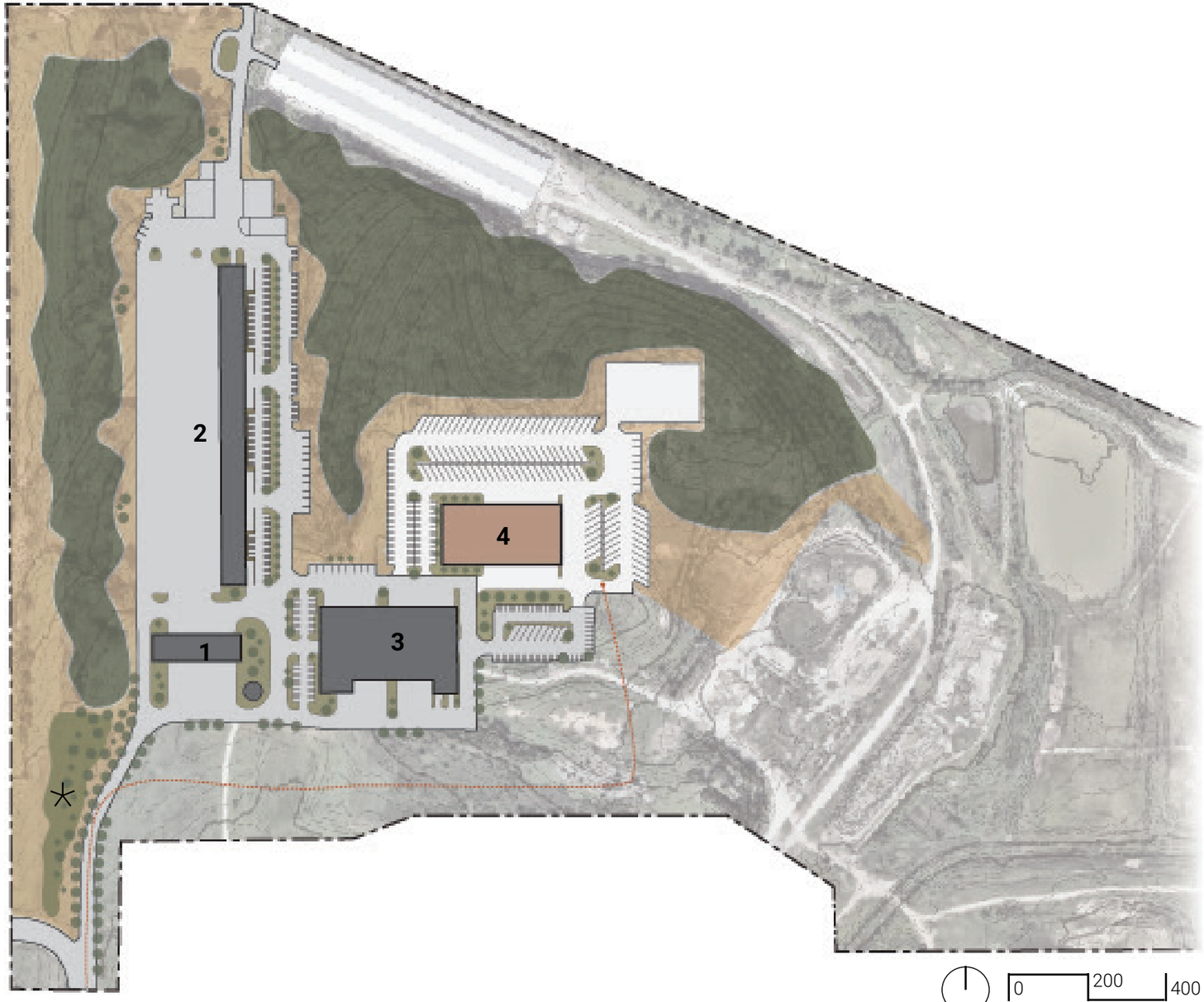
Phase **03**

Phase 03 is proposed to include the construction of the Solid Waste Division building and required site paving for staff and fleet vehicles. Additionally, overhead canopies will be constructed over fleet parking areas.

The Solid Waste Division building will be constructed on contaminated soil that is in need of remediation. The soil removed during construction will be transfered to the contaminated soil remediation area. Additionally, The soil removed from the Central Maintenance garage site during phase 3 will have concluded the remediation process and can be used for landscaping on or off site.

This phase is proposed to start construction in 2027 and be completed in 2029.

Projected Cost: $20M - $24M



1. Fuel Island
2. MSO Building: Water, Wastewater, Streets, Stormwater, Traffic & Inspections Divisions
3. Central Maintenance Garage
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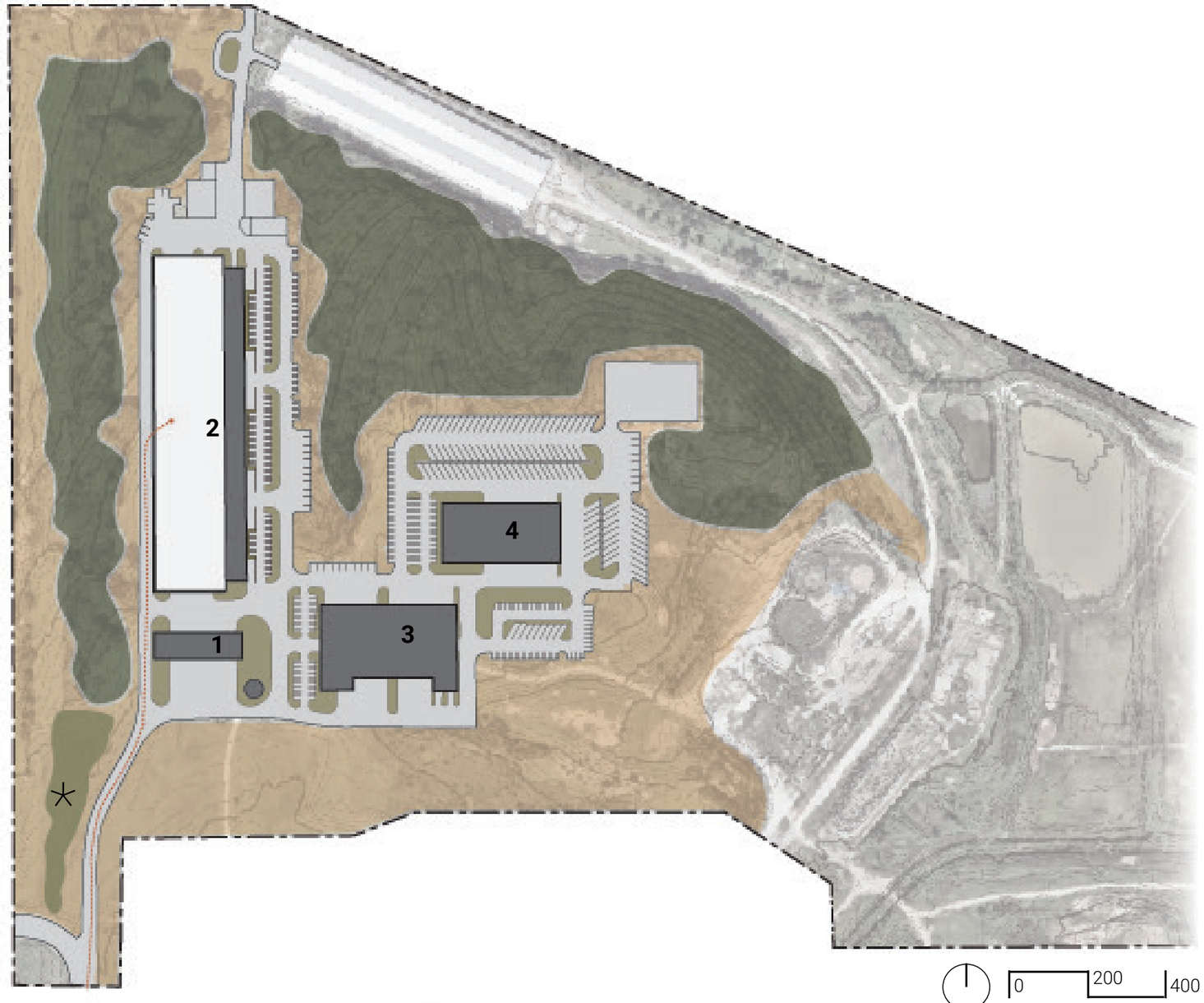
- Existing trees to remain
- Seeded prairie grass mix with fescue mow strip around all buildings and roads
- Interior campus landscaping to include shrub plantings and seeded prairie grass mix
- Proposed landscaping tree
- Berming and evergreen trees to contribute to noise attenuation

Phase **04**

Phase 04 is proposed to include the MSO Conditioned Storage Building for MSO fleet vehicles. This building would attach to the building built in Phase 1 which houses Administrative and Division Operation Critical spaces.

This phase is proposed to start construction in 2028 and be completed in 2030.

Projected Cost: $16M - $18M



1. Fuel Island
2. MSO Building: Water, Wastewater, Streets, Stormwater, Traffic & Inspections Divisions
3. Central Maintenance Garage
4. Solid Waste Division
5. Facility Maintenance Division
6. Forestry & Horticulture Divisions
7. Household Hazardous Waste Division

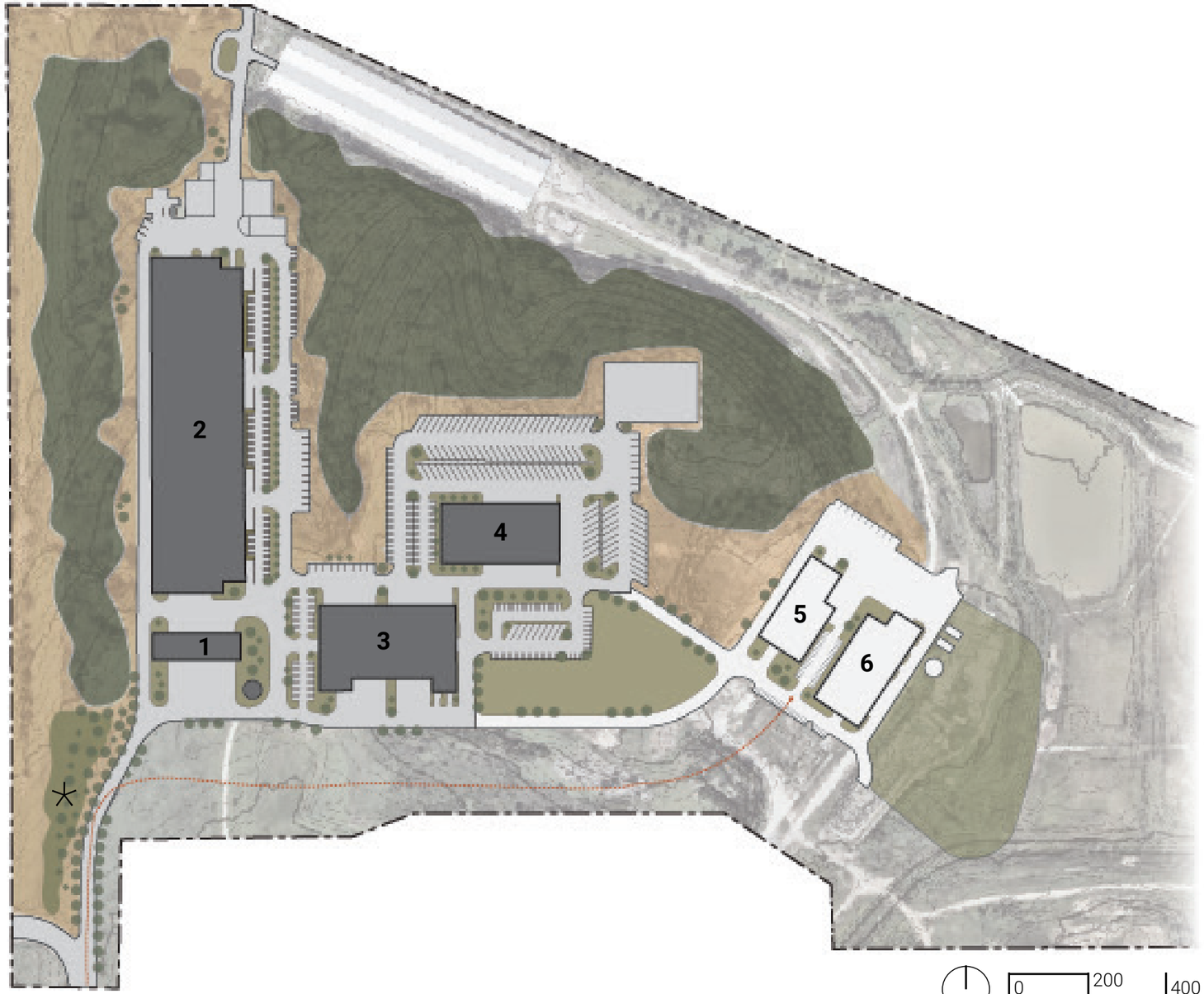
- Existing trees to remain
- Seeded prairie grass mix with fescue mow strip around all buildings and roads
- Interior campus landscaping to include shrub plantings and seeded prairie grass mix
- Proposed landscaping tree
- Berming and evergreen trees to contribute to noise attenuation

Phase **05**

Phase 05 is proposed to include the construction of Facilities, Forestry and Horticulture Divisions. The soil removed from the Solid Waste site during phase 4 will have concluded the remediation process and can be used for landscaping on or off site.

This phase is proposed to start construction in 2030 and be completed in 2032.

Projected Cost: $16M - $20M



1. Fuel Island
2. MSO Building: Water, Wastewater, Streets, Stormwater, Traffic & Inspections Divisions
3. Central Maintenance Garage
4. Solid Waste Division
5. Facility Maintenance Division
6. Forestry & Horticulture Divisions
7. Household Hazardous Waste Division

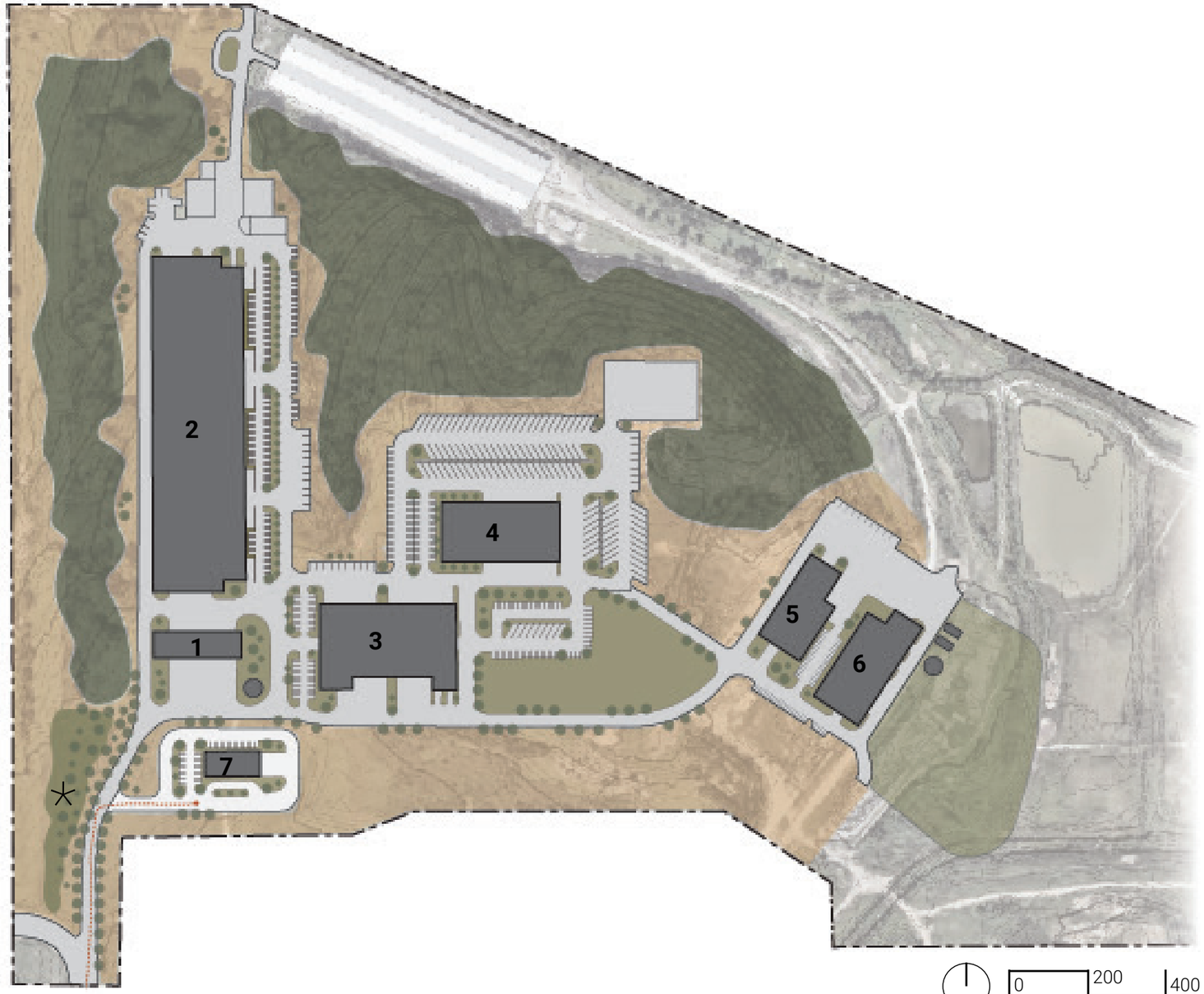
- Existing trees to remain
- Seeded prairie grass mix with fescue mow strip around all buildings and roads
- Interior campus landscaping to include shrub plantings and seeded prairie grass mix
- Proposed landscaping tree
- Berming and evergreen trees to contribute to noise attenuation

Phase **06**

Phase 06 is proposed to include the construction of a Household Hazardous Waste Facility and required site paving. The building is located near the entry to the site, stemming directly from the main entry drive. Due to the public nature of the facility, it is critical that this building be located in a area that is easily accessible to the public, while still providing security to the rest of the campus.

This phase is proposed to start construction in 2032 and be completed in 2033.

Projected Cost: $4M - $4.5M



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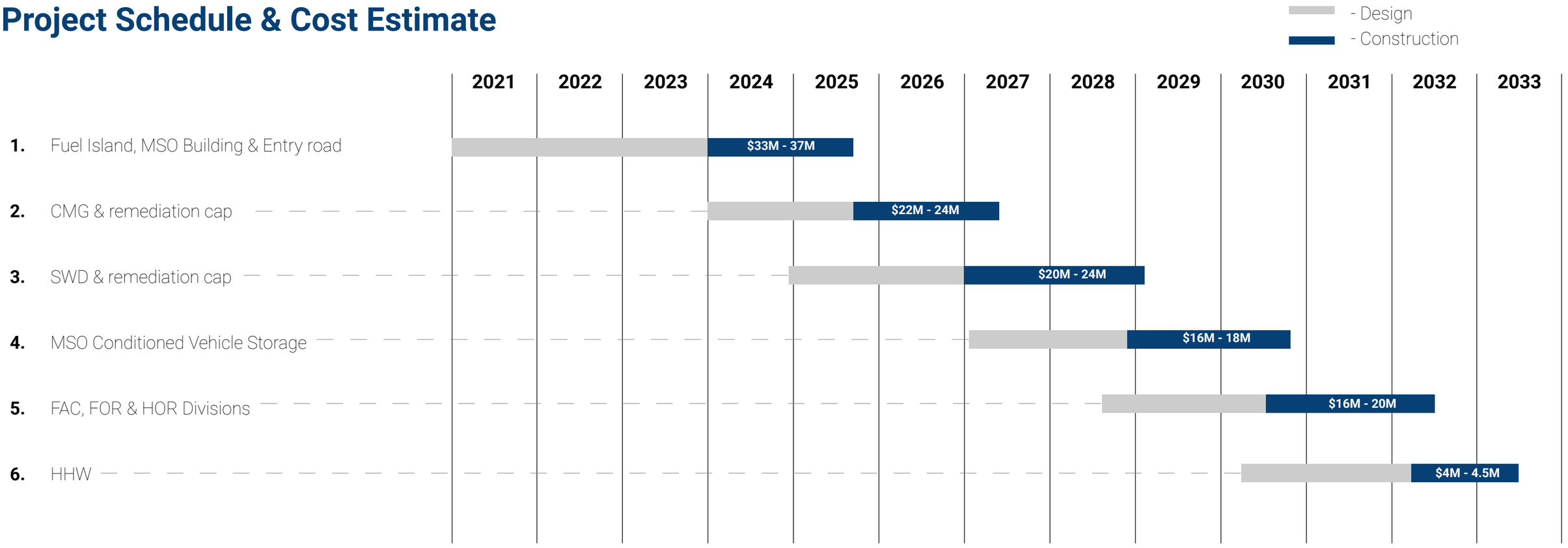
Project Schedule & Cost Estimate



Next Steps

1. Proceed with Schematic Design for Phases 1 and 2.

Developing the first two critical phases for the Lawrence Field Operations Campus would allow further interaction between the Design Team and the City, towards a goal of making the designs even more efficient and responsive. Scope would include a 100% Schematic Design for the Central Maintenance Garage (CMG), Fuel Island and MSO Building (which houses the Traffic, Streets, Stormwater, Water, Inspections, Water Divisions). This Design Package would include cost estimation information and would represent a clear vision to achieve the City's goals in built form, allowing City Leadership to understand how the buildings would function on the site, what they would look like, how they would satisfy sustainability and performance goals, what phasing made most sense, and what the likely cost impacts would be. The information would also be critical during the RFQ process to select a Construction Manager @ Risk in a later step.

2. Proceed with Planning and Entitlement Work for the Campus.

During Schematic Design, it is recommended that the Design Team complete Planning and Entitlement work, including: Rezoning submittal; Institutional Development Plan submittal; Special Use Permit application; Downstream Sanitary Sewer Analysis; Minor Subdivision Plat application; Master Street Tree Plan; Landscape Plan.

3. Explore alternate strategies for later Phases.

The Master Plan includes a far reaching vision for all Divisional Field Operations on a single campus. Due to funding limitations, some Divisions (Facilities, Forestry and Horticulture) would not be constructed until 2030. With this in mind, it may be strategic to consider renovating these facilities to take care of deferred maintenance, and to meet future needs as programmed. The Design Team recommends a Conceptual Design analysis of these facilities, to determine if programmatic needs can be met with renovations or additions, as opposed to new facilities at the Lawrence Field Operations Campus.

4. Select Construction Manager @ Risk (CM@R).

CM@R is a construction delivery method that works well for civic facilities, in which the public owner engages a qualified construction manager after Schematic Design, to provide both Preconstruction Services during Design Development and Construction Documentation. The 100% Schematic Design Package described in Step 1 would provide a solid vision for the Lawrence Field Operations Campus project, representing the culmination of months of programming, master planning and preliminary concept design. It is recommended that this Design Package would be shared with potential CM@R candidates, to allow them the ability to understand the project (and its programming and vision) on a deep level. After Preconstruction Services, The CM@R would then act as the Contractor during construction, holding the trade contracts and providing the management and construction services during the construction phase. Although the Design Team coordinates closely with the CM@R, the two contracts would remain separate.

Aerial View of Proposed Master Plan: View Looking North

City of Lawrence

Lawrence Field Operations Facility

Existing Facility Condition Narratives

DAKE | WELLS architecture

OERTEL ARCHITECTS

CFS ENGINEERS cfse.com

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8	**Streets & Stormwater**	
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10	**Water, Wastewater, Inspections & Engineering**	
	720 W 3rd St	**26**

1 - Introduction

The City of Lawrence currently operates nearly a dozen separate facilities to house field operations for Divisions within the Municipal Services and Operations Department (MSO) and the Parks and Recreation Department. The Divisions have done their very best to operate from these facilities over the years, but the poor condition of the existing facilities makes it difficult to be responsive to the operational needs of the City. Many of the buildings are undersized, or have design idiosyncrasies that result in poor operational flow. Most are in need of significant maintenance and infrastructural upgrades.

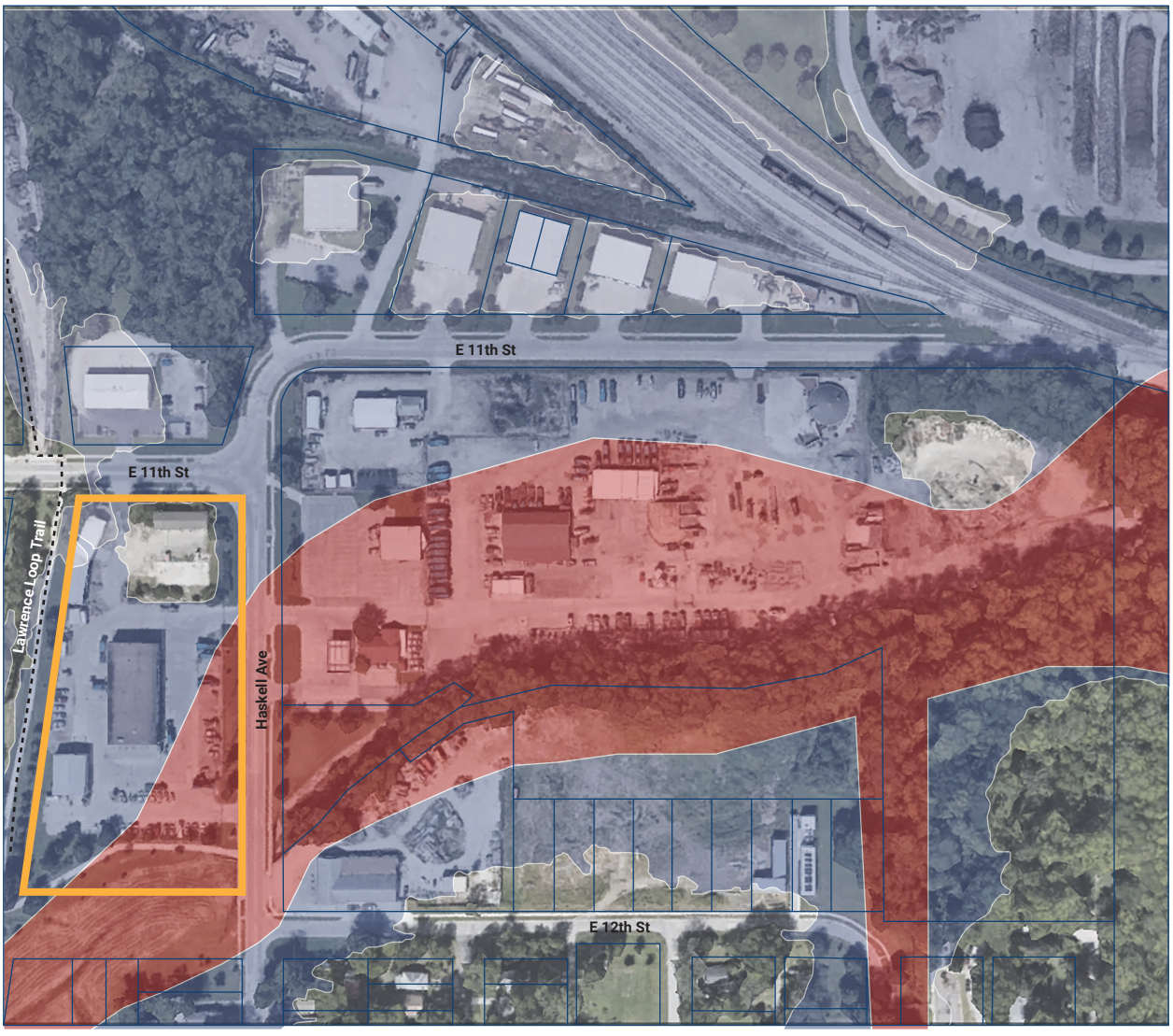
Aside from deferred maintenance issues, many of the buildings exist in the 500 year floodplain, some of them in the 100 year floodplain, and some of them are located directly in the floodway. Rather than invest funds to improve these underperforming structures, the City decided to consolidate the operations into a single campus-oriented facility, called the Lawrence Field Operations Facility. In 2019, a Design Team led by Dake Wells Architecture, Oertel Architects and CFS Engineers was retained to develop a Program and Conceptual Design for this Facility.

The relocation of the field operations into a single campus will result in the existing facilities being vacated. The purpose of this Existing Facility Condition Narratives Document is to provide a brief, consolidated overview of each facility, along with recommendations for the future of each property.

2- Central Maintenance Garage
1141 Haskell Ave

The site at 1141 Haskell Ave is blocks away from downtown Lawrence and the Kansas River. The site is almost completely in the 100 year floodplain with the southeast portion of the site within the floodway. The Lawrence Loop Trail runs directly adjacent on the West side of the site. There is potential for contaminated soil due to the division's operational use.

Recommendations for future use: The Design Team predicts that resale of this site may be difficult due to potential contaminants and inevitable flooding from the river. There may be potential for rezoning to break the site into smaller pieces in order to sell the northern portion of the site which is not in the floodplain. Due to its proximity to the Lawrence Loop trail, we would recommend that this site be used to house supporting functions for the trail, such as parking, a rest area or even a neighborhood pocket park.



Exterior - good condition

Exterior - good condition

Concrete floor; painted CMU walls, exposed steel structure , fair condition

Concrete floor; painted CMU walls, exposed steel structure , fair condition

Concrete floor, painted CMU walls, surface mounted fixtures, poor condition

Linoleum floor, painted gypsum board walls, popcorn ceiling, surface mounted fixtures

Linoleum tile floor decorative wall covering, poor condition

Linoleum tile floor, decorative wall covering, gypsum board ceiling, surface mounted fixtures, poor condition

Concrete floor, painted CMU walls, gyp board ceiling, surface mounted fixtures, poor condition

Concrete floor, painted CMU walls, gyp board ceiling, surface mounted fixtures, poor condition

Concrete floor, pre-engineered steel structure; good condition

Exterior storage shed, good condition

3 - Facility Maintenance
1050 E 11th St

The Facility Maintenance Division is housed on the southern portion of the parcel at 2201 Kresge Rd. (The northern portion currently houses the Household Hazardous Waste Division). The current structure was originally built for a trucking company. Without a dramatic upgrade--involving a full demo down to pre-engineered frame and properly rebuilding on the frame--it is not well-suited for operational uses required by the Facility Maintenance Division.

Recommendations for future use: As the property is not in the floodplain, and the Division is not intrinsically tied to other Divisions, it may be of value to rebuild a new facility on the site, potentially operating out of the existing building until construction is complete. If the city determines it is wiser to relocate the Facility Maintenance Division at LFOF, and there is no need for the land for a Municipal use, then it could be possible to replat the southern portion of the site and offer it for sale to adjacent property owners.

Exterior - fair condition

Concrete floor, exposed pre-engineered steel structure, poor condition

Concrete floor, exposed pre-engineered steel structure, poor condition

Concrete floor, painted gypsum board walls and ceiling, surface mounted lights

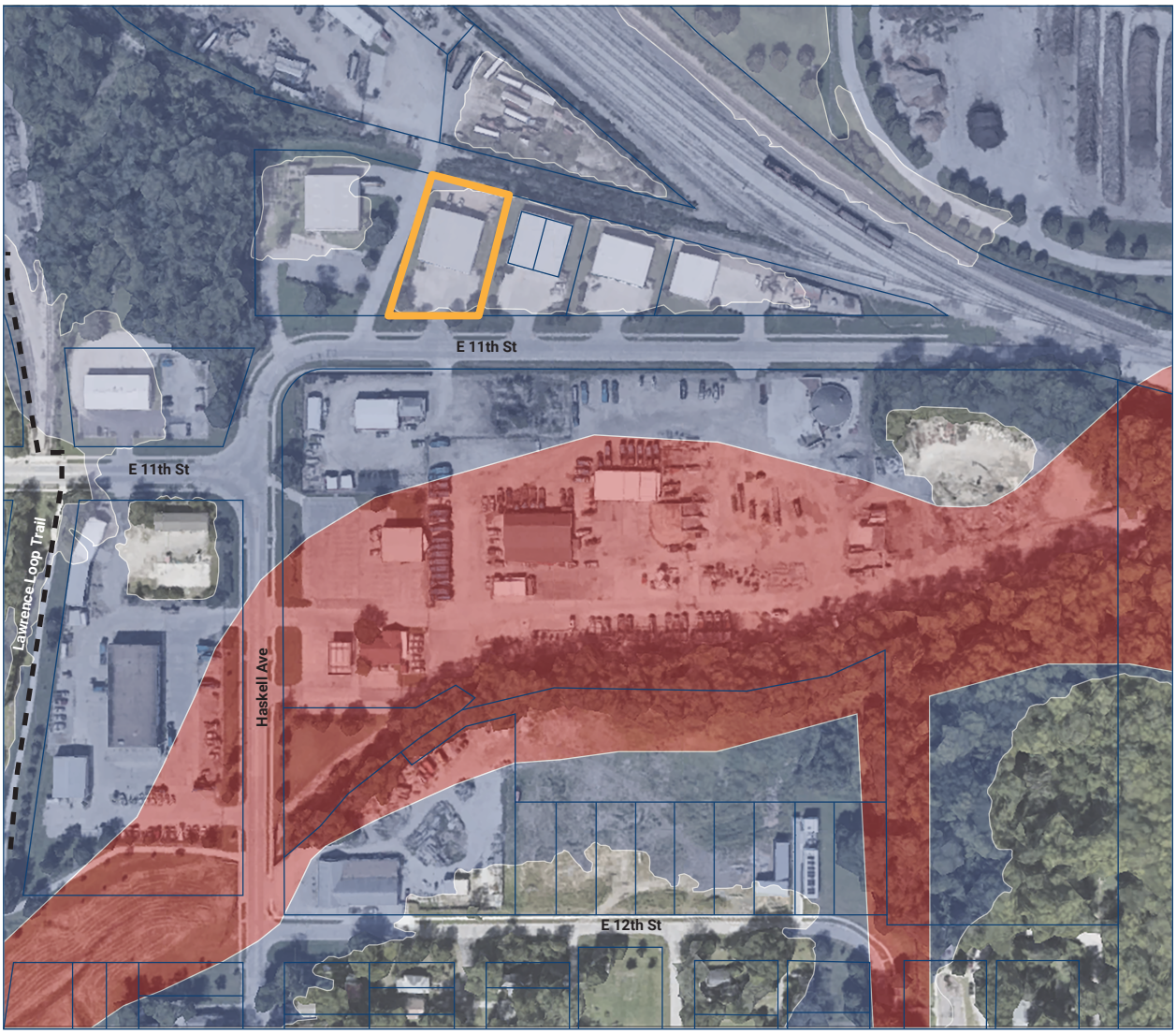
Linoleum floor, 2'x4' ACT ceiling, poor condition

Carpet floor, ACT ceiling with lights

4 - Forestry
1050 E 11th St

The majority of the site at 1050 E 11th St sits in the 500 yr floodplain, with small portions in the 100 year floodplain. The pre-engineered building is in fair condition, with significant improvements needed. The current facility meets operational needs but does not allow room for future growth.

Recommendations for future use: The Division has expressed a preference to remain in proximity to the Horticulture Division and to the Compost facility, located 1420 E 11th St, where disposal of landscape debris occurs. The City would need to weigh in on a longer term plan. We do not recommend that any new buildings be erected on this site, nor significant investment be made to improve the building, due to its location in the floodplain. Eventually the Forestry Division will need to move onto a larger site to allow for future growth. This site could potentially be used as a Compost facility or tree nursery, which could conceivably survive a mild flood event, although some damage to inventory could occur.



Exterior - good condition

Concrete floor, gypsum board walls, poor condition

ADA accessible restroom, gypsum board walls

Linoleum flooring, gypsum board walls, popcorn ceiling, surface mounted fixtures,

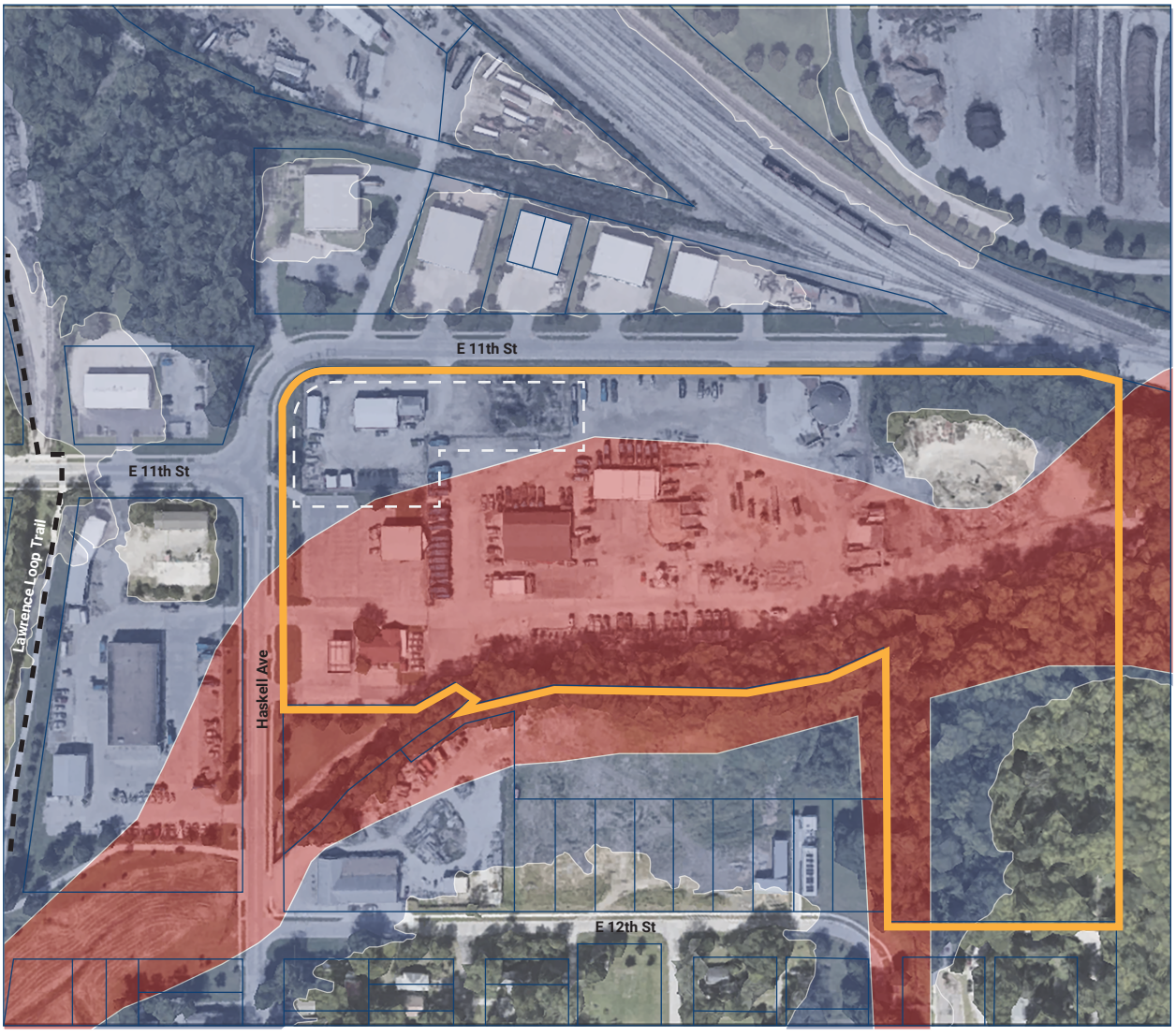
Concrete floor, pre-engineered metal structure, good condition

Concrete floor, pre-engineered metal structure, good condition

5 - Horticulture
1110 Haskell Ave

The Horticulture facility sits on the northern portion of the site at 1110 Haskell Ave at the edge of the floodway in the 100 year floodplain. Their current building does not meet operational needs and the site does not allow room for growth due to its location in the floodplain.

Recommendations for future use: The Division has expressed a preference to remain in proximity to the Forestry Division and to the Compost facility, located at 1420 E 11th St, where disposal of landscape debris occurs. The City would need to weigh in on a longer term plan. We do not recommend that any new buildings be erected on this site, nor significant investment be made to improve the building, due to its location in the floodplain. Eventually the Horticulture Division will need to move onto a larger site to allow for future growth. This site could potentially be used as a Compost facility or tree nursery, which could conceivable survive a mild flood event, although some damage to inventory could occur.



Exterior - fair condition

Linoleum flooring, painted gypsum board walls, popcorn ceiling, surface mounted fixtures

Linoleum flooring, painted gypsum board walls, popcorn ceiling, surface mounted fixtures

Concrete floor, pre-engineered metal structure, good condition

Concrete floor, plywood walls, good condition

Prefabricated greenhouse structure, good condition

6 - Household Hazardous Waste
2201 Kresge Rd

The Household Hazardous Waste Facility at 2201 Kresge Rd was built approximately 5 years ago and remains in good condition. The site is centrally located within the city and is in close proximity to the interstate. Due to the high levels of public interaction that take place for this operation, it is critical that the public is well-informed on its location.

Recommendations for future use: Due to the recent construction of this highly specialized facility, we do not recommend that HHW move to a different location. Moving would result in high advertising costs to inform the public on the new location of the facility. There may be potential for expansion of this facility on the existing site in future phases of construction.

Exterior - good condition

Exterior - good condition

Concrete floor, painted gypsum board walls, ACT tile ceiling, good condition

Concrete floor, pre-engineered steel structure, bag insulation, good condition

Concrete floor, painted CMU walls, good condition

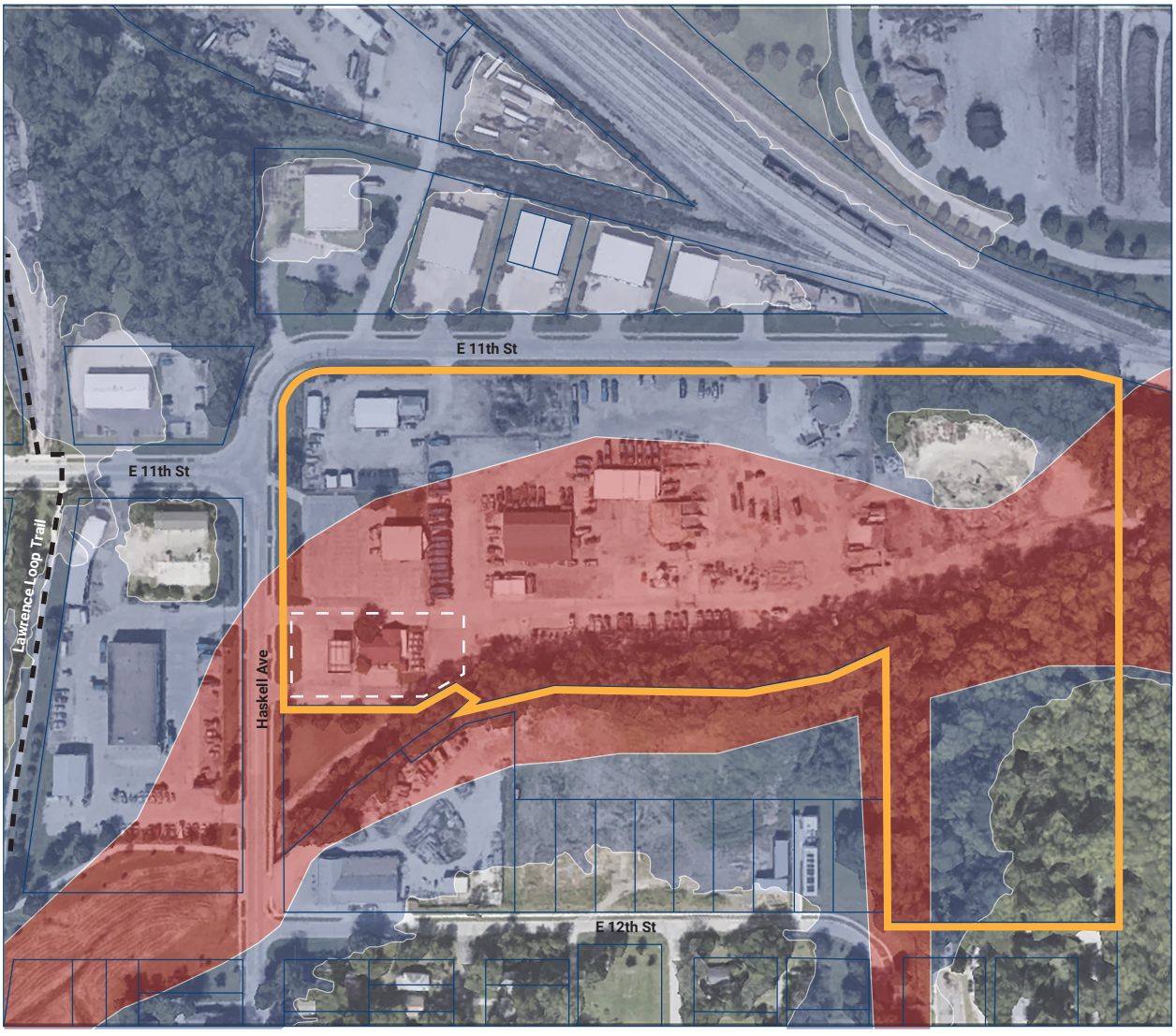
Concrete floor, pre-engineered steel structure, bag insulation, good condition

7a - Solid Waste and Fueling Station

1110 Haskell Ave

The Solid Waste Operations building at 1110 Haskell exists in close proximity to the Lawrence Loop Trail and is completely in the floodway.

Recommendations for future use: We recommend that all MSO structures be removed from the floodway, which may include the removal of potential contaminants/pollutants on the site. Due to its proximity to the Lawrence Loop Trail, we recommend that this site could be used for parking or open space/park in connection with the Trail.



Exterior - good condition

Fueling station, good condition

Linoleum flooring, painted CMU walls, gypsum board ceiling, surface mounted fixtures, fair condition

Carpet tile flooring, painted CMU walls, gypsum board ceiling, surface mounted fixtures, poor condition

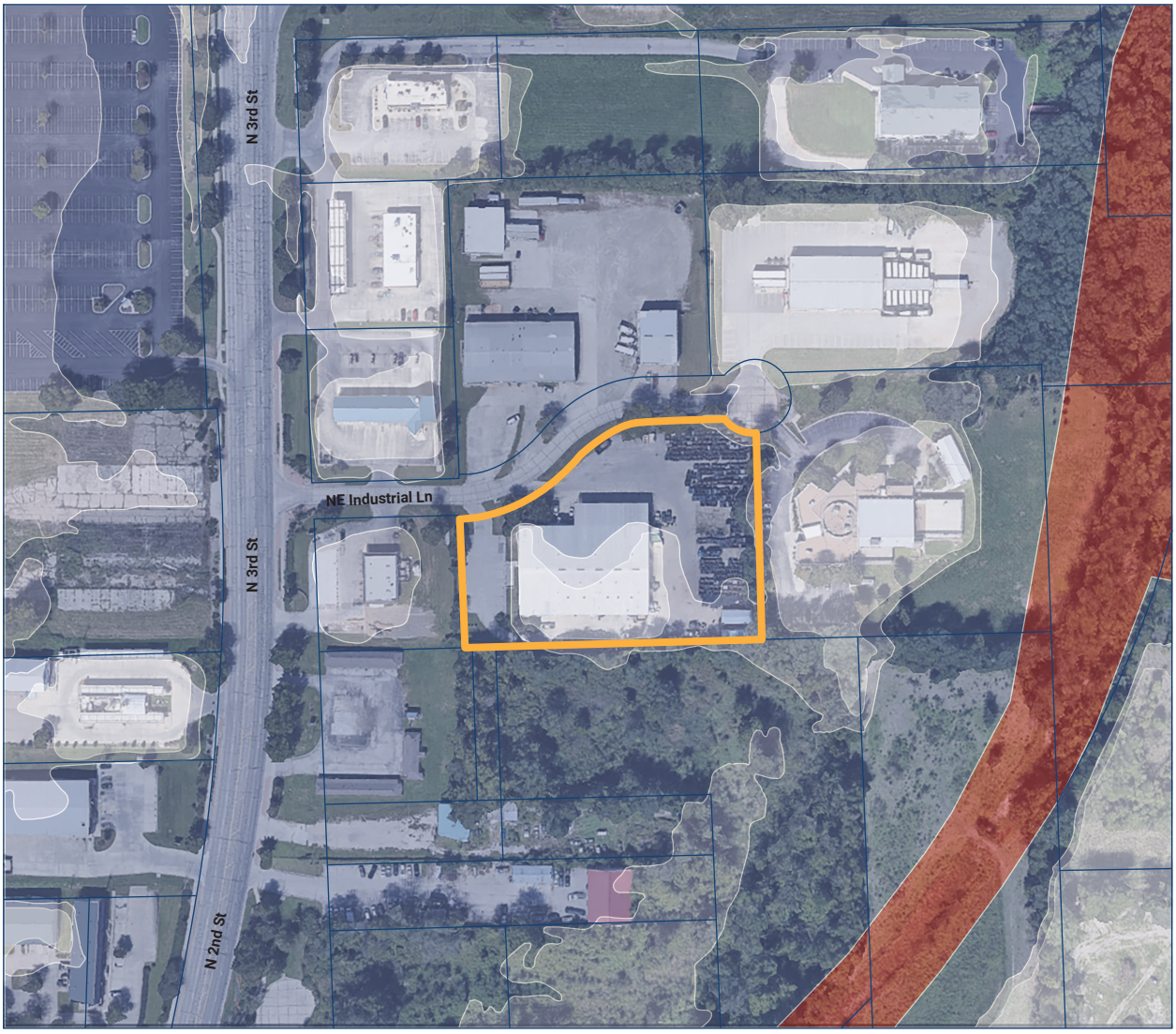
Linoleum flooring, painted CMU walls, gypsum board ceiling, surface mounted fixtures

Linoleum flooring, painted CMU walls gypsum board ceiling, surface mounted fixtures

7b - Solid Waste
320 NE Industrial Ln

The site at 320 NE Industrial Ln houses Solid Waste Maintenance and sits in the 100 year floodplain. The structure is in good condition.

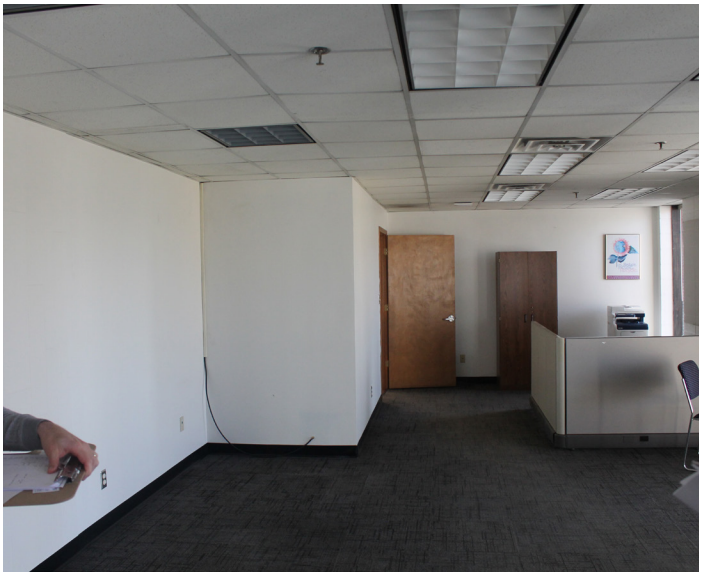
Recommendations for future use: We do not recommend building or maintaining any structures in the 100 year floodplain. This site may be marketable to another entity if the buyer is willing to purchase a site in the floodplain.



Solid Waste - exterior, good condition

Concrete floor, pre-engineered steel structure, good condition

Concrete floor, pre-engineered steel structure



Carpet tile floors, gypsum board walls, ACT tile ceiling, fair condition

Concrete floors, pre-engineered steel structure, fair

Concrete floor, painted CMU walls, gypsum board ceiling, surface mounted fixtures

7c - Solid Waste
1400 E 8th St

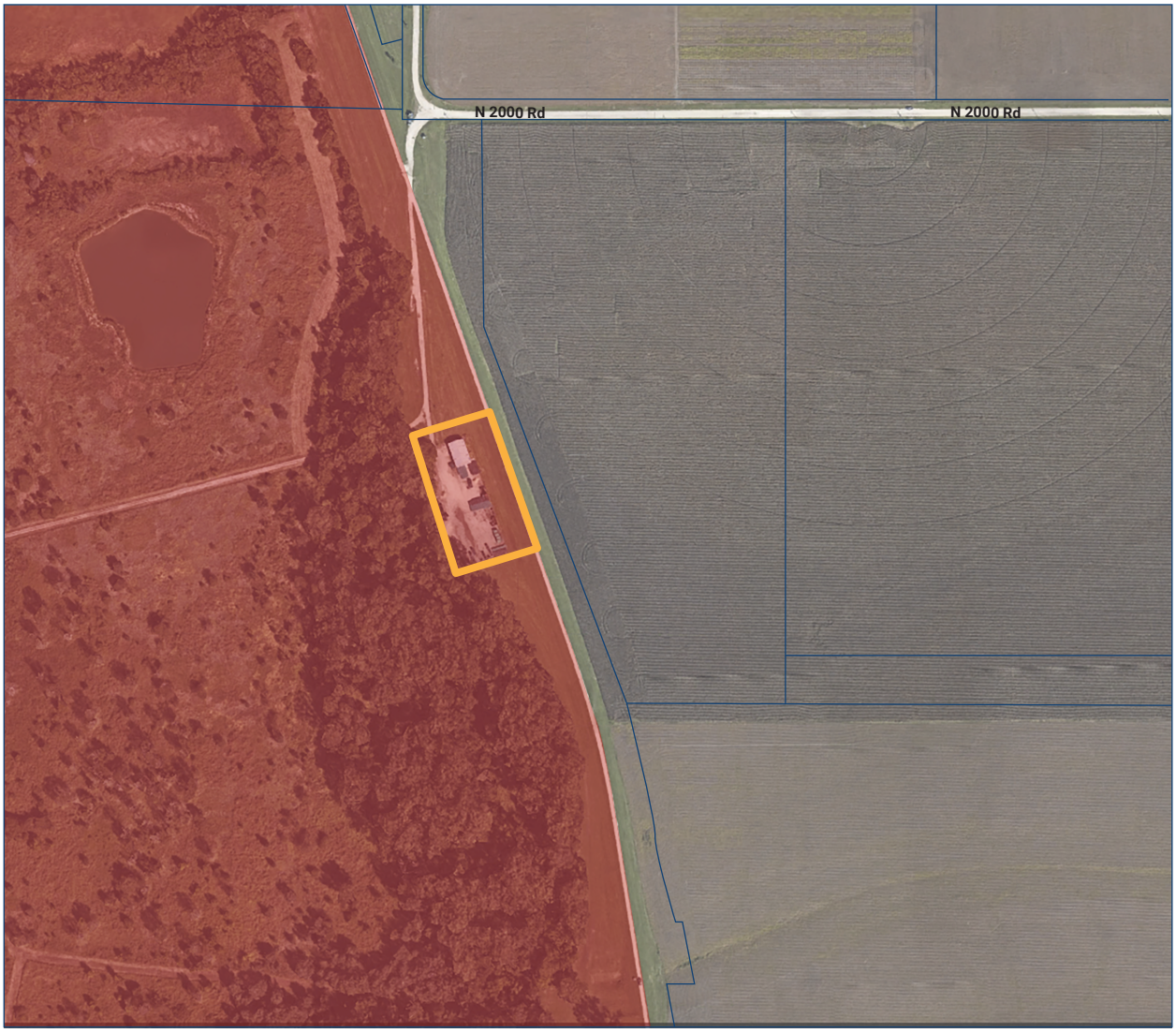
The site at 1400 E 8th St is currently used for Solid Waste Roll off storage and sits in the 100 year floodplain.

Recommendations for future use: If the risk for roll off loss or damage during a flood event is acceptable to the City, we recommend that this site continue to be used as is. There may be potential for future expansion of the Wastewater treatment plant onto this site.

7d - Solid Waste
1249 N 2000 Rd

The site at 1249 N 2000 Rd sits in the floodway and is currently used as roll off storage for the Solid Waste Division.

Recommendations for future use: If the risk for roll off loss or damage during a flood event is acceptable to the City, we recommend that this site continue to be used as is.

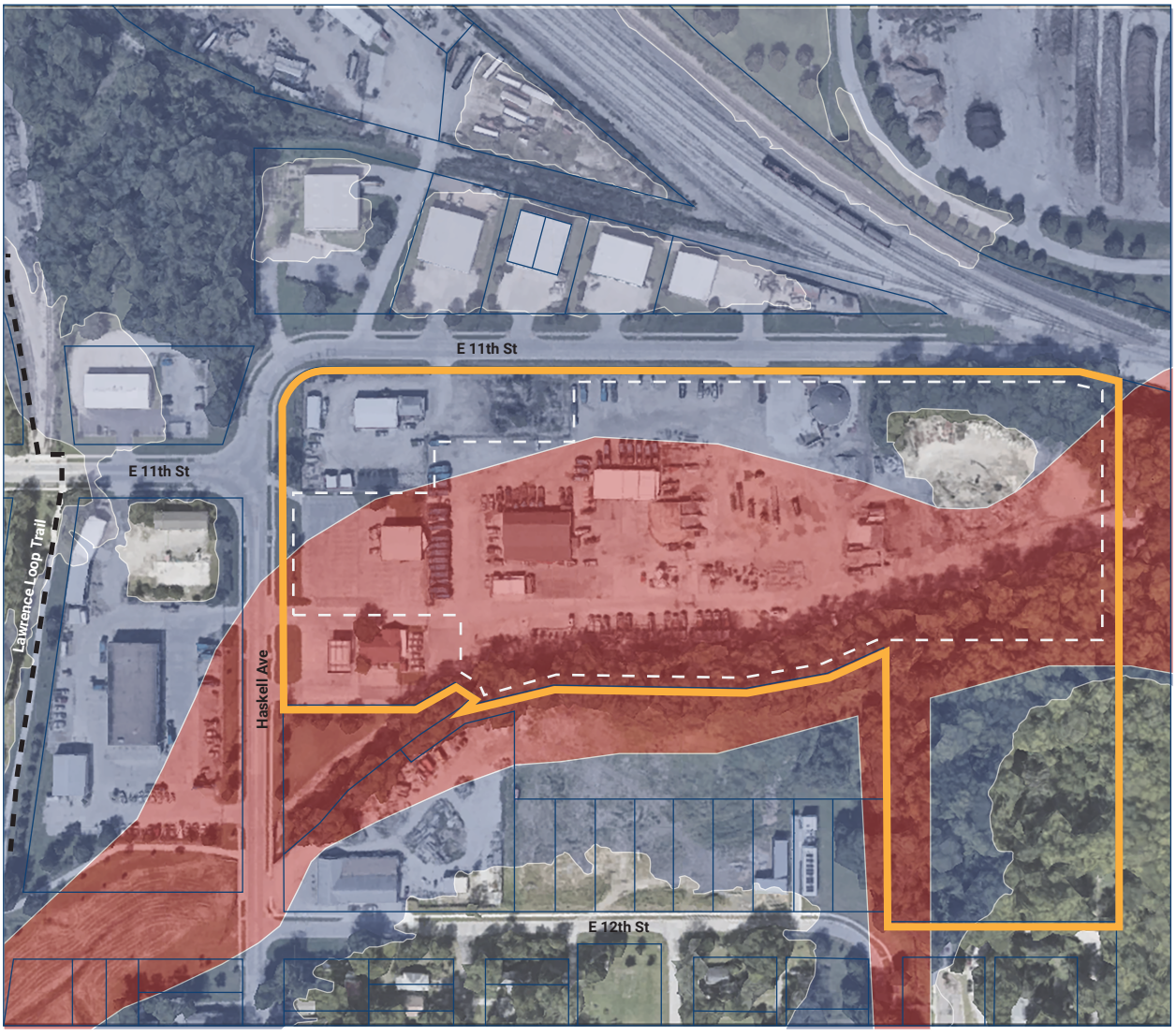


8 - Streets & Stormwater

1110 Haskell Ave

The site at 1110 Haskell Ave is blocks away from downtown Lawrence and the Kansas River. The majority of this site exists in the floodway, with the northern portion of the site in the 100 year floodplain. The Lawrence Loop Trail runs north to south approximately one block to the west. The current structures on this site are in poor condition and there is potential for contaminated soil due to the division's operational use.

Recommendations for future use: We predict that resale of this site will be difficult due to potential contaminants and inevitable flooding from the river. We recommend that this site be converted to park land which could work as a feature node along the Lawrence Loop Trail.



Exterior - poor condition

Linoleum flooring, painted gypsum board walls, ACT ceiling, good condition

Linoleum flooring, painted gypsum board walls, ACT ceiling, poor condition

Linoleum flooring, painted gypsum board walls, ACT ceiling, poor condition

Linoleum flooring, painted gypsum board walls, ACT ceiling, poor condition

Linoleum flooring, painted gypsum board walls, ACT ceiling, poor condition

Exterior - poor condition

Concrete floor, surface mounted fixtures, overall poor condition

Concrete floor, surface mounted fixtures, overall poor condition

Concrete floor, exposed insulation, surface mounted fixtures, overall poor condition

Learn-to structure, surface mounted fixture, good condition

Concrete floor, ceiling damage, overall poor condition

9 - Traffic
445 Mississippi St

The site at 445 Mississippi St houses the Traffic Division and is completely surrounded by residential housing, with a neighborhood park a block away. The existing facility contains both a two story masonry structure, and a single story bowstring truss structure. The facility is in fair condition, but needs a complete update on all systems.

Recommendations for future use: If the right partner could be found, the facility holds a lot of promise as a community / cultural or educational amenity. It would take significant resources to renovate, but the property has a simple layout that would be amenable to multiple functions. Renovation would capitalize on the significant embodied energy contained within the facility, supporting the City's sustainability goals. If a buyer or partner could not be found, the building could be demolished and replaced with a use allowed by GPI zoning*. The property could also be rezoned and platted into a number of single family lots for affordable housing units.

*GPI Zoning: The GPI District is a Special Purpose Base District primarily intended to accommodate Institutional Uses occupying significant land areas but not appropriate for development in the H District or on property designated on the official zoning map as U. The District regulations are designed to offer the institution maximum flexibility for patterns of uses within the District while ensuring that uses and development patterns along the edges of the District are compatable with adjoining land uses.

100 yr floodplain
500 yr floodplain
Property line

50 100 200 400'

Exterior - poor condition

Exterior - poor condition

Concrete floor, painted CMU and gypsum board walls, fair condition

Concrete floor, painted CMU and gypsum board walls, fair condition

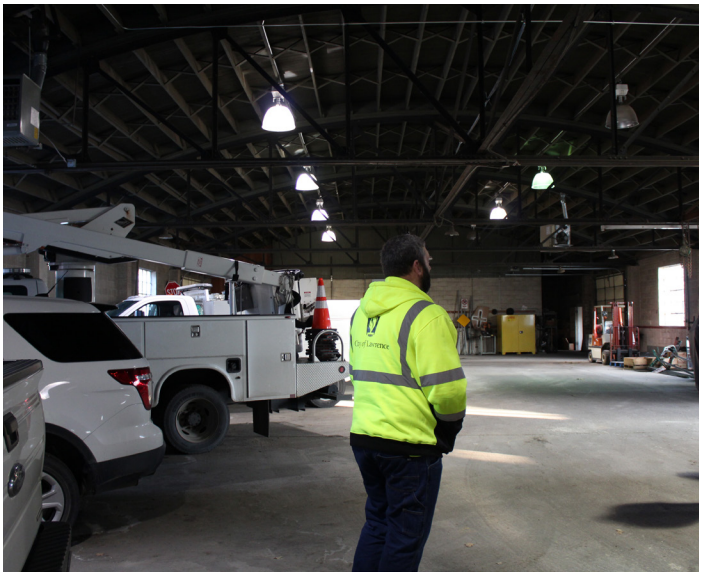
Concrete floor, CMU walls, exposed structure, fair condition

Concrete floor, painted CMU walls, ACT ceiling, fair condition

Carpet floor, painted CMU walls, decorative wood wall panel, ACT ceiling, poor condition

Linoleum flooring, painted CMU walls, ACT ceiling, fair condition

Concrete floors, partially painted CMU walls, exposed structure, water damage, poor condition



Concrete floor, CMU walls, exposed structure

Water damage, poor condition

Linoleum flooring, painted CMU walls built in storage, ACT ceiling, poor condition

10 - Water, Wastewater, Inspections & Engineering
720 W 3rd St

The site at 720 W 3rd St houses Water, Wastewater, Inspections and Engineering. The north-east portion of the site sits in the 100 year and 500 year floodplain.

Recommendations for future use: Due to its location, we see potential for expansion of the Kaw River Water Treatment Plant to the south on this site.

Exterior - fair condition

Exterior - fair condition (left) poor condition (right)

Concrete floor, damaged insulation, overall poor condition

Concrete floor, damaged insulation, fair condition

Concrete floor, pre-engineered steel structure, bag insulation, fair condition

Concrete floor, pre-engineered steel structure, pendent lights, overall good condition

Concrete floor, painted gypsum board walls, ACT ceiling, fair condition

Concrete floor, painted gypsum board walls, ACT ceiling, poor condition

Concrete floor, painted gypsum board walls, ACT ceiling, good condition

Linoleum flooring, painted gypsum board walls, ACT ceiling, good condition

Concrete floor, steel structure, bag insulation, overall poor condition

Concrete floor, steel structure, bag insulation, surface mounted fixtures, overall poor condition

City *of* Lawrence

Lawrence Field Operations Facility

Division Programming Summary

12 May 2020

DAKE | WELLS
architecture

OERTEL
ARCHITECTS

CFS ENGINEERS
cfse.com

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1 - Introduction

The Lawrence Field Operations Facility. In recent years, the City of Lawrence Kansas has streamlined city services to create the Municipal Services and Operations Organization, commonly referred to as MSO. The Organization is divided into several Divisions that provide services to the collective of residents and businesses in Lawrence. It is the desire of the City to create a single campus-oriented facility that consolidates the field operations for MSO Divisions--along with a few Field Operations Divisions within the Parks and Recreation Department.

In 2019, a Design Team led by Dake Wells Architecture, Oertel Architects and CFS Engineers was retained to develop a Program and Conceptual Design for the Lawrence Field Operations Facility. The purpose of this document is to outline the preliminary programmatic requirements of each individual Division, and to determine how they could interact within a campus-type facility. Brief summaries of the field operations for each Division are as follows:

CMG – Central Maintenance Garage
Central Maintenance provides service and repair to the entire fleet of City owned equipment. Maintenance staff are responsible for day to day preventative maintenance services, as well as detailed large scale repairs, including repairs of specialized equipment. Divisional leadership is responsible for all fleet asset management, including fuel management and fleet equipment purchase and replacement.

CMED – Construction Management Engineering
CMED provides oversight and management for city funded projects, ranging from planning to construction projects.

FAC – Facility Maintenance
Facility Maintenance is responsible for the maintenance and continued operation of the current 258 facilities owned and operated by the City of Lawrence. Services include HVAC, electrical, plumbing, building structure maintenance and grounds maintenance.

FOR – Forestry
Forestry works to protect and maintain street trees throughout the City of Lawrence, enhancing community image and pride through the beautification of public spaces. Forestry works closely with Streets, Water, Wastewater, Engineering, Traffic, Horticulture and other Parks and Recreation facilities to provide these services.

HOR – Horticulture
Horticulture staff provides maintenance and services which beautify and preserve parks, natural areas, municipal building exteriors, right of way landscaping, and traffic landscaping throughout the City of Lawrence to enhance community image and civic pride. Horticulture works closely with Forestry staff and Parks and Recreation facilities to provide these services.

HHW – Household Hazardous Waste
The Household Hazardous Waste Facility is a component of the Environmental Division for the City of Lawrence and is a joint venture between the City of Lawrence and Douglas County. The purpose is to provide residents a proper and easy way to dispose

of common household hazardous waste and remove these dangerous items from traditional waste streams, reducing the threat to the environment and overall public health.

INS – Inspections
Inspections provide installation and repair oversight for all City of Lawrence infrastructure construction and repair activities.

SWD – Solid Waste
Solid Waste has been a city service since 1946 and provides a valuable service to Lawrence residents. The collection services are provided to residential and commercial entities within the city. Collections include trash, recycling, yard waste, bulky items and tires. The Division maintains a stock of commercial dumpsters and an operational vehicle fleet that requires specialized work areas.

STWT – Stormwater
Stormwater staff oversee the construction and maintenance of stormwater infrastructure throughout the City of Lawrence and are closely integrated with the Streets Division.

STRT – Streets
The Streets Division provides day to day general maintenance of the network of roads and supports other Divisions in the maintenance of their respective responsibility for city infrastructure.

TRAF – Traffic
The Traffic Division maintains and monitors signs and signals throughout the City of Lawrence. To accomplish this mission, the City makes and keeps street and traffic signs, and stores and repairs signal equipment to maintain the entire traffic system with minimal downtime. The Division works closely with Streets, Distribution and Collection divisions for use of signs and coordinating maintenance activities.

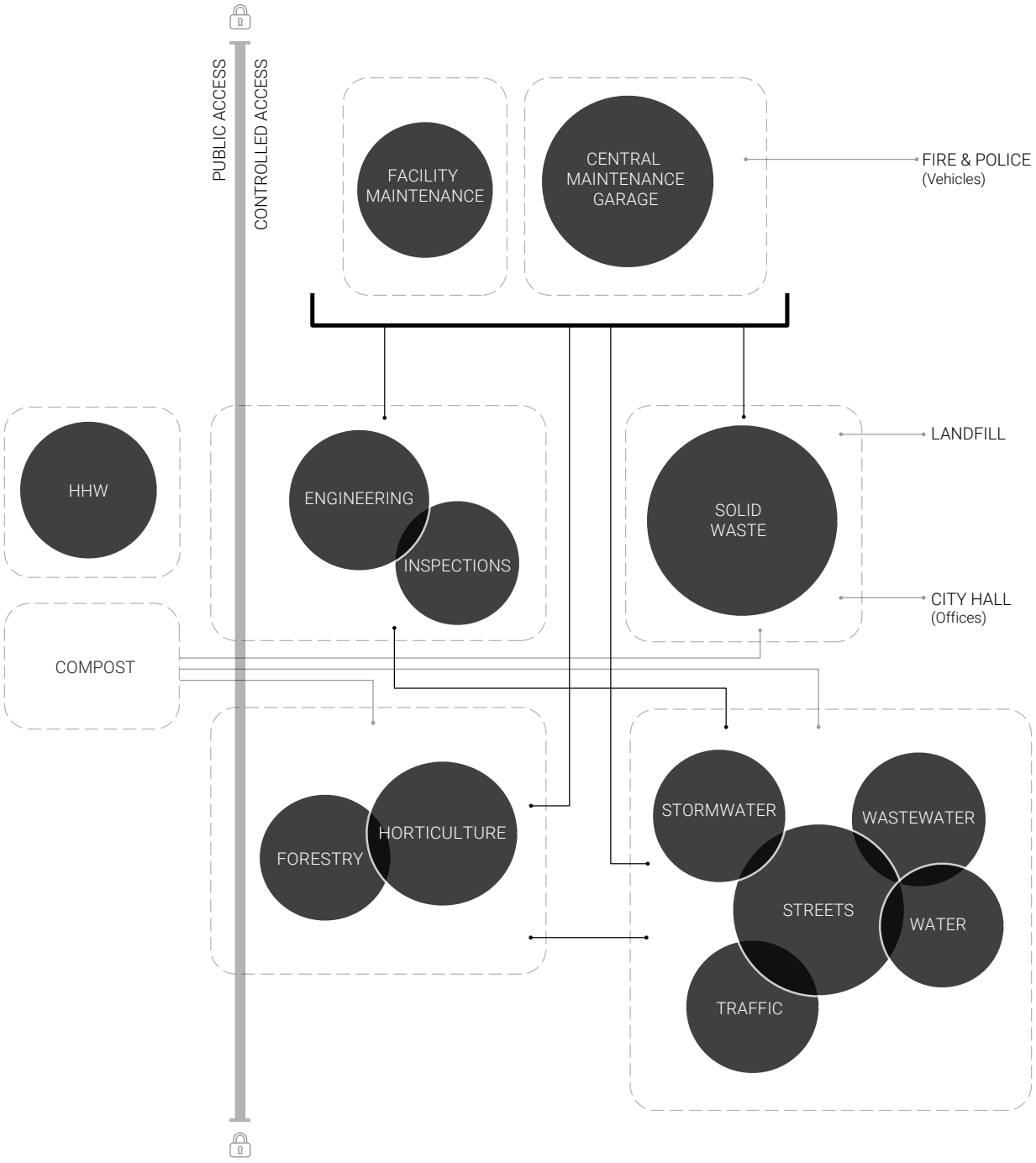
WSWT – Wastewater Collections
Wastewater Collection staff is responsible for maintaining the city's sanitary sewer system. Their work efforts prevent sewer backups and overflows to homes and businesses within the City.

WTDT – Water Distribution
Distribution staff is responsible for maintaining the water distribution system for the City of Lawrence. They ensure safe, clean water and fire protection to all customers. Distribution services include providing water meters, servicing and repairing the entire water distribution network. The Distribution Division operates closely with the Streets Division and Wastewater Collections Division.

2 - Divisional Space Needs

Through research, site visits and preliminary interviews with Division Management, an organizational diagram has been developed to communicate the general relationship between Divisions at the Lawrence Field Operations Facility. The diagram illustrates that the entrance to the Facility will be controlled, and that public access will be limited. It also illustrates how other City Departments and services (Fire Department, Police Department, Landfill, City Hall, Composting Operation) would interact with the Facility.

After the development of the Diagram, the Programming process began in earnest. The Design Team reached out to leaders within each Division, to obtain staffing counts, vehicle and equipment lists and to determine what the critical operational spaces were. Site tours and interviews followed, resulting in Adjacency Diagrams and Space Needs spreadsheets for each Division.



Division Organization Diagram

Secure entry

External connection

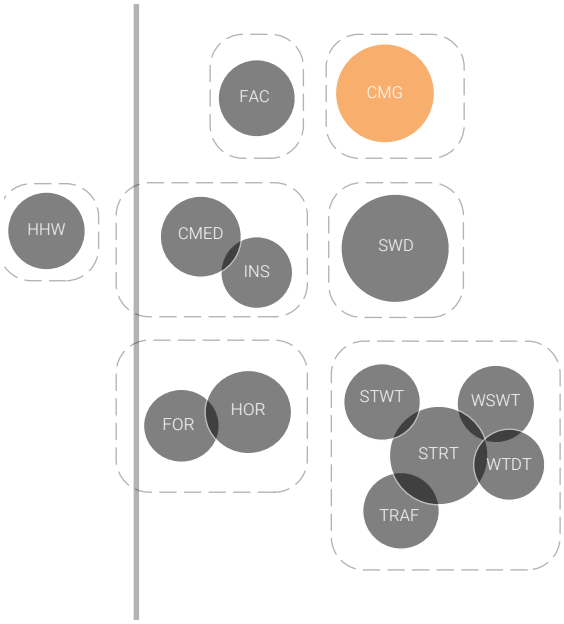
Internal connection

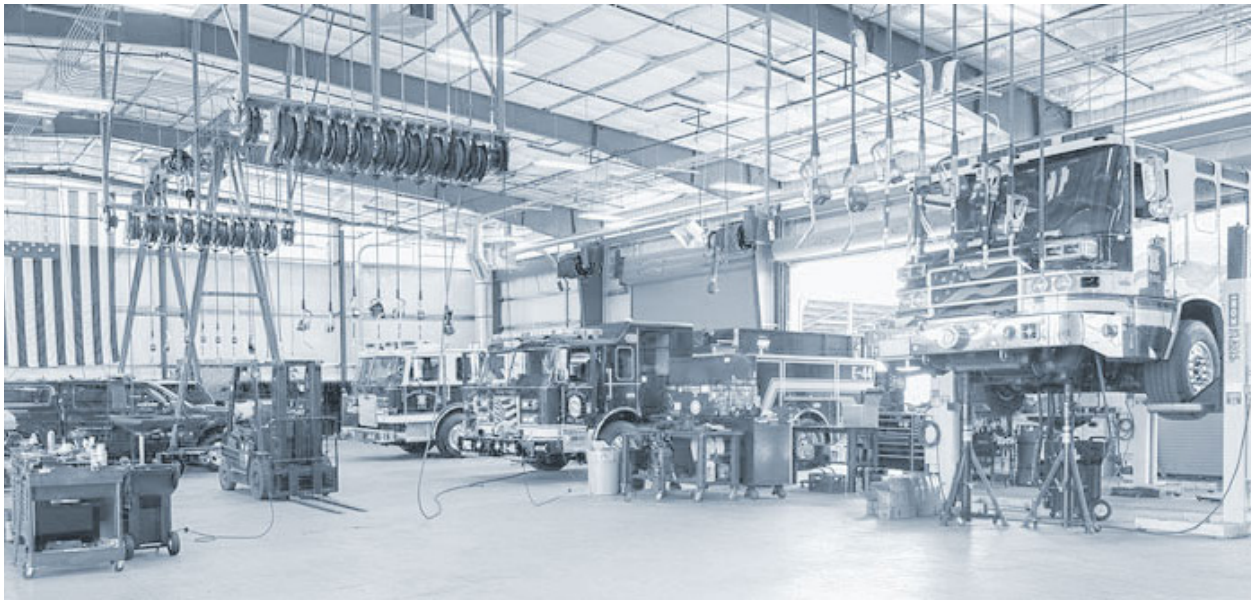
CMG – Central Maintenance Garage

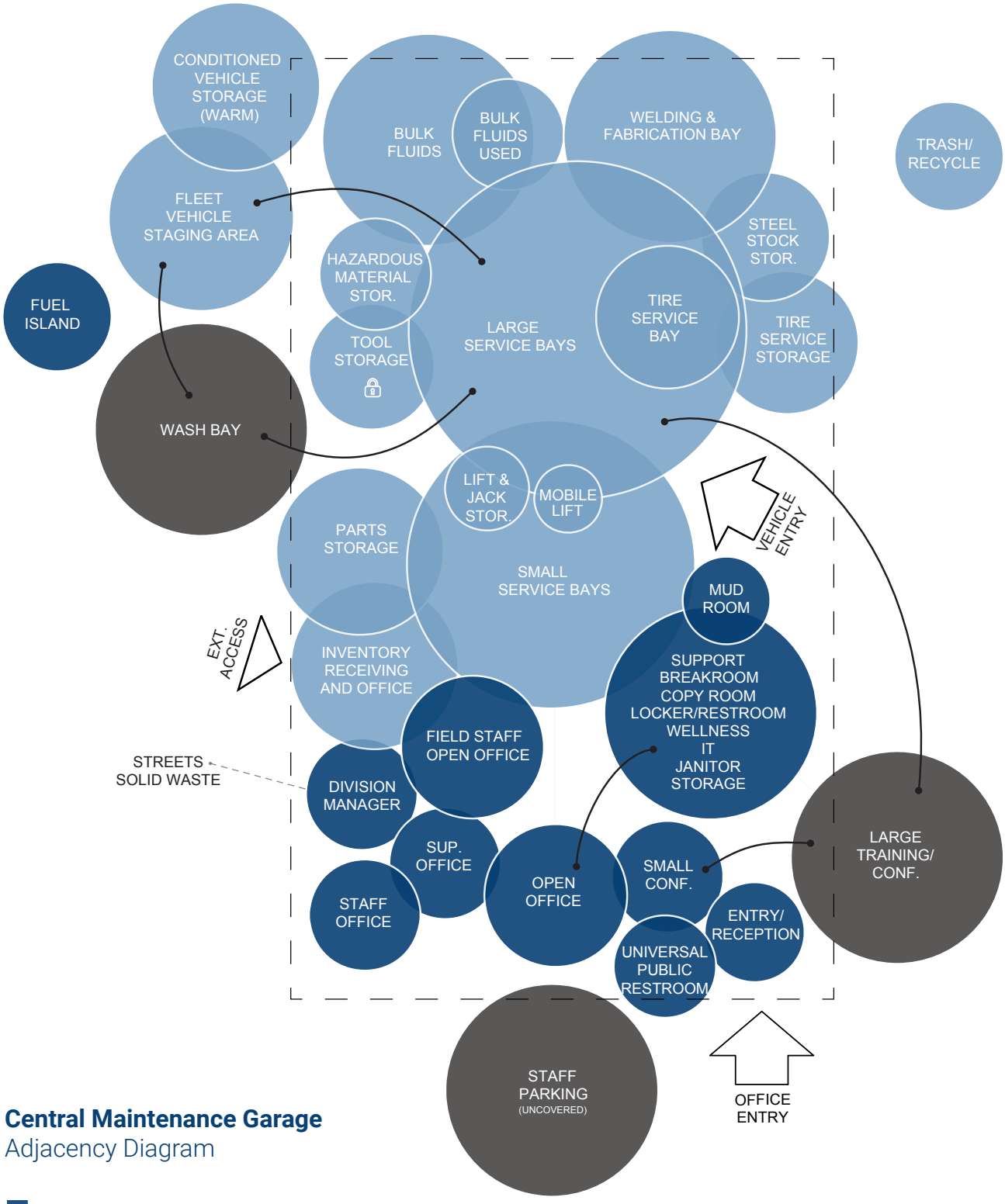
Central Maintenance has space needs that include all functions necessary for a standalone facility. Though CMG supports the entire City of Lawrence operation, due to it's highly trained and specialized work force and tasks, it is a Division that should have some distinct separation from other Divisions.

CMG has a need for both large and small vehicle service bays. The number of each bay size will be based on workflow and maintenance practices, number of maintenance staff and organization of those staff. Specialized equipment storage, parts and material storage, as well as personal tool storage, is required to support the primary activity of each service bay.

CMG staff need to be supported with administrative and personnel supporting spaces. These include private offices and open office workspace, small group meeting and large group training rooms, restrooms and locker rooms based on current and projected staff make-up, break and personnel comfort areas, and administrative and function support spaces such as IT closet, general storage, janitorial and building mechanical equipment rooms.







Central Maintenance Garage
Adjacency Diagram

- Standardized Spaces
- Division Specific Spaces
- Shared Spaces

* Some shared spaces are defined in the Space Standards section

Central Maintenance Garage Space Needs Summary

ADMINISTRATIVE	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
DIV.1a - Building Entry / Vestibule *	100	0	1	100	
DIV.1b - Reception *	100	10' x 10'	1	100	
DIV.2 - Division Manager Office	180	12' x 15'	1	180	
DIV.3 - Supervisor Office	150	10' x 15'	2	300	
DIV.4 - Staff Office	120	12' x 10'	1	120	
DIV.5 - Field Staff Workstation / Open Office	684	6'x6' x (FTE+1/2PTE)	1	684	
DIV.6a - Small Conference Room *	120	12' x 10'	1	120	
DIV.6b - Standard Conference Room *	NA			-	
DIV.7 - Large Conference Room-Training Room *	500	20' x 25'	1	500	
DIV.8 - Copy Area / Document Work Room *	216	12' x 18'	1	216	
DIV.9 - Breakroom *	750	25 sf x Staff #	1	750	
DIV.10a - Universal Public Restroom *	72	8' x 9'	2	144	
DIV.10b - Men's Locker and Restroom *	445	TBD	1	445	
DIV.10c - Women's Locker and Restroom *	251	TBD	1	251	
DIV.10d - Wellness Room *	168	12' x 14'	1	168	
DIV.10e - IT Closet *	48	6' x 8'	1	48	
DIV.10f - Janitorial *	63	7' x 9'	2	126	
DIV.11 - General Storage / Supply Closets	100	10' x 10'	1	100	
DIV.12 - Mud Room / Wash Area	96	8' x 12'	1	96	
DIV.13 - General Computer Area *	NA			-	Central Computer area - See Also DIV.5 - Field Staff / Open Office
DIV.14 - Laundry Facility *	NA			-	
DIV.10g - Mechanical and Electrical Room	667	15% of supported	1.0	667	
ADMINISTRATIVE AREA SUBTOTAL				5,115	
CIRCULATION @ 30%				1,535	
TOTAL				6,650	

CONDITIONED VEHICLE STORAGE (WARM)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	0	0	Parking Spaces Only
Medium Space	288	12'x24'	0	0	Parking Spaces Only
Pickup Space	200	10'x20'	6	1,200	Parking Spaces Only
VEHICLE PARKING SUBTOTAL	1,200				
DOUBLE TRAFFIC LANE STORAGE INCREASE	1,440			2,640	Parking plus traffic lane serving parking
Mezzanine Storage				880	Maximum 1/3 of open storage area (IBC)
General Storage area				330	Area created by angled parking, used for small implement storage
CONDITIONED VEHICLE STORAGE SUBTOTAL				2,640	Parking plus traffic lane serving parking
CIRCULATION @ 15%				396	
TOTAL				3,366	Sum of parking and traffic lanes, plus additional circulation and general storage

DIVISION OPERATION CRITICAL SPACES	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
CMG.1a - Large Service Bay	1,456	28' x 52'	18	26,208	Bays based on Projected Fleet & Vehicles per Mechanic
CMG.1b - Small Service Bay	704	22' x 32'	12	8,448	Bays based on Projected Fleet & Vehicles per Mechanic
CMG.2 - Welding and Fabrication Bay	2,560	32' x 80'	2	5,120	
CMG.2b - Steel Stock Storage	200	10' x 20'	2	400	
CMG.3a - Tire Service Bay	1,456	28' x 52'	1	1,456	
CMG.3b - Tire Service Storage	800	20' x 40'	1	800	
CMG4.a - Bulk Fluids Room - Waste Oil	180	15' x 12'	1	180	
CMG.4b - Bulk Fluids Room - Virgin Fluids	2,000	50'x40'	1	2,000	
CMG.5 - Parts Storage	1,500	50' x 30'	1	1,500	
CMG.6 - Tool Storage	450	15' x 30'	1	450	
CMG.7 - Mobile Lift and Jack Storage	64	8' x 8'	5	320	
CMG.8 - Hazardous Material Storage	150	15' x 10'	1	150	
CMG.9 - Inventory Receiving Area and Office	300	15' x 20'	1	330	
CMG.10 - Wash Bay - Degreasing Bay	1,680	56' x 30'	1	1,680	
CMG Division Operation Critical Spaces	49,042				
DIVISION OPERATION SPACES SUBTOTAL				49,042	
CIRCULATION @ 30%				14,713	
TOTAL				63,755	

UNCONDITIONED VEHICLE STORAGE (COLD)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	0	0	Parking Spaces Only
Medium Space	288	12'x24'	0	0	Parking Spaces Only
Pickup Space	200	10'x20'	0	0	Parking Spaces Only
VEHICLE PARKING SUBTOTAL	0				
DOUBLE TRAFFIC LANE STORAGE INCREASE	0			0	Parking plus traffic lane serving parking
Mezzanine Storage				0	Maximum 1/3 of open storage area (IBC)
General Storage area				0	Area created by angled parking, used for small implement storage
UNCONDITIONED VEHICLE STORAGE SUBTOTAL				0	Parking plus traffic lane serving parking
CIRCULATION @ 15%				0	
TOTAL				0	Sum of parking and traffic lanes, plus additional circ and storage

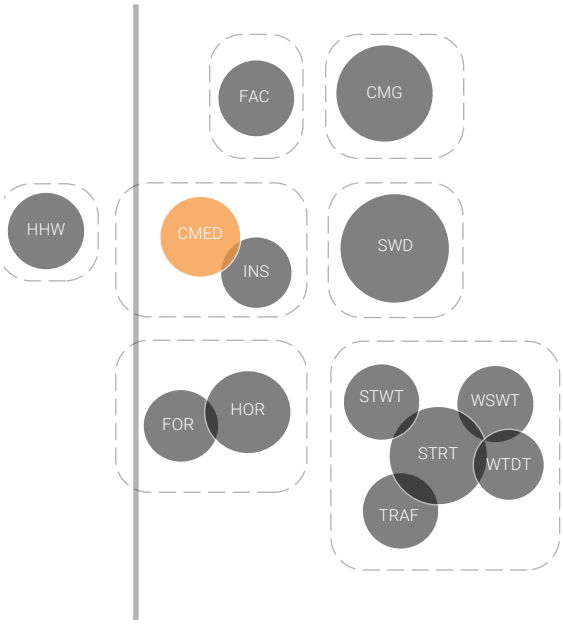
SITE PROGRAM REQUIREMENTS	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Staff Parking and Drive Aisle	284	9' x 18' +1/2 of 27' Drive	30	8,505	1 per staff on largest shift
Exterior Equipment Parking Demands	288	12' x 24'	0	0	
ADA Space plus Aisle	306	9' x 18' +8' Aisle	1	367	
DIV.15 - Trash / Reycling Area	900	30'x30' (can vary)	1	900	
CMG.11 - Fleet Vehicle Staging Area	900	20' x 45'	6	5,400	
Fuel Island	1,500	30' x 50'	1	1,500	
SITE PROGRAM SUB-TOTAL				16,672	
SITE CIRCULATION @ 150%				25,008	Accounts for access to all sides of separated site functions
TOTAL				41,681	

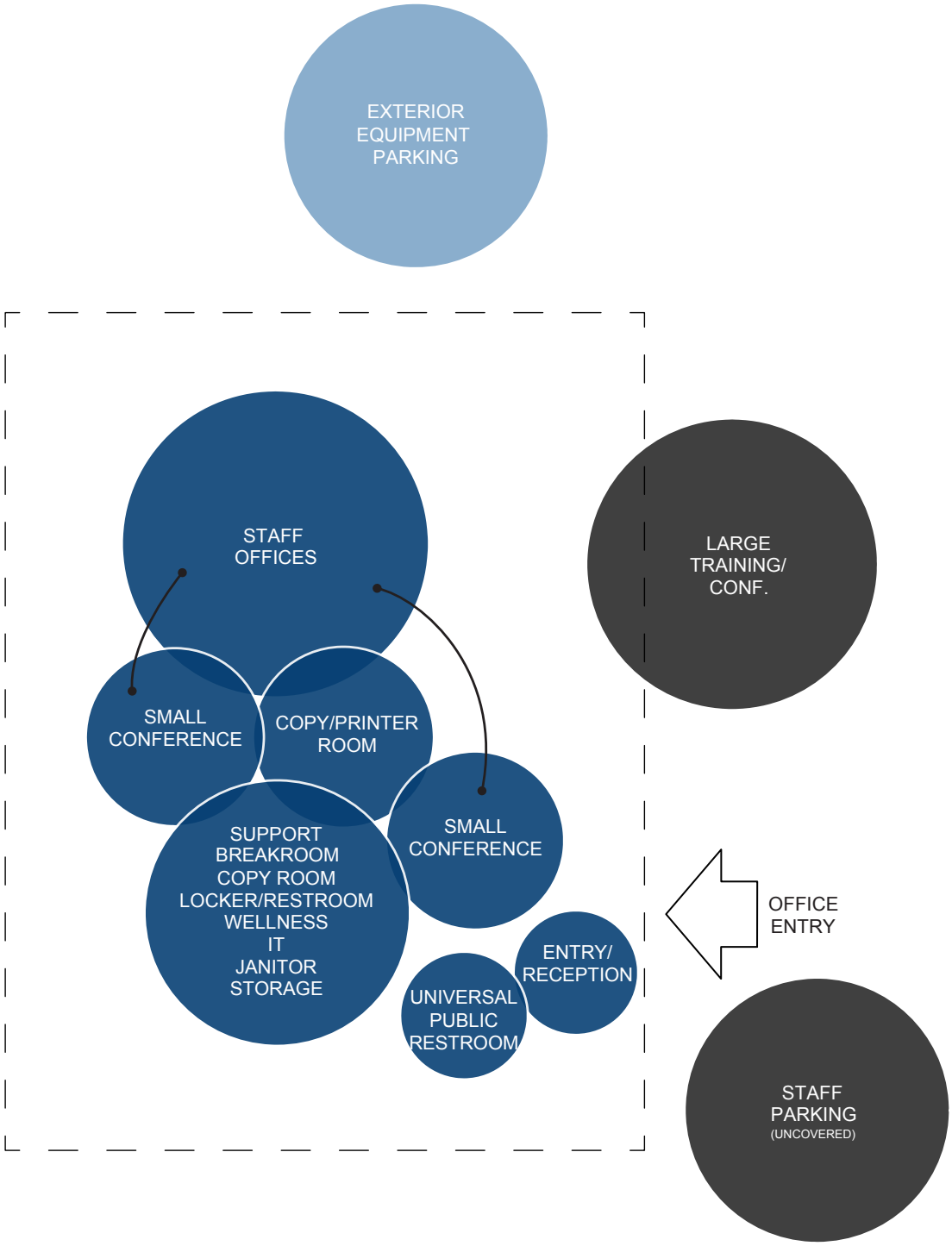
SITE AREA TOTALS					
MAIN BUILDING	73,770				
CIRCULATION AROUND BUILDING	15,939	25% of subtotal			
COLD STORAGE	0				
CIRCULATION AROUND BUILDING	0	25% of subtotal			
SITE PROGRAM REQUIREMENTS	41,681				
CIRCULATION AROUND BUILDING	10,420	25% of subtotal			
Program Totals	141,810				
25% GREEN SPACE	35,452				
Stormwater Management	35,452	25% of subtotal			
GRAND TOTAL SITE AREA NEEDED	276,529	8.25			*Total squarefootage and acreage, plus added 30% of programmed acreage for drainage paths, easements, setbacks, etc.*

* Sharing potential across Divisions

CMED - Construction Management Engineering Division

CMED's space needs are well suited for combining with another MSO division at a central facility. Space needs as identified are limited to office function based on staff hierarchy and number, meeting rooms, and staff support spaces such as break rooms and locker rooms. Vehicles ideally would be parked indoors but could be parked in an outdoor fleet lot.





Construction Management Engineering Division

Adjacency Diagram

- Standardized Spaces
- Division Specific Spaces
- Shared Spaces

* Some shared spaces are defined in the Space Standards section

Construction Management Engineering Division Space Needs Summary

ADMINISTRATIVE	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
DIV.1a - Building Entry / Vestibule *	100	10'x10'	1	100	
DIV.1b - Reception *	100	10' x 10'	1	100	
DIV.2 - Division Manager Office	180	12' x 15'	0	0	
DIV.3 - Supervisor Office	150	10' x 15'	0	0	
DIV.4 - Staff Office	120	12' x 10'	23	2,760	
DIV.5 - Field Staff Workstation / Open Office	0	6'x6' x (FTE+1/2PTE)	1	0	
DIV.6a - Small Conference Room *	120	12' x 10'	1	120	
DIV.6b - Standard Conference Room *	NA			-	
DIV.7 - Large Conference Room-Training Room *	500	20' x 25'	1	500	
DIV.8 - Copy Area / Document Work Room *	216	12' x 18'	1	216	
DIV.9 - Breakroom *	575	25 sf x Staff #	1	575	
DIV.10a - Universal Public Restroom *	72	8' x 9'	2	144	
DIV.10b - Men's Locker and Restroom *	450	Varies	1	450	
DIV.10c - Women's Locker and Restroom *	335	Varies	1	335	
DIV.10d - Wellness Room *	168	12' x 14'	1	168	
DIV.10e - IT Closet *	48	6' x 8'	1	48	
DIV.10f - Janitorial *	63	7' x 9'	1	63	
DIV.11 - General Storage / Supply Closets	100	10' x 10'	1	100	
DIV.12 - Mud Room / Wash Area	NA			-	
DIV.13 - General Computer Area *	NA			-	Central Computer area - See Also DIV.5 - Field Staff / Open Office
DIV.14 - Laundry Facility *	NA			-	
DIV.10g - Mechanical and Electrical Room	852	10' x 10'	1	852	
ADMINISTRATIVE AREA SUBTOTAL				6,531	
CIRCULATION @ 30%				1,959	
TOTAL				8,490	

CONDITIONED VEHICLE STORAGE (WARM)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	0	0	Parking Spaces Only
Medium Space	288	12'x24'	0	0	Parking Spaces Only
Pickup Space	200	10'x20'	0	0	Parking Spaces Only
VEHICLE PARKING SUBTOTAL	0				
DOUBLE TRAFFIC LANE STORAGE INCREASE	0			0	Parking plus traffic lane serving parking
Mezzanine Storage				0	Maximum 1/3 of open storage area (IBC)
General Storage area				0	Area created by angled parking, used for small implement storage
CONDITIONED VEHICLE STORAGE SUBTOTAL				0	Parking plus traffic lane serving parking
CIRCULATION @ 15%				0	
TOTAL				0	Sum of parking and traffic lanes, plus additional circulation and general storage

DIVISION OPERATION CRITICAL SPACES	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
NO SPACES REQUIRED				0	
CMED Division Operation Critical Spaces	0				
DIVISION OPERATION SPACES SUBTOTAL				0	
CIRCULATION @ 30%				0	
TOTAL				0	

* Sharing potential across Divisions

UNCONDITIONED VEHICLE STORAGE (COLD)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	0	0	Parking Spaces Only
Medium Space	288	12'x24'	0	0	Parking Spaces Only
Pickup Space	200	10'x20'	0	0	Parking Spaces Only
VEHICLE PARKING SUBTOTAL	0				
DOUBLE TRAFFIC LANE STORAGE INCREASE	0			0	Parking plus traffic lane serving parking
Mezzanine Storage				0	Maximum 1/3 of open storage area (IBC)
General Storage area				0	Area created by angled parking, used for small implement storage
UNCONDITIONED VEHICLE STORAGE SUBTOTAL				0	Parking plus traffic lane serving parking
CIRCULATION @ 15%				0	
TOTAL				0	Maximum 1/3 of open storage area (IBC)

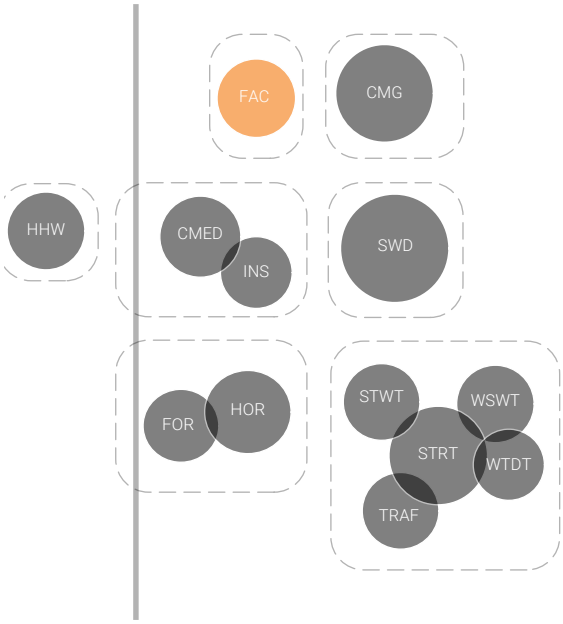
SITE PROGRAM REQUIREMENTS	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Staff Parking and Drive Aisle	284	9' x 18'	23	6,521	1 per staff on largest shift
Exterior Equipment Parking Demands	288	12' x 24'	10	2,765	
ADA Space plus Aisle	306	9' x 18' +8' Aisle	1	306	
SITE PROGRAM SUB-TOTAL				9,591	
SITE CIRCULATION @ 150%				14,387	Accounts for access to all sides of separated site functions
TOTAL				23,978	

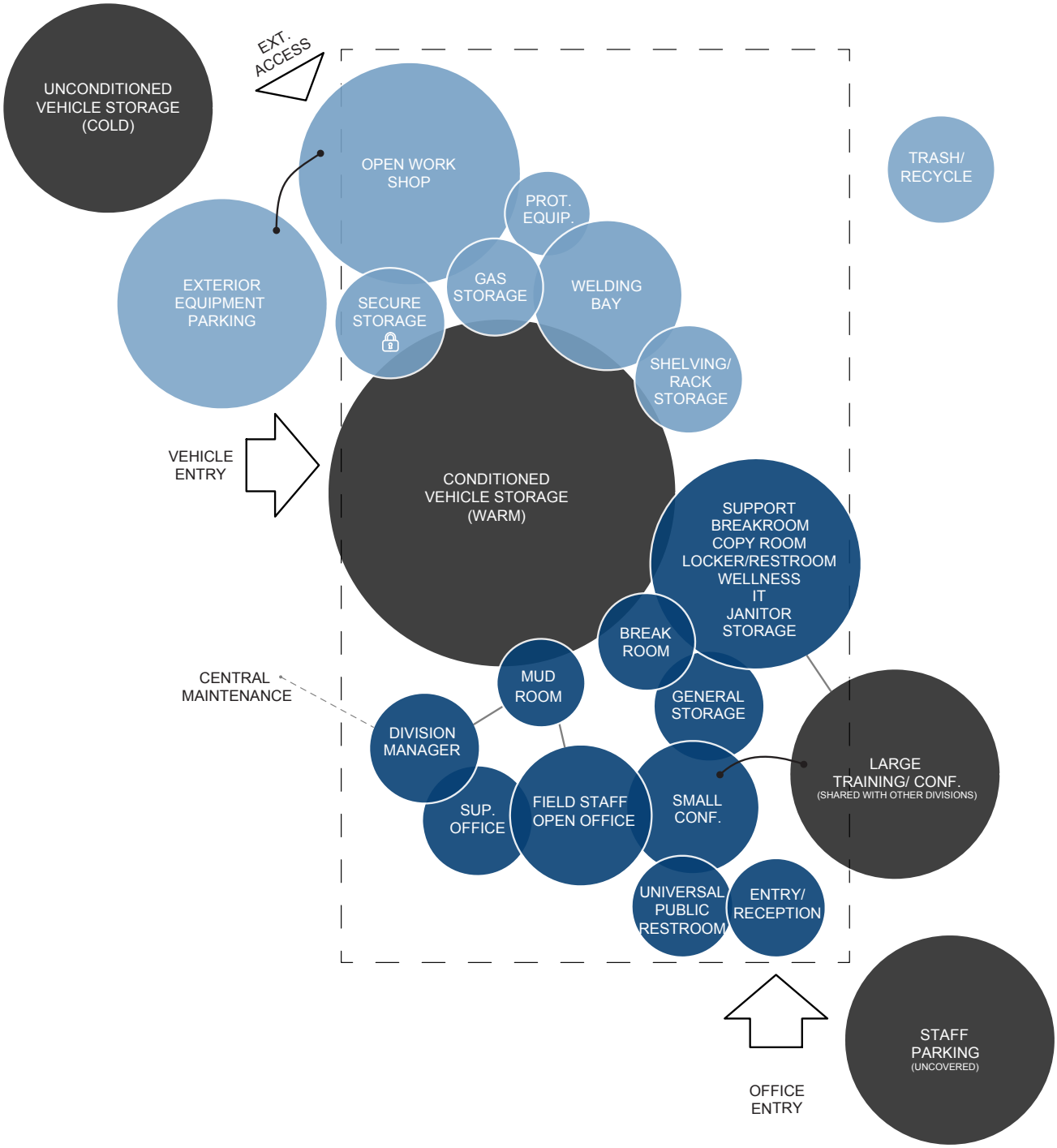
SITE AREA TOTALS					
MAIN BUILDING	8,490				
CIRCULATION AROUND BUILDING	2,123	25% of subtotal			
COLD STORAGE	0				
CIRCULATION AROUND BUILDING	0	25% of subtotal			
SITE PROGRAM REQUIREMENTS	23,978				
CIRCULATION AROUND BUILDING	11,989	25% of subtotal			
Program Totals	46,580				
25% GREEN SPACE	11,645				
Stormwater Management	11,645	25% of subtotal			
GRAND TOTAL SITE AREA NEEDED	90,831	2.71			*Total squarefootage and acreage, plus added 30% of programmed acreage for drainage paths, easements, setbacks, etc.*

FAC – Facility Maintenance Division

Facility Maintenance space needs include: administrative space, personnel support space, vehicle warm storage and specialized workshop areas.

Facility Maintenance's mission is to support every part of Lawrence's building inventory; thus they support each and every division of MSO. There is no direct correlation between their workflow and another division of MSO, which makes them well suited for either a standalone facility, or inclusion in a centralized campus facility.





Facility Maintenance Division
Adjacency Diagram

- Standardized Spaces
- Division Specific Spaces
- Shared Spaces

* Some shared spaces are defined in the Space Standards section

Facility Maintenance Division Space Needs Summary

ADMINISTRATIVE	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
DIV.1a - Building Entry / Vestibule *	100	10'x10'	1	100	
DIV.1b - Reception *	100	10' x 10'	0	0	
DIV.2 - Division Manager Office	180	12' x 15'	1	180	
DIV.3 - Supervisor Office	150	10' x 15'	1	150	
DIV.4 - Staff Office	NA			-	
DIV.5 - Field Staff Workstation / Open Office	574	6'x6' x (FTE+1/2PTE)	1	574	
DIV.6a - Small Conference Room *	120	12' x 10'	1	120	
DIV.6b - Standard Conference Room *	NA			-	
DIV.7 - Large Conference Room-Training Room *	500	20' x 25'	0	0	Not included in program, shared with another division
DIV.8 - Copy Area / Document Work Room *	216	12' x 18'	1	216	
DIV.9 - Breakroom *	425	25 sf x Staff #	1	425	
DIV.10a - Universal Public Restroom *	72	8' x 9'	1	72	
DIV.10b - Men's Locker and Restroom *	348	TBD	1	348	
DIV.10c - Women's Locker and Restroom *	252	TBD	1	252	
DIV.10d - Wellness Room *	168	12' x 14'	1	168	
DIV.10e - IT Closet *	48	6' x 8'	1	48	
DIV.10f - Janitorial *	63	7' x 9'	1	63	
DIV.11 - General Storage / Supply Closets	NA			-	
DIV.12 - Mud Room / Wash Area	96	8' x 12'	1	96	
DIV.13 - General Computer Area *	NA			-	Central Computer area - See Also DIV.5 - Field Staff / Open Office
DIV.14 - Laundry Facility *	NA			-	
DIV.10g - Mechanical and Electrical Room	407	10' x 10'	1	407	
ADMINISTRATIVE AREA SUBTOTAL				3,219	
CIRCULATION @ 30%				966	
TOTAL				4,185	

CONDITIONED VEHICLE STORAGE (WARM)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	5	4,320	Parking Spaces Only
Medium Space	288	12'x24'	14	4,147	Parking Spaces Only
Pickup Space	200	10'x20'	5	1,040	Parking Spaces Only
VEHICLE PARKING SUBTOTAL	9,507				
DOUBLE TRAFFIC LANE STORAGE INCREASE	11,409			20,916	Parking plus traffic lane serving parking
Mezzanine Storage				6,972	Maximum 1/3 of open storage area (IBC)
General Storage area				2,614	Area created by angled parking, used for small implement storage
CONDITIONED VEHICLE STORAGE SUBTOTAL				20,916	Parking plus traffic lane serving parking
CIRCULATION @ 15%				3,137	
TOTAL				26,668	Sum of parking and traffic lanes, plus additional circ and storage

* Sharing potential across Divisions

DIVISION OPERATION CRITICAL SPACES	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
FAC.2 - Open Work Shop	750	25' x 30'	1	750	
FAC.3 - Welding Bay	384	32' x 12'	1	384	
FAC.4 - Shelving and Racking Storage	450	15' x 30'	1	450	
FAC.5 - Personal Protective Equipment Storage	80	8' x 10'	1	80	
FAC.6 - Secure Tool/Parts/Material Storage	240	20' x 12'	1	240	
FAC.7 - Refrigerant and Compressed Gas Storage	150	15' x 10'	1	150	
FAC Division Operation Critical Spaces	2,054				
DIVISION OPERATION SPACES SUBTOTAL				2,054	
CIRCULATION @ 30%				616	
TOTAL				2,670	

UNCONDITIONED VEHICLE STORAGE (COLD)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	0	0	Parking Spaces Only
Medium Space	288	12'x24'	0	0	Parking Spaces Only
Pickup Space	200	10'x20'	16	3,200	Parking Spaces Only
VEHICLE PARKING SUBTOTAL	3,200				
DOUBLE TRAFFIC LANE STORAGE INCREASE	3,840			7,040	Parking plus traffic lane serving parking
Mezzanine Storage				2,347	Maximum 1/3 of open storage area (IBC)
General Storage area				880	Area created by angled parking, used for small implement storage
UNCONDITIONED VEHICLE STORAGE SUBTOTAL				7,040	Parking plus traffic lane serving parking
CIRCULATION @ 15%				1,056	
TOTAL				8,976	Sum of parking and traffic lanes, plus additional circ and storage

SITE PROGRAM REQUIREMENTS	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Staff Parking and Drive Aisle	284	9' x 18'	18	5,103	1 per staff on largest shift
Exterior Equipment Parking Demands	288	12' x 24'	0	0	
ADA Space plus Aisle	306	9' x 18' +8' Aisle	1	306	
DIV.15 - Trash/Recycling Area	900	30'x30' (can vary)	1	900	
SITE PROGRAM SUB-TOTAL				6,309	
SITE CIRCULATION @ 150%				9,464	Accounts for access to all sides of separated site functions
TOTAL				15,773	

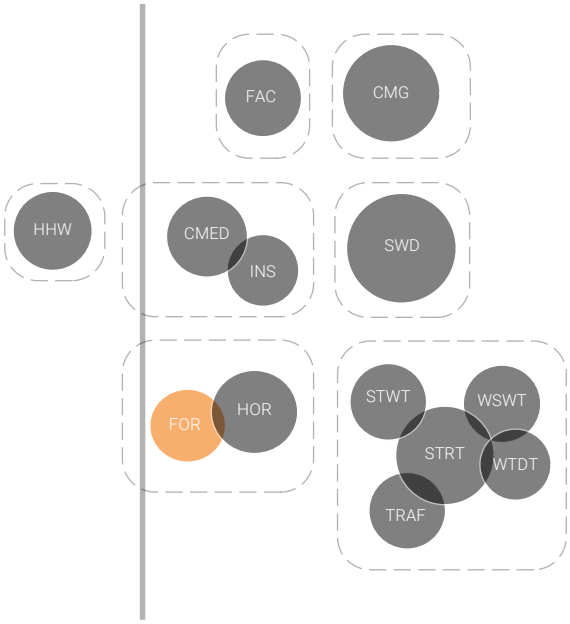
SITE AREA TOTALS					
MAIN BUILDING	33,523				
CIRCULATION AROUND BUILDING	8,381	25% of subtotal			
COLD STORAGE	8,976				
CIRCULATION AROUND BUILDING	4,488	25% of subtotal			
SITE PROGRAM REQUIREMENTS	15,773				
CIRCULATION AROUND BUILDING	7,886	25% of subtotal			
Program Totals	79,027				
25% GREEN SPACE	19,757				
Stormwater Management	19,757	25% of subtotal			
GRAND TOTAL SITE AREA NEEDED	154,102	4.60			*Total squarefootage and acreage, plus added 30% of programmed acreage for drainage paths, easements, setbacks, etc.*

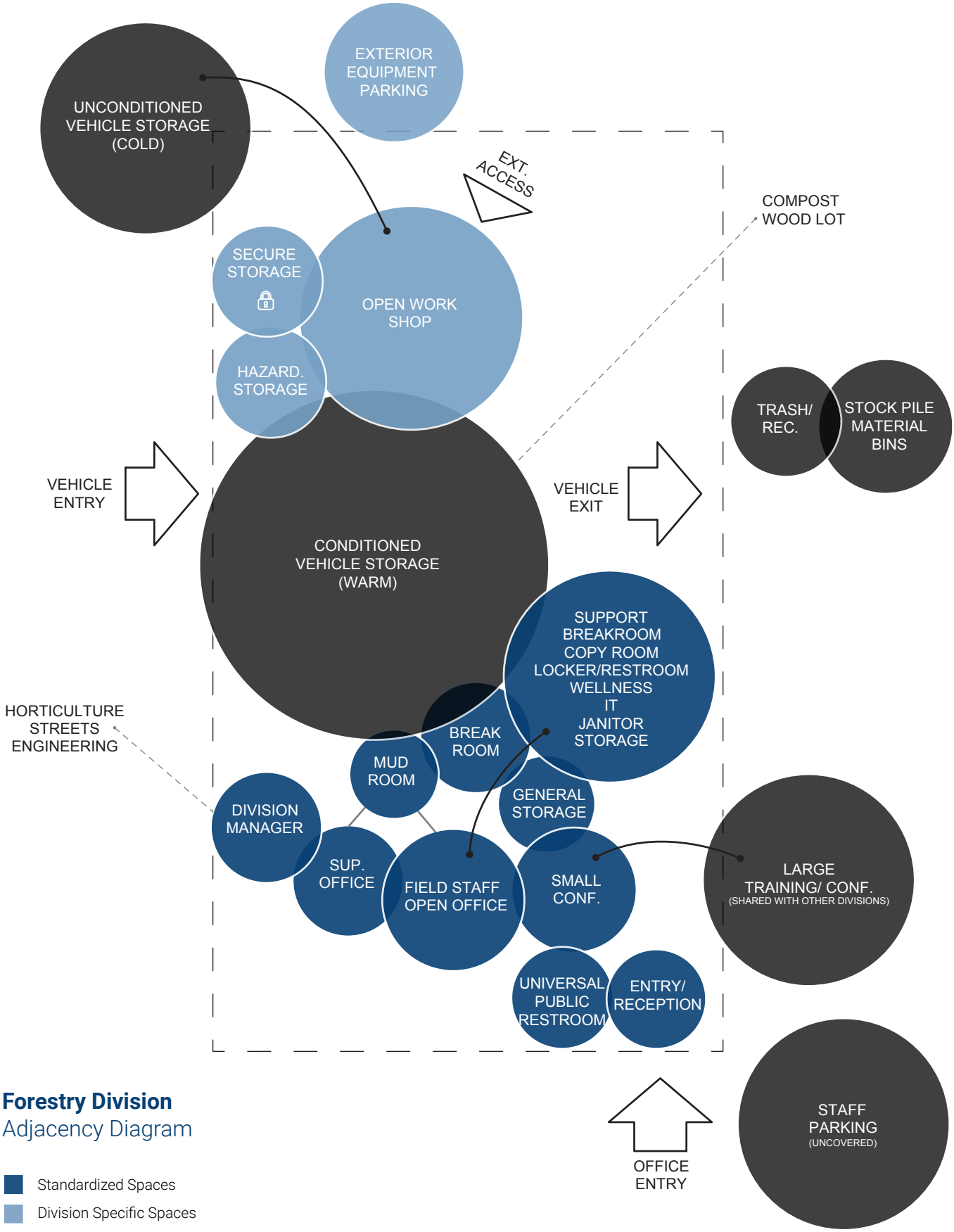
FOR – Forestry Division

Forestry has a need for specialized work areas, both indoor and outdoor, as well as administrative support spaces. Divisional administrative spaces would include both private and open office functions. There is need for proper break space and locker room / restroom facilities. There is also a need for warm vehicle storage to support the specialized interior work areas.

Staff size and divisional function is ideal for a dedicated workshop with associated vehicle parking. Personnel areas could be combined with other Divisions, such as Horticulture, to take advantage of meeting room, break room and locker room programmatic needs.

The Forestry Division is content with their current location due to its proximity to the Woodlot, Downtown, and other City Parks and Rec buildings.





Forestry Division
Adjacency Diagram

- Standardized Spaces
- Division Specific Spaces
- Shared Spaces

* Some shared spaces are defined in the Space Standards section

Forestry Division Space Needs Summary

ADMINISTRATIVE	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
DIV.1a - Building Entry / Vestibule *	100	10'x10'	1	100	
DIV.1b - Reception *	100	10' x 10'	0	0	
DIV.2 - Division Manager Office	180	12' x 15'	1	180	
DIV.3 - Supervisor Office	150	10' x 15'	1	150	
DIV.4 - Staff Office	120	12' x 10'	0	0	
DIV.5 - Field Staff Workstation / Open Office	378	6'x6' x (FTE+1/2PTE)	1	378	
DIV.6a - Small Conference Room *	120	12' x 10'	1	120	
DIV.6b - Standard Conference Room *	NA			-	
DIV.7 - Large Conference Room-Training Room *	500	20' x 25'	0	0	Not included in program, shared with another division
DIV.8 - Copy Area / Document Work Room *	216	12' x 18'	1	216	
DIV.9 - Breakroom *	263	25 sf x Staff #	1	263	
DIV.10a - Universal Public Restroom *	72	8' x 9'	1	72	
DIV.10b - Men's Locker and Restroom *	299	TBD	1	299	
DIV.10c - Women's Locker and Restroom *	246	Varies	1	246	
DIV.10d - Wellness Room *	168	12' x 14'	1	168	
DIV.10e - IT Closet *	48	6' x 8'	1	48	
DIV.10f - Janitorial *	63	7' x 9'	2	126	
DIV.11 - General Storage / Supply Closets	100	10' x 10'	1	100	
DIV.12 - Mud Room / Wash Area	96	8' x 12'	1	96	
DIV.13 - General Computer Area *	NA			-	Central Computer area - See Also DIV.5 - Field Staff / Open Office
DIV.14 - Laundry Facility *	NA			-	
DIV.10g - Mechanical and Electrical Room	384	15% of supported	1	384	
ADMINISTRATIVE AREA SUBTOTAL				2,946	
CIRCULATION @ 30%				884	
TOTAL				3,829	

CONDITIONED VEHICLE STORAGE (WARM)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	5	4,320	Parking Spaces Only
Medium Space	288	12'x24'	3	922	Parking Spaces Only
Pickup Space	200	10'x20'	8	1,600	Parking Spaces Only
VEHICLE PARKING SUBTOTAL	6,842				
DOUBLE TRAFFIC LANE STORAGE INCREASE	8,210			15,052	Parking plus traffic lane serving parking
Mezzanine Storage				5,017	Maximum 1/3 of open storage area (IBC)
General Storage area				1,881	Area created by angled parking, used for small implement storage
CONDITIONED VEHICLE STORAGE SUBTOTAL				15,052	Parking plus traffic lane serving parking
CIRCULATION @ 15%				2,258	
TOTAL				19,191	Sum of parking and traffic lanes, plus additional circ and storage

* Sharing potential across Divisions

DIVISION OPERATION CRITICAL SPACES	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
FOR.2 - Open Work Shop	875	25' x 35'	1	875	
FOR.3 - Secure Tool/Parts/Material Storage	240	20' x 12'	1	240	
FOR.4 - Hazardous Storage	150	15' x 10'	1	150	
FOR.5 - Exterior Fleet Parking	0	0	0	0	
FOR Division Opertion Critical Spaces	1,265				
DIVISION OPERATION SPACES SUBTOTAL				1,265	
CIRCULATION @ 30%				380	
TOTAL				1,645	

UNCONDITIONED VEHICLE STORAGE (COLD)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	0	0	Parking Spaces Only
Medium Space	288	12'x24'	0	0	Parking Spaces Only
Pickup Space	200	10'x20'	3	640	Parking Spaces Only
VEHICLE PARKING SUBTOTAL	640				
DOUBLE TRAFFIC LANE STORAGE INCREASE	768			1,408	Parking plus traffic lane serving parking
Mezzanine Storage				469	Maximum 1/3 of open storage area (IBC)
General Storage area				176	Area created by angled parking, used for small implement storage
					Maximum 1/3 of open storage area (IBC)
UNCONDITIONED VEHICLE STORAGE SUBTOTAL				1,408	Parking plus traffic lane serving parking
CIRCULATION @ 15%				211	
TOTAL				1,795	Sum of parking and traffic lanes, plus additional circ and storage

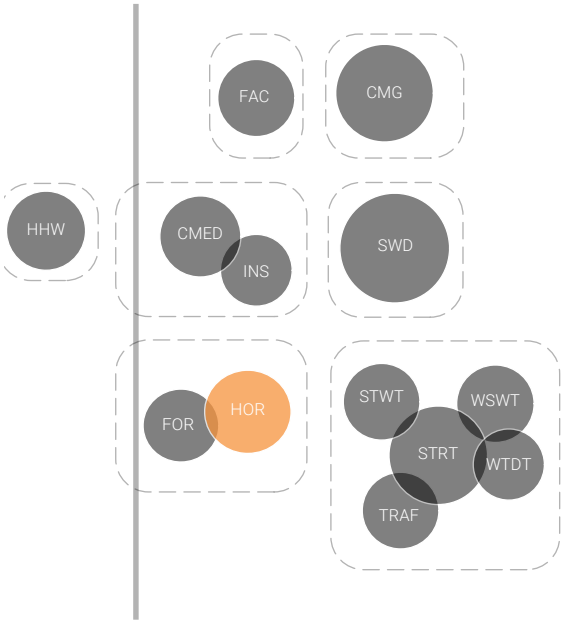
SITE PROGRAM REQUIREMENTS	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Staff Parking and Drive Aisle	284	9' x 18'	8	2,268	1 per staff on largest shift
Exterior Equipment Parking Demands	288	12' x 24'	0	0	
ADA Space plus Aisle	306	9' x 18' +8' Aisle	1	306	
DIV.15 - Trash Area	900	30'x30' (can vary)	1	900	
DIV.16 - Stock Pile Material Bins	800	40' x 20'	1	800	
SITE PROGRAM SUB-TOTAL				4,274	
SITE CIRCULATION @ 150%				6,411	Accounts for access to all sides of separated site functions
TOTAL				10,685	

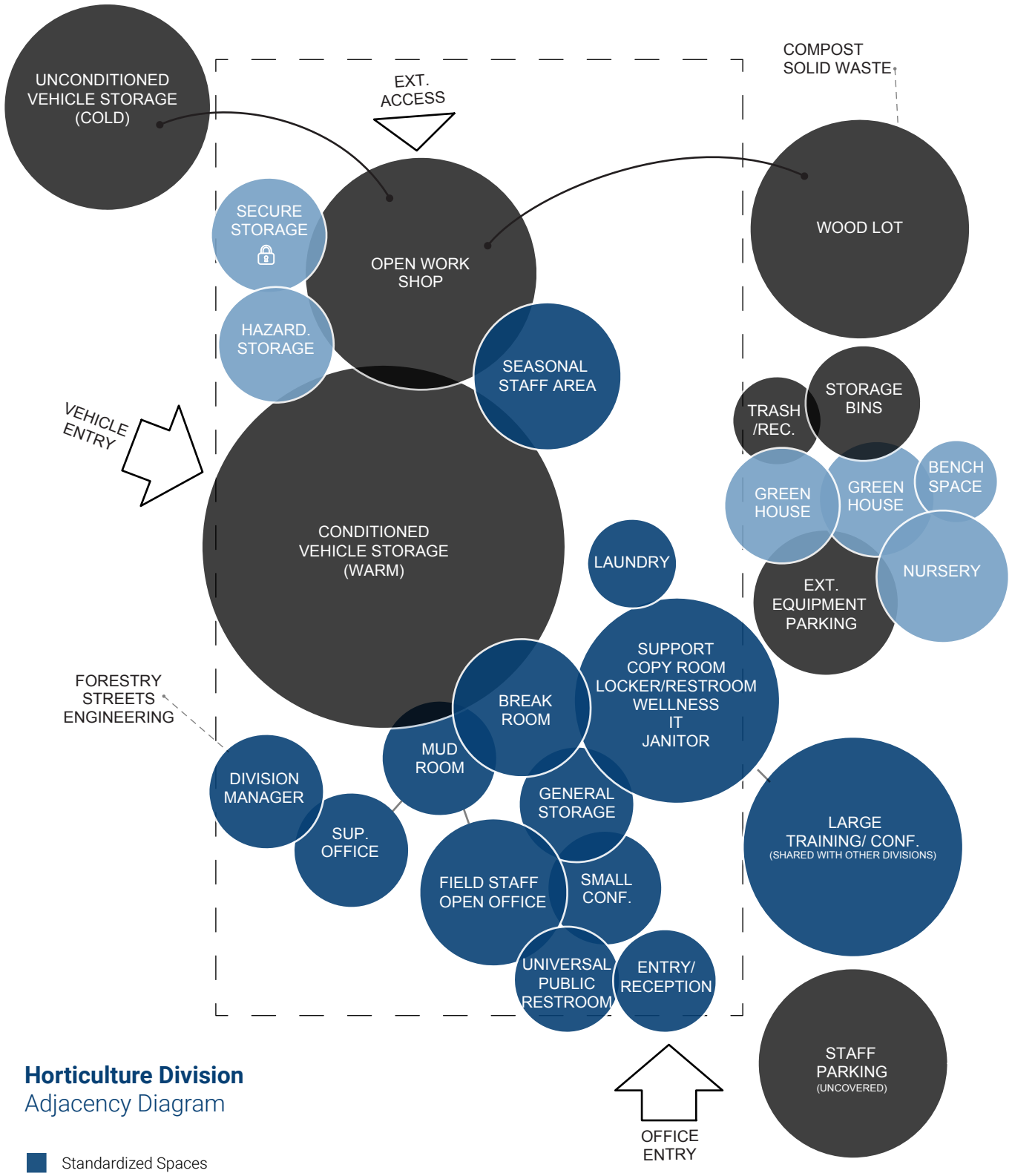
SITE AREA TOTALS					
MAIN BUILDING	24,665				
CIRCULATION AROUND BUILDING	6,166	25% of subtotal			
COLD STORAGE	1,795				
CIRCULATION AROUND BUILDING	449	25% of subtotal			
SITE PROGRAM REQUIREMENTS	10,685				
CIRCULATION AROUND BUILDING	2,671	25% of subtotal			
Program Totals	46,431				
25% GREEN SPACE	11,608				
Stormwater Management	11,608	25% of subtotal			
GRAND TOTAL SITE AREA NEEDED	90,541	2.70			*Total squarefootage and acreage, plus added 30% of programmed acreage for drainage paths, easements, setbacks, etc.*

HOR – Horticulture Division

Horticulture has a need for specialized interior work areas but has a high outdoor and/or separate building work area demand. Divisional administrative spaces would include both private and open office functions. There is also a need for proper break space and locker room / restroom facilities.

Staff size and divisional function is ideal for a dedicated workshop with associated vehicle parking, and interior specialized equipment and material storage areas. Personnel areas could be combined with other divisions to take advantage of meeting room, break room and locker room programmatic needs.





Horticulture Division
Adjacency Diagram

- Standardized Spaces
- Division Specific Spaces
- Shared Spaces

* Some shared spaces are defined in the Space Standards section

Horticulture Division Space Needs Summary

ADMINISTRATIVE	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
DIV.1a - Building Entry / Vestibule *	100	10'x10'	1	100	
DIV.1b - Reception *	100	10' x 10'	0	0	
DIV.2 - Division Manager Office	180	12' x 15'	1	180	
DIV.3 - Supervisor Office	150	10' x 15'	1	150	
DIV.4 - Staff Office	120	12' x 10'	0	0	
DIV.5 - Field Staff Workstation / Open Office	648	6'x6' x (FTE+1/2PTE)	1	648	
DIV.6a - Small Conference Room *	120	12' x 10'	1	120	
DIV.6b - Standard Conference Room *	NA			-	
DIV.7 - Large Conference Room-Training Room *	500	20' x 25'	0	0	Not included in program, shared with another division
DIV.8 - Copy Area / Document Work Room *	216	12' x 18'	1	216	
DIV.9 - Breakroom *	450	25 sf x Staff #	1	450	
DIV.10a - Universal Public Restroom *	72	8' x 9'	2	144	
DIV.10b - Men's Locker and Restroom *	355	TBD	1	355	
DIV.10c - Women's Locker and Restroom *	265	TBD	1	265	
DIV.10d - Wellness Room *	168	12' x 14'	1	168	
DIV.10e - IT Closet *	48	6' x 8'	1	48	
DIV.10f - Janitorial *	63	7' x 9'	1	63	
DIV.11 - General Storage / Supply Closets	100	10' x 10'	1	100	
DIV.12 - Mud Room / Wash Area	96	8' x 12'	1	96	
DIV.13 - General Computer Area *	NA			-	Central Computer area - See Also DIV.5 - Field Staff / Open Office
DIV.14 - Laundry Facility *	100	10' x 10'	1	100	
DIV.10g - Mechanical and Electrical Room	481	15% of supported	1	481	
ADMINISTRATIVE AREA SUBTOTAL				3,684	
CIRCULATION @ 30%				1,105	
TOTAL				4,789	

CONDITIONED VEHICLE STORAGE (WARM)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	0	0	Parking Spaces Only
Medium Space	288	12'x24'	0	0	Parking Spaces Only
Pickup Space	200	10'x20'	9	1,720	Parking Spaces Only
VEHICLE PARKING SUBTOTAL	1,720				
DOUBLE TRAFFIC LANE STORAGE INCREASE	2,064			3,784	Parking plus traffic lane serving parking
Mezzanine Storage				1,261	Maximum 1/3 of open storage area (IBC)
General Storage area				473	Area created by angled parking, used for small implement storage
CONDITIONED VEHICLE STORAGE SUBTOTAL				3,784	Parking plus traffic lane serving parking
CIRCULATION @ 15%				568	
TOTAL				4,825	Sum of parking and traffic lanes, plus additional circ and storage

DIVISION OPERATION CRITICAL SPACES	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
HOR.2 - Open Workshop and Storage	750	25' x 30'	2	1,500	
HOR.3 - Seasonal Staff Area	225	15' x 15'	1	225	
HOR.4 - Secure Tool/Parts/Material Storage	240	20' x 12'	1	240	
HOR.5 - Hazardous Storage	150	15' x 10'	3	450	
HOR Division Opertion Critical Spaces	1,725				
DIVISION OPERATION SPACES SUBTOTAL				1,725	
CIRCULATION @ 30%				518	
TOTAL				2,243	

UNCONDITIONED VEHICLE STORAGE (COLD)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	0	0	Parking Spaces Only
Medium Space	288	12'x24'	0	0	Parking Spaces Only
Pickup Space	200	10'x20'	16	3,200	Parking Spaces Only
VEHICLE PARKING SUBTOTAL	3,200				
DOUBLE TRAFFIC LANE STORAGE INCREASE	3,840			7,040	Parking plus traffic lane serving parking
Mezzanine Storage				2,347	Maximum 1/3 of open storage area (IBC)
General Storage area				880	Area created by angled parking, used for small implement storage
					Maximum 1/3 of open storage area (IBC)
UNCONDITIONED VEHICLE STORAGE SUBTOTAL				7,040	Parking plus traffic lane serving parking
CIRCULATION @ 15%				1,056	
TOTAL				8,976	Sum of parking and traffic lanes, plus additional circ and storage

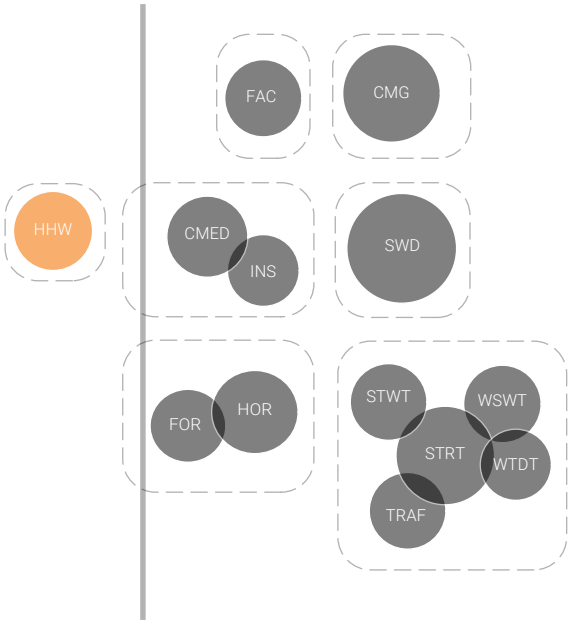
SITE PROGRAM REQUIREMENTS	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Staff Parking and Drive Aisle	284	9' x 18'	26	7,371	1 per staff on largest shift
Exterior Equipment Parking Demands	288	12' x 24'	14	4,147	
ADA Space plus Aisle	306	9' x 18' +8' Aisle	14	4,406	
HOR.7 - Exterior Fleet Parking	0	0	0	0	
HOR.8 - Wood Lot / Hardscape Storage Area	16,000	80' x 200'	1	16,000	
HOR.9 - Storage Bins	800	20' x 20'	4	3,200	
HOR.10a - Greenhouse	1,200	50' x 24'	2	2,400	One Heated Greenhouse / One Unheated
HOR.10b - Bench Space	1,200	50' x 24'	1	1,200	
HOR.11 - Nursery	10,800	120' x 90'	1	10,800	
SITE PROGRAM SUB-TOTAL				49,525	
SITE CIRCULATION @ 150%				74,287	Accounts for access to all sides of separated site functions
TOTAL				123,812	

SITE AREA TOTALS					
MAIN BUILDING	11,856				
CIRCULATION AROUND BUILDING	2,964	25% of subtotal			
COLD STORAGE	8,976				
CIRCULATION AROUND BUILDING	2,244	25% of subtotal			
SITE PROGRAM REQUIREMENTS	123,812				
CIRCULATION AROUND BUILDING	30,953	25% of subtotal			
Program Totals	180,805				
25% GREEN SPACE	45,201				
Stormwater Management	45,201	25% of subtotal			
GRAND TOTAL SITE AREA NEEDED	352,569	10.52			*Total squarefootage and acreage, plus added 30% of programmed acreage for drainage paths, easements, setbacks, etc.*

* Sharing potential across Divisions

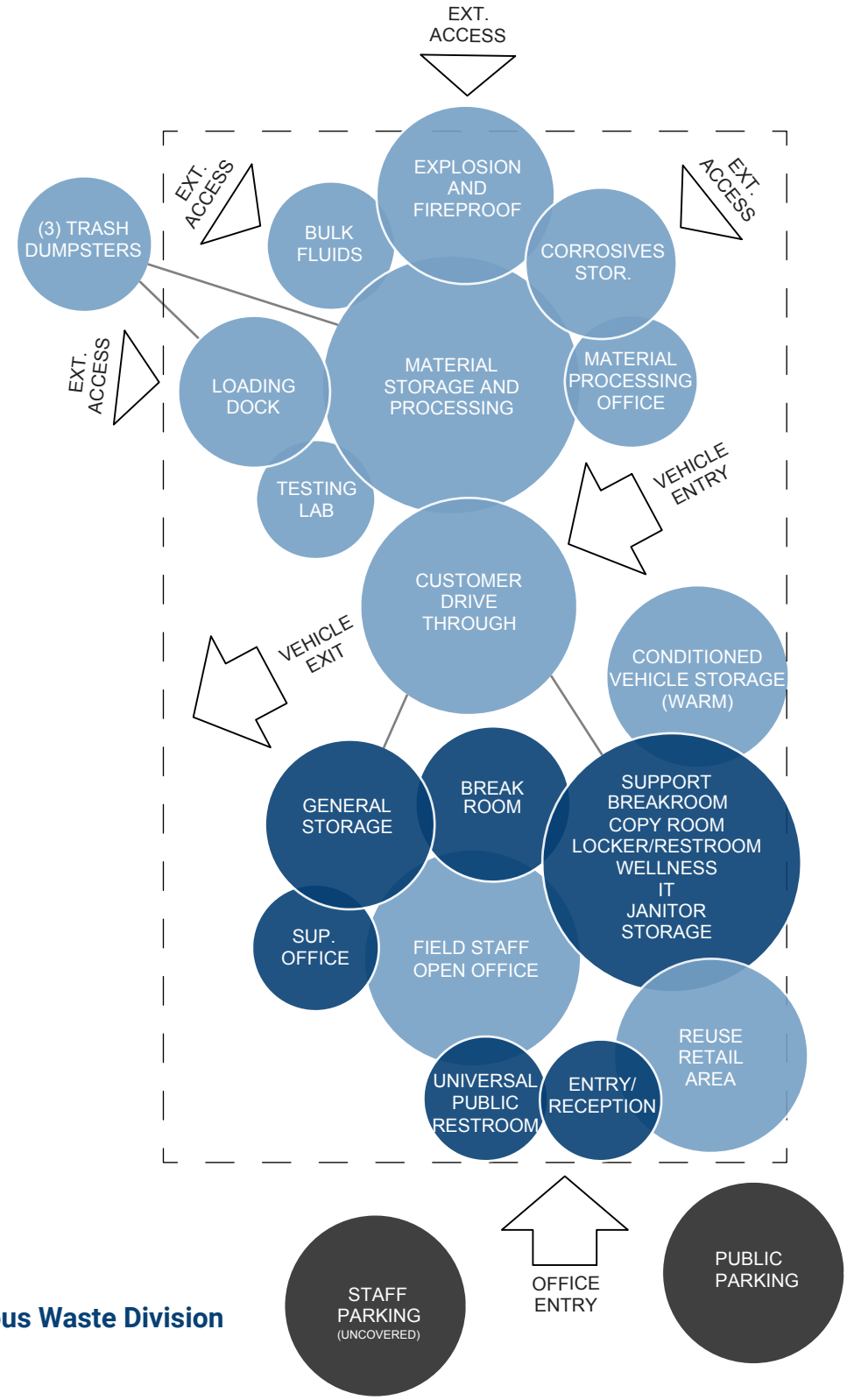
HHW – Household Hazardous Waste Division

HHW's operation is well suited for a separate facility from a centralized Field Operations Facility (FOF). The primary mission is to receive Household Hazardous Waste Materials from Lawrence and Douglas County residents. This is a critical mission and City service but would introduce traffic flow and security risks if it were part of a centralized facility. Hours of operation include Saturday, further compounding the potential security and traffic risks. An HHW facility could be included in a campus style format, but would require separate site security, separate parking and potentially separate stormwater treatment areas due to possible contamination. This would require a significant amount of site area and possibly limit the flexibility of the available site.



As the facility handles hazardous waste, there are building code complications that require either extreme physical separation or expensive construction to make this facility part of any combined structure.

Space needs include: administrative support spaces, personnel support spaces and facility support spaces, as well as mission critical spaces to meet the operational function.



Household Hazardous Waste Division
Adjacency Diagram

- Standardized Spaces
- Division Specific Spaces
- Shared Spaces

* Some shared spaces are defined in the Space Standards section

Household Hazardous Waste Division Space Needs Summary

ADMINISTRATIVE	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
DIV.1a - Building Entry / Vestibule *	100	10'x10'	1	100	
DIV.1b - Reception *	NA			-	
DIV.2 - Division Manager Office	NA			-	
DIV.3 - Supervisor Office	150	10' x 15'	1	150	
DIV.4 - Staff Office	NA			-	
DIV.5 - Field Staff Workstation / Open Office	162	6'x6' x (FTE+1/2PTE)	1	162	
DIV.6a - Small Conference Room *	NA			-	
DIV.6b - Standard Conference Room *	NA			-	
DIV.7 - Large Conference Room-Training Room *	NA			-	
DIV.8 - Copy Area / Document Work Room *	216	12' x 18'	1	216	
DIV.9 - Breakroom *	138	25 sf x Staff #	1	138	
DIV.10a - Universal Public Restroom *	72	8' x 9'	3	216	
DIV.10b - Men's Locker and Restroom *				-	
DIV.10c - Women's Locker and Restroom *				-	
DIV.10d - Wellness Room *	NA			-	
DIV.10e - IT Closet *	48	6' x 8'	1	48	
DIV.10f - Janitorial *	63	7' x 9'	2	126	
DIV.11 - General Storage / Supply Closets	100	10' x 10'	1	100	
DIV.12 - Mud Room / Wash Area	NA			-	
DIV.13 - General Computer Area *	NA			-	Central Computer area - See Also DIV.5 - Field Staff / Open Office
DIV.14 - Laundry Facility *	NA			-	
DIV.10g - Mechanical and Electrical Room	188	15% of supported	1	188	
ADMINISTRATIVE AREA SUBTOTAL				1,444	
CIRCULATION @ 30%				433	
TOTAL				1,877	

CONDITIONED VEHICLE STORAGE (WARM)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	0	0	Parking Spaces Only
Medium Space	288	12'x24'	0	0	Parking Spaces Only
Pickup Space	200	10'x20'	1	200	Parking Spaces Only
VEHICLE PARKING SUBTOTAL	200				
DOUBLE TRAFFIC LANE STORAGE INCREASE	240			440	Parking plus traffic lane serving parking
Mezzanine Storage				147	Maximum 1/3 of open storage area (IBC)
General Storage area				55	Area created by angled parking, used for small implement storage
CONDITIONED VEHICLE STORAGE SUBTOTAL				440	Parking plus traffic lane serving parking
CIRCULATION @ 15%				66	
TOTAL				561	Sum of parking and traffic lanes, plus additional circ and storage

* Sharing potential across Divisions

DIVISION OPERATION CRITICAL SPACES	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
HHW.1 - Material Storage and Processing	4,096	64' x 64'	1	4,096	
HHW.2 - Customer Drive Through	225	15' x 15' min.	1	225	
HHW.3 - Testing Lab	224	14' x 16'	1	224	
HHW.4 - Material Processing Office	48	8' x 6'	1	48	
HHW.5 - Corrosives and Water Reactive Storage	224	16' x 14'	1	224	
HHW.6 - Explosion and Fire Proof Room	448	16' x 28'	1	448	
HHW.7 - Bulk Fluids Room - Waste fluids	180	15' x 12'	1	180	
HHW.8 - Loading Dock	225	15' x 15'	2	450	
HHW.9 - Staff Work Area (See DIV.5)				0	
HHW.10 - Reuse Retail Area	1,000	20' x 50'	1	1,000	
HHW.11 - Customer Restrooms (See Div.10a)				0	
HHW.12 - General Operational Storage	600	30' x 20'	1	600	
HHW Division Opertion Critical Spaces	7,495				
DIVISION OPERATION SPACES SUBTOTAL				7,495	
CIRCULATION @ 30%				2,249	
TOTAL				9,744	

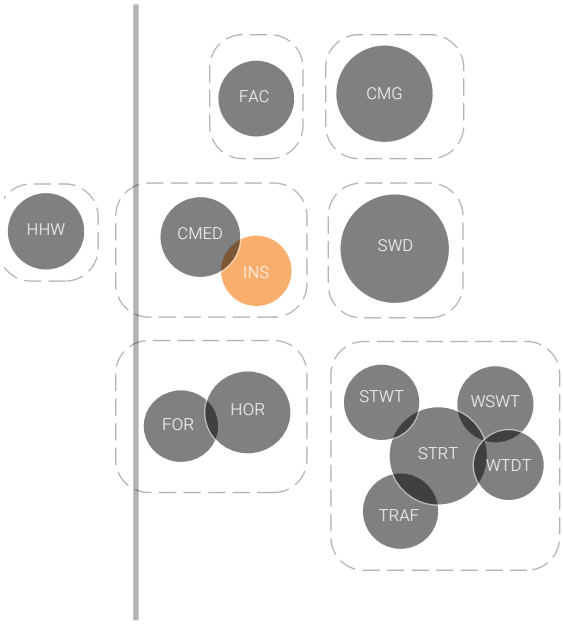
UNCONDITIONED VEHICLE STORAGE (COLD)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	0	0	Maximum 1/3 of open storage area (IBC)
Medium Space	288	12'x24'	0	0	Parking Spaces Only
Pickup Space	200	10'x20'	0	0	Parking Spaces Only
VEHICLE PARKING SUBTOTAL	0				
DOUBLE TRAFFIC LANE STORAGE INCREASE	0			0	Parking plus traffic lane serving parking
Mezzanine Storage				0	Maximum 1/3 of open storage area (IBC)
General Storage area				0	Area created by angled parking, used for small implement storage
UNCONDITIONED VEHICLE STORAGE SUBTOTAL				0	Parking plus traffic lane serving parking
CIRCULATION @ 15%				0	
TOTAL				0	Sum of parking and traffic lanes, plus additional circ and storage

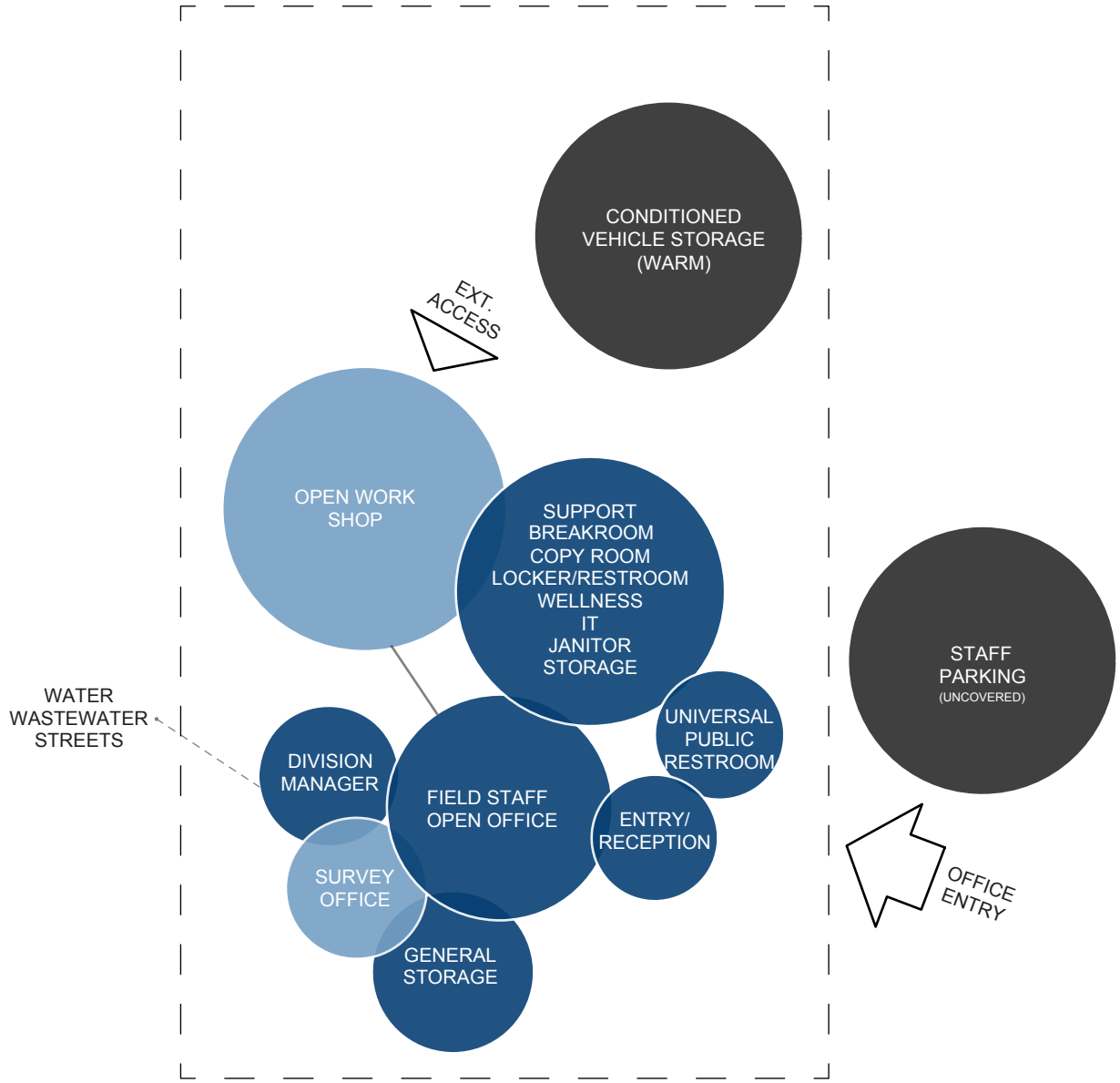
SITE PROGRAM REQUIREMENTS	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Staff Parking and Drive Aisle	284	9' x 18'	9	2,552	1 per staff on largest shift
Public Visitors	284	9' x 18'	17	4,725	
Exterior Equipment Parking Demands	288	12' x 24'	0	0	
ADA Space plus Aisle	306	9' x 18' +8' Aisle	2	612	
HHW.13 - Dumpster Containers	104	8' x 13'	3	312	
SITE PROGRAM SUB-TOTAL				8,201	
SITE CIRCULATION @ 150%				12,301	Accounts for access to all sides of separated site functions
TOTAL				20,501	

SITE AREA TOTALS					
MAIN BUILDING	12,181				
CIRCULATION AROUND BUILDING	4,872	50% of subtotal			
COLD STORAGE	0				
CIRCULATION AROUND BUILDING	0	25% of subtotal			
SITE PROGRAM REQUIREMENTS	20,501				
CIRCULATION AROUND BUILDING	10,251	50% of subtotal			
Program Totals	47,805				
25% GREEN SPACE	11,951				
Stormwater Management	11,951	25% of subtotal			
GRAND TOTAL SITE AREA NEEDED	93,220	2.78			*Total squarefootage and acreage, plus added 30% of programmed acreage for drainage paths, easements, setbacks, etc.*

INS - Inspections Division

Inspections' space needs are well suited for combining with other related MSO divisions at a central facility. There is a close operational relationship to most of the divisions. Space needs as identified are basically limited to office function based on staff hierarchy and number, meeting rooms, and staff support spaces such as break rooms and locker rooms. Vehicles would ideally be parked indoors but could be parked in an outdoor fleet lot. Inspections has a need for highly specialized, secure small equipment storage, and a small workshop to support maintenance of that equipment.





Inspections Division
Adjacency Diagram

- Standardized Spaces
- Division Specific Spaces
- Shared Spaces

* Some shared spaces are defined in the Space Standards section

Inspections Division Space Needs Summary

ADMINISTRATIVE	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
DIV.1a - Building Entry / Vestibule *	100	10'x10'	1	100	
DIV.1b - Reception *	NA			-	
DIV.2 - Division Manager Office	180	12' x 15'	1	180	
DIV.3 - Supervisor Office	NA			-	
DIV.4 - Staff Office	120	12' x 10'	1	120	
DIV.5 - Field Staff Workstation / Open Office	538	6'x6' x (FTE+1/2PTE)	1	538	
DIV.6a - Small Conference Room *	NA			-	
DIV.6b - Standard Conference Room *	NA			-	
DIV.7 - Large Conference Room-Training Room *	NA			-	
DIV.8 - Copy Area / Document Work Room *	216	12' x 18'	1	216	
DIV.9 - Breakroom *	375	25 sf x Staff #	1	375	
DIV.10a - Universal Public Restroom *	72	8' x 9'	2	144	
DIV.10b - Men's Locker and Restroom *	370	TBD	1	370	
DIV.10c - Women's Locker and Restroom *	258	TBD	1	258	
DIV.10d - Wellness Room *	168	12' x 14'	1	168	
DIV.10e - IT Closet *	48	6' x 8'	1	48	
DIV.10f - Janitorial *	63	7' x 9'	1	63	
DIV.11 - General Storage / Supply Closets	200	20' x 10'	1	200	
DIV.12 - Mud Room / Wash Area	96	8' x 12'	1	96	
DIV.13 - General Computer Area *	NA			-	Central Computer area - See Also DIV.5 - Field Staff / Open Office
DIV.14 - Laundry Facility *	NA			-	
DIV.10g - Mechanical and Electrical Room	431	15% of supported	1	-	
ADMINISTRATIVE AREA SUBTOTAL				2,876	
CIRCULATION @ 30%				863	
TOTAL				3,738	

CONDITIONED VEHICLE STORAGE (WARM)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	0	0	Parking Spaces Only
Medium Space	288	12'x24'	0	0	Parking Spaces Only
Pickup Space	200	10'x20'	0	0	Parking Spaces Only
VEHICLE PARKING SUBTOTAL	0				
DOUBLE TRAFFIC LANE STORAGE INCREASE	0			0	Parking plus traffic lane serving parking
Mezzanine Storage				0	Maximum 1/3 of open storage area (IBC)
General Storage area				0	Area created by angled parking, used for small implement storage
CONDITIONED VEHICLE STORAGE SUBTOTAL				0	Parking plus traffic lane serving parking
CIRCULATION @ 15%				0	
TOTAL				0	Sum of parking and traffic lanes, plus additional circ and storage

* Sharing potential across Divisions

DIVISION OPERATION CRITICAL SPACES	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
INS.1 - Open Work Shop	750	25' x 30'	1	750	
INS.2 - Surveyor Office - (See DIV.3)				0	
INS.3 - Common Office Area (See DIV.5)				0	
INS Division Opertion Critical Spaces	750				
DIVISION OPERATION SPACES SUBTOTAL				750	
CIRCULATION @ 30%				225	
TOTAL				975	

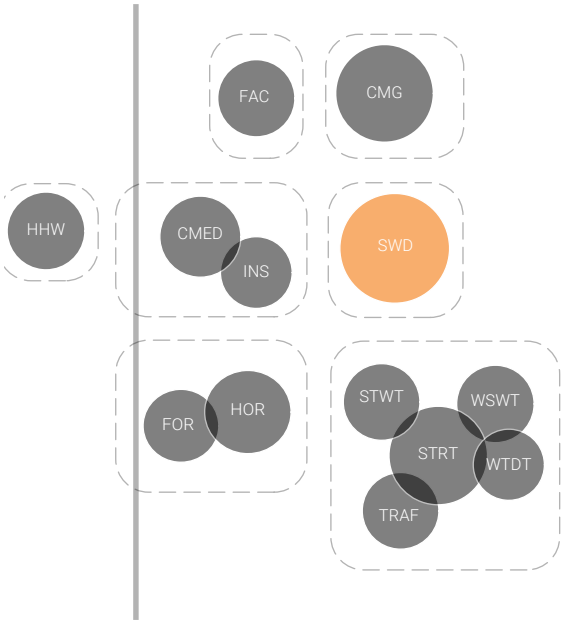
UNCONDITIONED VEHICLE STORAGE (COLD)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	0	0	Parking Spaces Only
Medium Space	288	12'x24'	0	0	Parking Spaces Only
Pickup Space	200	10'x20'	0	0	Parking Spaces Only
VEHICLE PARKING SUBTOTAL	0				
DOUBLE TRAFFIC LANE STORAGE INCREASE	0			0	Parking plus traffic lane serving parking
Mezzanine Storage				0	Maximum 1/3 of open storage area (IBC)
General Storage area				0	Area created by angled parking, used for small implement storage
UNCONDITIONED VEHICLE STORAGE SUBTOTAL				0	Maximum 1/3 of open storage area (IBC)
CIRCULATION @ 15%				0	
TOTAL				0	Sum of parking and traffic lanes, plus additional circ and storage

SITE PROGRAM REQUIREMENTS	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Staff Parking and Drive Aisle	284	9' x 18'	15	4,253	1 per staff on largest shift
Exterior Equipment Parking Demands	288	12' x 24'	14	4,147	
ADA Space plus Aisle	306	9' x 18' +8' Aisle	1	306	
SITE PROGRAM SUB-TOTAL				8,706	
SITE CIRCULATION @ 150%				13,059	Accounts for access to all sides of separated site functions
TOTAL				21,764	

SITE AREA TOTALS					
MAIN BUILDING	4,713				
CIRCULATION AROUND BUILDING	1,178	25% of subtotal			
COLD STORAGE	0				
CIRCULATION AROUND BUILDING	0	25% of subtotal			
SITE PROGRAM REQUIREMENTS	21,764				
CIRCULATION AROUND BUILDING	5,441	25% of subtotal			
Program Totals	33,097				
25% GREEN SPACE	8,274				
Stormwater Management	8,274	25% of subtotal			
GRAND TOTAL SITE AREA NEEDED	64,539	1.93			*Total squarefootage and acreage, plus added 30% of programmed acreage for drainage paths, easements, setbacks, etc.*

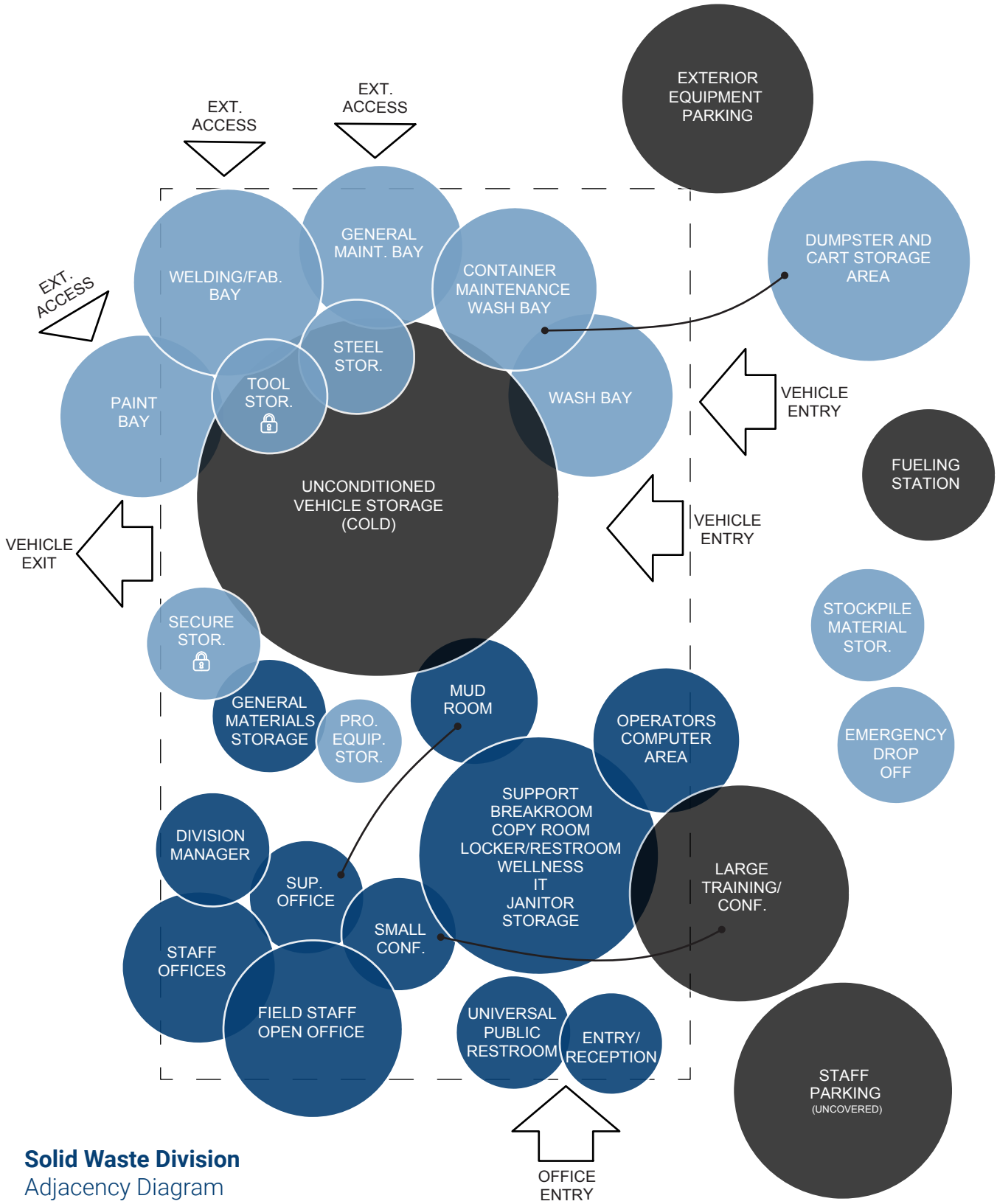
SWD – Solid Waste Division

Solid Waste has a unique operation that requires administrative, personnel and facility support spaces, as well as highly specialized workshop and service bay functions. Due to the nature of the operation (involving environmental and health contaminant concerns) it makes sense to physically separate this Division from others, although it can still be located at a centralized campus location. Functions that must remain separate include: equipment and vehicle washing, parking and storage, as well as staff entries, wash facilities, locker / restroom facilities.



The Solid Waste vehicle fleet should be stored in a manner to prolong vehicle and equipment life. This could be either an interior, ventilated conditioned space or simply covered storage. Equipment has many moving parts that needs protection from UV exposure (hydraulic hoses) and freezing.

Although key functions must be separated, training and large meeting facilities could potentially be shared. Some equipment general maintenance can be shared or immediately adjacent to CMG to utilize like resources such as welding and exhaust, bulk fluid resources, etc.



Solid Waste Division
Adjacency Diagram

- Standardized Spaces
- Division Specific Spaces
- Shared Spaces

* Some shared spaces are defined in the Space Standards section

Solid Waste Division Space Needs Summary

ADMINISTRATIVE	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
DIV.1a - Building Entry / Vestibule *	100	10'x10'	1	100	
DIV.1b - Reception *	NA			-	
DIV.2 - Division Manager Office	180	12' x 15'	1	180	
DIV.3 - Supervisor Office	150	10' x 15'	1	150	
DIV.4 - Staff Office	120	12' x 10'	6	720	
DIV.5 - Field Staff Workstation / Open Office	1,744	4' x 4' x Staff	1	1,744	
DIV.6a - Small Conference Room *	120	12' x 10'	3	360	
DIV.6b - Standard Conference Room *	NA			-	
DIV.7 - Large Conference Room-Training Room *	500	20' x 25'	1	500	
DIV.8 - Copy Area / Document Work Room *	216	12' x 18'	1	216	
DIV.9 - Breakroom *	2,725	25 sf x Staff #	1	2,725	
DIV.10a - Universal Public Restroom *	72	8' x 9'	2	144	
DIV.10b - Men's Locker and Restroom *	874	Varies	1	874	
DIV.10c - Women's Locker and Restroom *	656	Varies	1	656	
DIV.10d - Wellness Room *	168	12' x 14'	1	168	
DIV.10e - IT Closet *	48	6' x 8'	1	48	
DIV.10f - Janitorial *	63	7' x 9'	4	252	
DIV.11 - General Storage / Supply Closets	100	10' x 10'	3	300	
DIV.12 - Mud Room / Wash Area	160	16' x 10'	1	160	
DIV.13 - General Computer Area *	NA			-	Central Computer area - See Also DIV.5 - Field Staff / Open Office
DIV.14 - Laundry Facility *	225	15' X 15'	1	225	
DIV.10g - Mechanical and Electrical Room	1,428	15% of supported	1	1,428	
ADMINISTRATIVE AREA SUBTOTAL				10,950	
CIRCULATION @ 30%				3,285	
TOTAL				14,235	

CONDITIONED VEHICLE STORAGE (WARM)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	0	0	Parking Spaces Only
Medium Space	288	12'x24'	0	0	Parking Spaces Only
Pickup Space	200	10'x20'	0	0	Parking Spaces Only
VEHICLE PARKING SUBTOTAL	0				
DOUBLE TRAFFIC LANE STORAGE INCREASE	0			0	Parking plus traffic lane serving parking
Mezzanine Storage				0	Maximum 1/3 of open storage area (IBC)
General Storage area				0	Area created by angled parking, used for small implement storage
CONDITIONED VEHICLE STORAGE SUBTOTAL				0	Parking plus traffic lane serving parking
CIRCULATION @ 15%				0	
TOTAL				0	Sum of parking and traffic lanes, plus additional circ and storage

* Sharing potential across Divisions

DIVISION OPERATION CRITICAL SPACES	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
SWD.2 - Welding and Fabrication Bay	2,560	32' x 80'	5	12,800	
SWD.3 - General Maintenance Bay	1,680	30' x 56'	1	1,680	
SWD.4 - Paint Bay / Booth	1,680	30' x 56'	1	1,680	
SWD.5 - Wash Bay	1,680	30' x 56'	2	3,360	
SWD.6 - Container Maintenance Wash Bay	1,680	56' x 30'	1	1,680	
SWD.7 - General Materials Storage	448	16' x 28'	1	448	
SWD.8 - General Tool Storage	448	16' x 28'	1	448	
SWD.9 - Steel Stock Storage	200	10' x 20'	2	400	
SWD.10 - Personal Protective Equipment Storage	80	8' x 10'	1	80	
SWD Division Opertion Critical Spaces	22,576				
DIVISION OPERATION SPACES SUBTOTAL				22,576	
CIRCULATION @ 30%				6,773	
TOTAL				29,349	

UNCONDITIONED VEHICLE STORAGE (COLD)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	0	0	Parking Spaces Only
Medium Space	288	12'x24'	0	0	Parking Spaces Only
Pickup Space	200	10'x20'	0	0	Parking Spaces Only
					Maximum 1/3 of open storage area (IBC)
VEHICLE PARKING SUBTOTAL	0				
DOUBLE TRAFFIC LANE STORAGE INCREASE	0			0	Parking plus traffic lane serving parking
Mezzanine Storage				0	Maximum 1/3 of open storage area (IBC)
General Storage area				0	Area created by angled parking, used for small implement storage
				TOTAL	
UNCONDITIONED VEHICLE STORAGE SUBTOTAL				0	Parking plus traffic lane serving parking
CIRCULATION @ 15%				0	
TOTAL				0	Sum of parking and traffic lanes, plus additional circ and storage

SITE PROGRAM REQUIREMENTS	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Staff Parking and Drive Aisle	284	9' x 18'	109	30,902	1 per staff on largest shift
Exterior Equipment Parking Demands	288	12' x 24'	109	31,334	
ADA Space plus Aisle	306	9' x 18' +8' Aisle	4	1,334	
SWD.13 - Dumpster and Cart Storage Area	48,000	160' x 300'	1	48,000	
SWD.14 - Roll-Off Dumpster Storage				0	Exterior - Off Site
SWD.15/16 - Stock Pile Material Storage Bins	800	40' x 20'	2	1,600	
SWD. 17 - Emergency Container Drop Off	6,400	80' x 80'	1	6,400	
Fuel Island	1,500	30' x 50'	1	1,500	
SITE PROGRAM SUB-TOTAL				57,500	
SITE CIRCULATION @ 150%				86,250	Accounts for access to all sides of separated site functions
TOTAL				143,750	

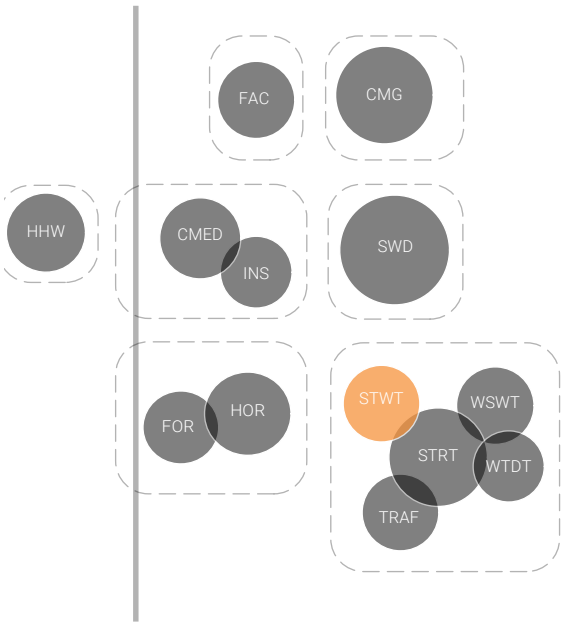
SITE AREA TOTALS					
MAIN BUILDING	43,584				
CIRCULATION AROUND BUILDING	43,584	25% of subtotal			
COLD STORAGE	0				
CIRCULATION AROUND BUILDING	0	12.5% of subtotal			
SITE PROGRAM REQUIREMENTS	143,750				
CIRCULATION AROUND BUILDING	17,969	12.5% of subtotal			
Program Totals	248,887				
25% GREEN SPACE	62,222				
Stormwater Management	62,222	25% of subtotal			
GRAND TOTAL SITE AREA NEEDED	485,330	14.48			*Total squarefootage and acreage, plus added 30% of programmed acreage for drainage paths, easements, setbacks, etc.*

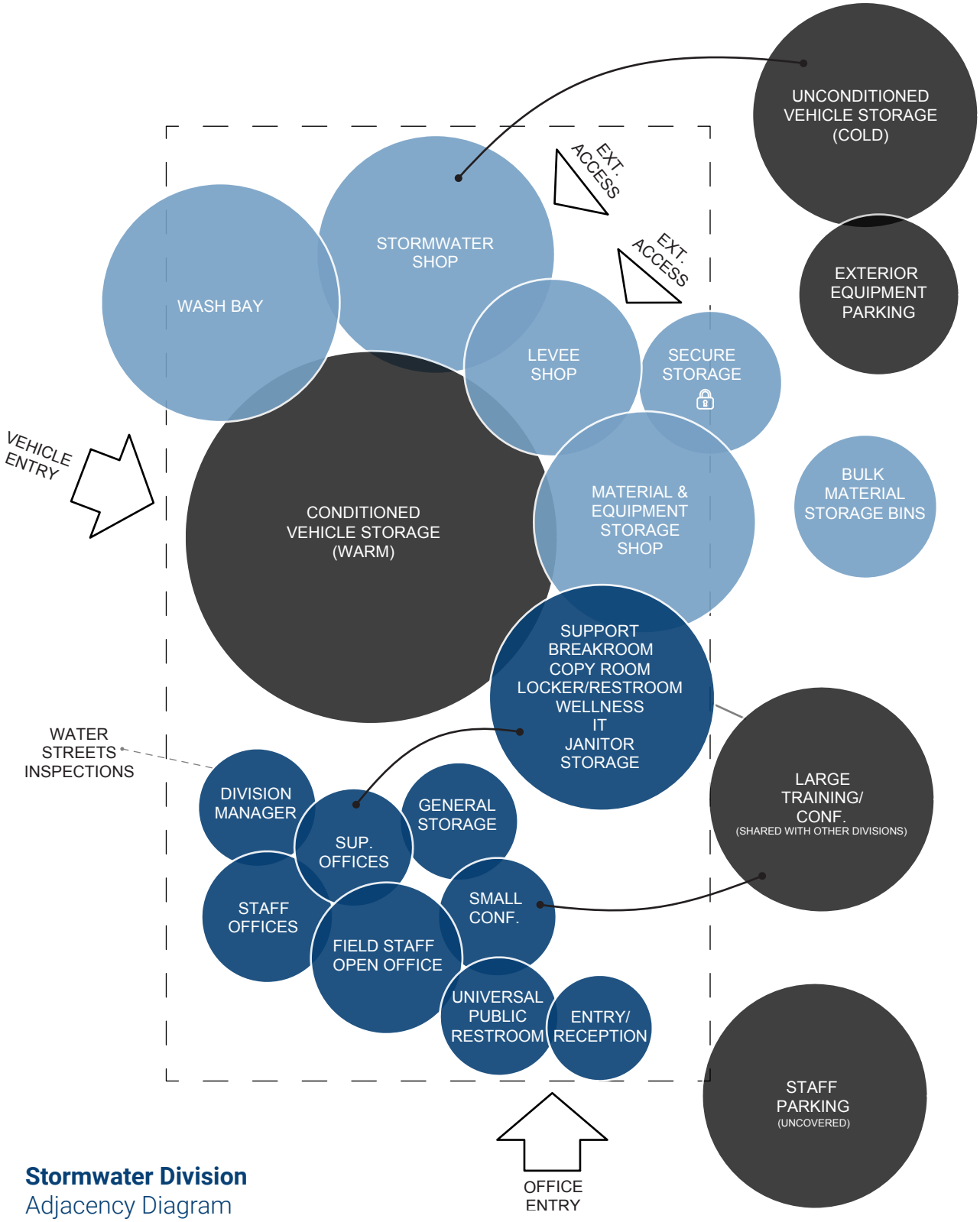
STWT – Stormwater Division

Stormwater has a significant amount of programmatic synergies with other MSO divisions, specifically Streets. There is a need for separated private offices for manager or supervisor positions, however, open office and administrative support spaces, break space, locker and restroom functions, meeting and training rooms can be combined with several like-function divisions to take advantage of those relationships.

As a singular division, there is a separate need for specialized workshop spaces for individualized work tasks. This would include a general purpose Stormwater Workshop, but also include support shops such as Levee Shop, Concrete Shop, etc.

Stormwater also has a need for warm vehicle storage, cold storage, outdoor and covered storage, as well as site storage areas to support operations.





Stormwater Division
Adjacency Diagram

- Standardized Spaces
- Division Specific Spaces
- Shared Spaces

* Some shared spaces are defined in the Space Standards section

Stormwater Division Space Needs Summary

ADMINISTRATIVE	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
DIV.1a - Building Entry / Vestibule *	100	10'x10'	1	100	
DIV.1b - Reception *	100	10' x 10'	0	0	
DIV.2 - Division Manager Office	180	12' x 15'	1	180	
DIV.3 - Supervisor Office	150	10' x 15'	2	300	
DIV.4 - Staff Office	120	12' x 10'	4	480	
DIV.5 - Field Staff Workstation / Open Office	324	6'x6' x (FTE+1/2PTE)	1	324	
DIV.6a - Small Conference Room *	120	12' x 10'	1	120	
DIV.6b - Standard Conference Room *	NA			-	
DIV.7 - Large Conference Room-Training Room *	500	20' x 25'	0	0	Not included in program, shared with another division
DIV.8 - Copy Area / Document Work Room *	216	12' x 18'	1	216	
DIV.9 - Breakroom *	400	25 sf x Staff #	1	400	
DIV.10a - Universal Public Restroom *	72	8' x 9'	1	72	
DIV.10b - Men's Locker and Restroom *	380	TBD	1	380	
DIV.10c - Women's Locker and Restroom *	260	TBD	1	260	
DIV.10d - Wellness Room *	168	12' x 14'	1	168	
DIV.10e - IT Closet *	48	6' x 8'	1	48	
DIV.10f - Janitorial *	63	7' x 9'	1	63	
DIV.11 - General Storage / Supply Closets	100	10' x 10'	3	300	
DIV.12 - Mud Room / Wash Area	96	8' x 12'	1	96	
DIV.13 - General Computer Area *	NA			-	Central Computer area - See Also DIV.5 - Field Staff / Open Office
DIV.14 - Laundry Facility *	NA			-	
DIV.10g - Mechanical and Electrical Room	526	15% of supported	1	526	
ADMINISTRATIVE AREA SUBTOTAL				4,033	
CIRCULATION @ 30%				1,210	
TOTAL				5,243	

CONDITIONED VEHICLE STORAGE (WARM)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	13	11,520	Parking Spaces Only
Medium Space	288	12'x24'	8	2,304	Parking Spaces Only
Pickup Space	200	10'x20'	2	400	Parking Spaces Only
VEHICLE PARKING SUBTOTAL	14,224				
DOUBLE TRAFFIC LANE STORAGE INCREASE	17,069			31,293	Parking plus traffic lane serving parking
Mezzanine Storage				10,431	Maximum 1/3 of open storage area (IBC)
General Storage area				3,912	Area created by angled parking, used for small implement storage
CONDITIONED VEHICLE STORAGE SUBTOTAL				31,293	Parking plus traffic lane serving parking
CIRCULATION @ 15%				4,694	
TOTAL				39,898	Sum of parking and traffic lanes, plus additional circ and storage

* Sharing potential across Divisions

DIVISION OPERATION CRITICAL SPACES	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
STWT.2 - Stormwater Shop	800	20' x 40'	1	800	
STWT.3 - Levee Shop	900	30' x 30'	1	900	
STWT.4 - Secure Storage	256	16' x 16'	1	256	
STWT.5 - Material and Equipment Storage Shop	1,350	45' x 30'	1	1,350	
STWT.6 - Wash Bay	1,680	30' x 56'	1	1,680	
STWT Division Opertion Critical Spaces	4,986				
DIVISION OPERATION SPACES SUBTOTAL				4,986	
CIRCULATION @ 30%				1,496	
TOTAL				6,482	

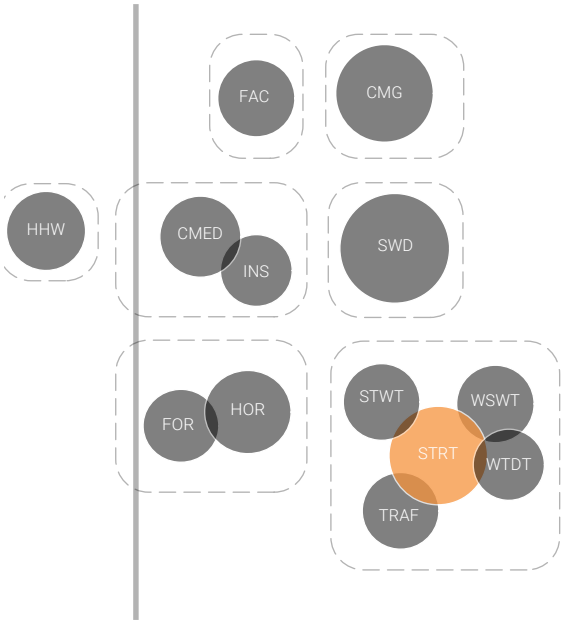
UNCONDITIONED VEHICLE STORAGE (COLD)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	0	0	Parking Spaces Only
Medium Space	288	12'x24'	5	1,382	Parking Spaces Only
Pickup Space	200	10'x20'	16	3,120	Parking Spaces Only
VEHICLE PARKING SUBTOTAL	4,502				
DOUBLE TRAFFIC LANE STORAGE INCREASE	5,403			9,905	Parking plus traffic lane serving parking
Mezzanine Storage				3,302	Maximum 1/3 of open storage area (IBC)
General Storage area				1,238	Maximum 1/3 of open storage area (IBC)
UNCONDITIONED VEHICLE STORAGE SUBTOTAL				9,905	Parking plus traffic lane serving parking
CIRCULATION @ 15%				1,486	
TOTAL				12,629	Sum of parking and traffic lanes, plus additional circ and storage

SITE PROGRAM REQUIREMENTS	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Staff Parking and Drive Aisle	284	9' x 18'	16	4,536	1 per staff on largest shift
Exterior Equipment Parking Demands	288	12' x 24'	13	3,686	
ADA Space plus Aisle	306	9' x 18' +8' Aisle	1	306	
STWT.7 - Exterior Fleet Parking				0	
STWT.8 - Stormsewer Pipe and Precast Stock				0	
STWT.8 & .9 - Bulk Material Storage Bins	800	40' x 20'	8	6,400	
SITE PROGRAM SUB-TOTAL				10,392	
SITE CIRCULATION @ 150%				15,589	Accounts for access to all sides of separated site functions
TOTAL				25,981	

SITE AREA TOTALS					
MAIN BUILDING	51,623				
CIRCULATION AROUND BUILDING	12,906	25% of subtotal			
COLD STORAGE	12,629				
CIRCULATION AROUND BUILDING	3,157	25% of subtotal			
SITE PROGRAM REQUIREMENTS	25,981				
CIRCULATION AROUND BUILDING	6,495	25% of subtotal			
Program Totals	112,792				
25% GREEN SPACE	28,198				
Stormwater Management	28,198	25% of subtotal			
GRAND TOTAL SITE AREA NEEDED	219,944	6.56			*Total squarefootage and acreage, plus added 30% of programmed acreage for drainage paths, easements, setbacks, etc.*

STRT - Streets Division

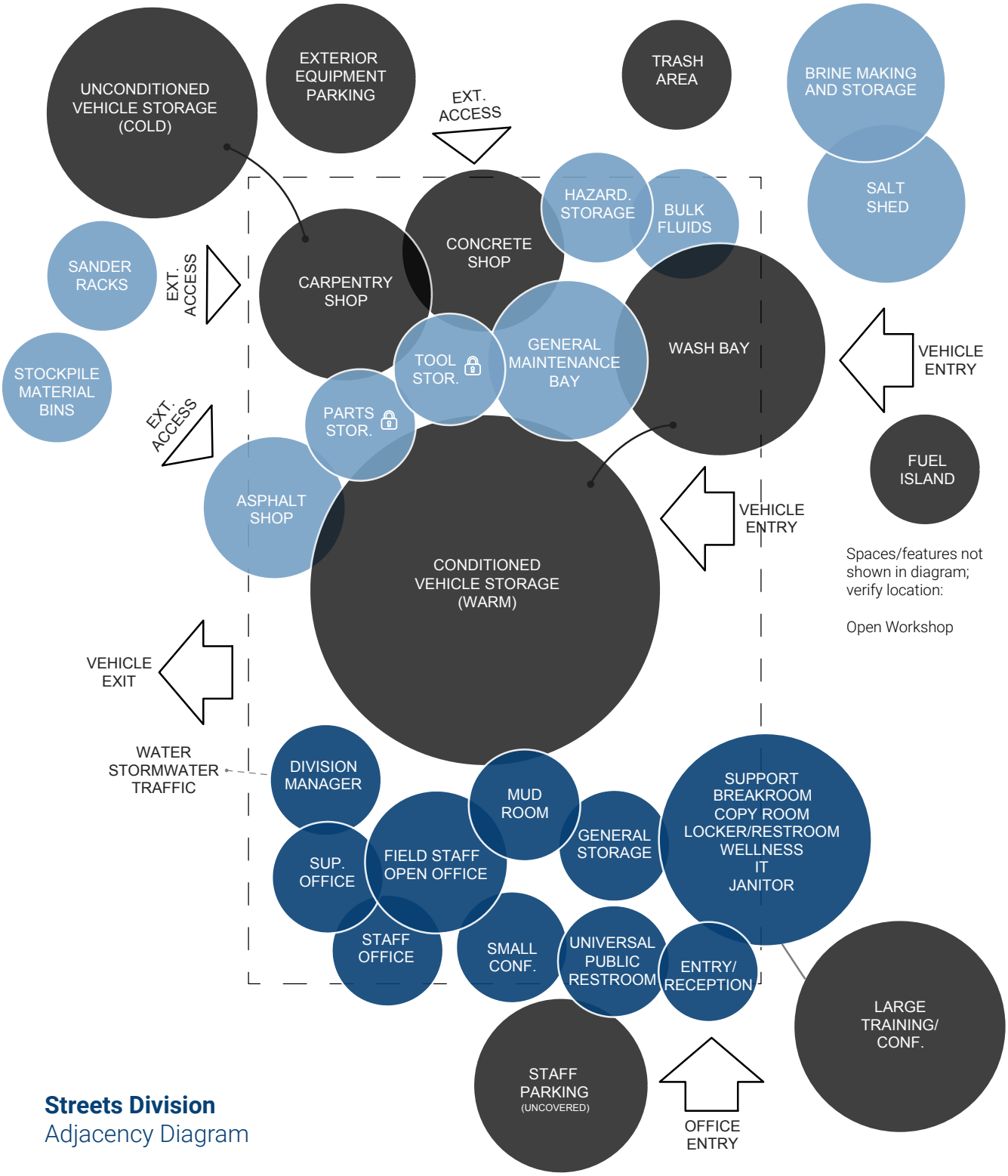
Streets has a significant amount of programmatic synergies with other MSO divisions, specifically Stormwater, and Traffic. There is a need for separated private offices for manager or supervisor positions, however, open office and administrative support spaces, break space, locker and restroom functions, meeting and training rooms can be combined with several like-function divisions to take advantage of those relationships.



As a singular division, there is a separate need for specialized workshop spaces for individualized work tasks. This could include a general purpose Streets Workshop, in addition to support shops such as a daily vehicle inspection and service bay (outside of Central Maintenance Garage), Asphalt Shop, Concrete Shop, Sign and Barricade Shop (double use as carpentry shop), etc.

Streets has a significant need for warm vehicle storage, cold storage, outdoor and covered storage, as well as site storage areas to support operations, based on operational best practices for storage and handling of the current and anticipated future vehicle and equipment inventory.

Streets employees work 12 hour shifts from 12 to 12. This may factor into amenities provided and facility access for this Division.



Streets Division
Adjacency Diagram

- Standardized Spaces
- Division Specific Spaces
- Shared Spaces

* Some shared spaces are defined in the Space Standards section

Streets Division Space Needs Summary

ADMINISTRATIVE	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
DIV.1a - Building Entry / Vestibule *	100	10'x10'	1	100	
DIV.1b - Reception *	100	10' x 10'	1	100	
DIV.2 - Division Manager Office	180	12' x 15'	1	180	
DIV.3 - Supervisor Office	150	10' x 15'	1	150	
DIV.4 - Staff Office	120	12' x 10'	1	120	
DIV.5 - Field Staff Workstation / Open Office	1,296	6'x6' x (FTE+1/2PTE)	1	1,296	
DIV.6a - Small Conference Room *	120	12' x 10'	2	240	
DIV.6b - Standard Conference Room *	NA			-	
DIV.7 - Large Conference Room-Training Room *	500	20' x 25'	1	500	
DIV.8 - Copy Area / Document Work Room *	216	12' x 18'	1	216	
DIV.9 - Breakroom *	975	25 sf x Staff #	1	975	
DIV.10a - Universal Public Restroom *	72	8' x 9'	2	144	
DIV.10b - Men's Locker and Restroom *	610	Varies	1	610	
DIV.10c - Women's Locker and Restroom *	318	Varies	1	318	
DIV.10d - Wellness Room *	168	12' x 14'	2	336	
DIV.10e - IT Closet *	48	6' x 8'	1	48	
DIV.10f - Janitorial *	63	7' x 9'	1	63	
DIV.11 - General Storage / Supply Closets	100	10' x 10'	3	300	
DIV.12 - Mud Room / Wash Area	96	8' x 12'	1	96	
DIV.13 - General Computer Area *	NA			-	Central Computer area - See Also DIV.5 - Field Staff / Open Office
DIV.14 - Laundry Facility *	100	10' x 10'	1	100	
DIV.10g - Mechanical and Electrical Room	884	15% of supported	1	884	
ADMINISTRATIVE AREA SUBTOTAL				6,775	
CIRCULATION @ 30%				2,033	
TOTAL				8,808	

CONDITIONED VEHICLE STORAGE (WARM)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	19	17,280	Parking Spaces Only
Medium Space	288	12'x24'	13	3,686	Parking Spaces Only
Pickup Space	200	10'x20'	4	800	Parking Spaces Only
VEHICLE PARKING SUBTOTAL	21,766				
DOUBLE TRAFFIC LANE STORAGE INCREASE	26,120			47,886	Parking plus traffic lane serving parking
Mezzanine Storage				15,962	Maximum 1/3 of open storage area (IBC)
General Storage area				5,986	Area created by angled parking, used for small implement storage
CONDITIONED VEHICLE STORAGE SUBTOTAL				47,886	Parking plus traffic lane serving parking
CIRCULATION @ 15%				7,183	
TOTAL				61,055	Sum of parking and traffic lanes, plus additional circ and storage

* Sharing potential across Divisions

DIVISION OPERATION CRITICAL SPACES	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
STRT.2 - General Maintenance Bay	1,680	30' x 56'	1	1,680	
STRT.3 - Asphalt Shop	1,200	20' x 60'	1	1,200	
STRT.4 - Carpentry / Wood Fabrication Shop	900	30' x 30'	1	900	
STRT.5 - Concrete Shop	960	40' x 24'	1	960	
STRT.6 - Hazardous Storage	450	15' x 30'	1	450	
STRT.7 - Wash Bay	1,680	30' x 56'	1	1,680	
STRT.8 - Parts Storage	224	16' x 14'	1	224	
STRT.9 - Tool Storage	224	16' x 14'	1	224	
STRT.10 - Bulk Fluids Room	192	16' x 12'	1	192	
STRT Division Opertion Critical Spaces	7,510				
DIVISION OPERATION SPACES SUBTOTAL				7,510	
CIRCULATION @ 30%				2,253	
TOTAL				9,763	

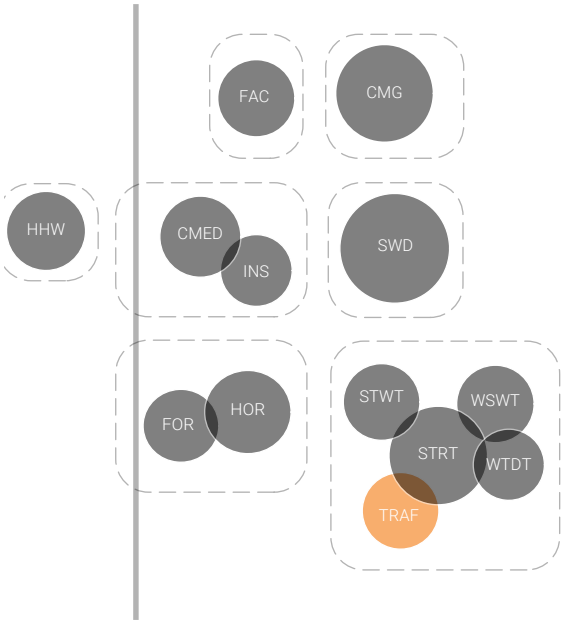
UNCONDITIONED VEHICLE STORAGE (COLD)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	0	0	Parking Spaces Only
Medium Space	288	12'x24'	3	922	Parking Spaces Only
Pickup Space	200	10'x20'	16	3,200	Parking Spaces Only
					Maximum 1/3 of open storage area (IBC)
VEHICLE PARKING SUBTOTAL	4,122				
DOUBLE TRAFFIC LANE STORAGE INCREASE	4,946			9,068	Parking plus traffic lane serving parking
Mezzanine Storage				3,023	Maximum 1/3 of open storage area (IBC)
General Storage area				1,133	Area created by angled parking, used for small implement storage
UNCONDITIONED VEHICLE STORAGE SUBTOTAL				9,068	Parking plus traffic lane serving parking
CIRCULATION @ 15%				1,360	
TOTAL				11,561	Sum of parking and traffic lanes, plus additional circ and storage

SITE PROGRAM REQUIREMENTS	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Staff Parking and Drive Aisle	284	9' x 18'	39	11,057	1 per staff on largest shift
Exterior Equipment Parking Demands	288	12' x 24'	28	7,949	
ADA Space plus Aisle	306	9' x 18' +8' Aisle	2	477	
DIV.15 - Trash Area	900	30'x30' (can vary)	1	900	
STRT.12 - Sander Racks	180	10' x 18'	36	6,480	
STRT.14 - Salt and Sand Mixing	4,800	60' x 80'	1	4,800	
STRT.15 - Salt Shed	8,000	100' x 80'	1	8,000	
STRT.16 - Stock Pile Material Bins	800	40' x 20'	8	6,400	
STRT.17 - Brine Making and Storage	1,920	40' x 48'	1	1,920	
Fuel Island	1,500	30' x 50'	1	1,500	
SITE PROGRAM SUB-TOTAL				29,100	
SITE CIRCULATION @ 150%				43,650	Accounts for access to all sides of separated site functions
TOTAL				72,750	

SITE AREA TOTALS					
MAIN BUILDING	79,626				
CIRCULATION AROUND BUILDING	19,906				
COLD STORAGE	11,561				
CIRCULATION AROUND BUILDING	2,890	25% of subtotal			
SITE PROGRAM REQUIREMENTS	72,750				
CIRCULATION AROUND BUILDING	18,188	25% of subtotal			
Program Totals	204,921				
25% GREEN SPACE	51,230				
Stormwater Management	51,230	25% of subtotal			
GRAND TOTAL SITE AREA NEEDED	399,596	11.93			*Total squarefootage and acreage, plus added 30% of programmed acreage for drainage paths, easements, setbacks, etc.*

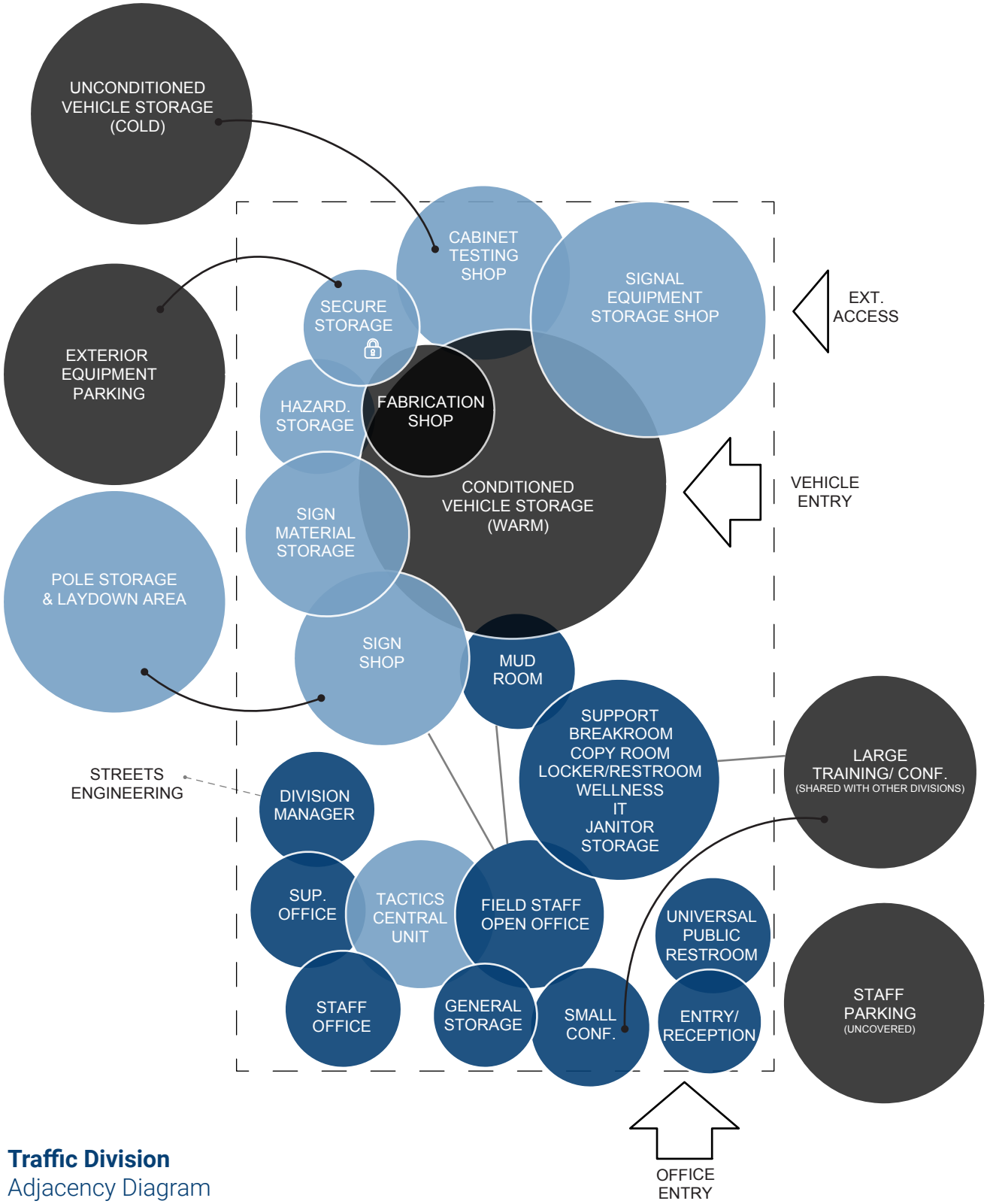
TRAF – Traffic Division

Traffic has a significant amount of programmatic synergies with other MSO divisions, specifically Streets. There is a need for separated private offices for manager or supervisor positions, however, open office and administrative support spaces, break space, locker and restroom functions, meeting and training rooms can be combined with several like function divisions to take advantage of those relationships.



As a singular division, there is a separate need for specialized workshop spaces for specialized work tasks. This could include a general purpose Traffic Workshop, but also include support shops such as Signal Shop, Sign Making and Storage, etc.

Traffic has a need for warm vehicle storage, cold storage, outdoor and covered storage, as well as site storage areas to support operations, based on operational best practices for storage and handling of the current and anticipated future vehicle and equipment inventory.



Traffic Division
Adjacency Diagram

- Standardized Spaces
- Division Specific Spaces
- Shared Spaces

* Some shared spaces are defined in the Space Standards section

Traffic Division Space Needs Summary

ADMINISTRATIVE	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
DIV.1a - Building Entry / Vestibule *	100	10'x10'	1	100	
DIV.1b - Reception *	100	10' x 10'	1	100	
DIV.2 - Division Manager Office	180	12' x 15'	1	180	
DIV.3 - Supervisor Office	150	10' x 15'	1	150	
DIV.4 - Staff Office	120	12' x 10'	2	240	
DIV.5 - Field Staff Workstation / Open Office	216	6'x6' x (FTE+1/2PTE)	1	216	
DIV.6a - Small Conference Room *	120	12' x 10'	1	120	
DIV.6b - Standard Conference Room *	NA			-	
DIV.7 - Large Conference Room-Training Room *	500	20' x 25'	0	0	Not included in program, shared with another division
DIV.8 - Copy Area / Document Work Room *	216	12' x 18'	1	180	
DIV.9 - Breakroom *	250	25 sf x Staff #	1	250	
DIV.10a - Universal Public Restroom *	72	8' x 9'	2	144	
DIV.10b - Men's Locker and Restroom *	320	Varies	1	320	
DIV.10c - Women's Locker and Restroom *	245	Varies	1	245	
DIV.10d - Wellness Room *	168	12' x 14'	1	168	
DIV.10e - IT Closet *	48	6' x 8'	1	48	
DIV.10f - Janitorial *	63	7' x 9'	1	63	
DIV.11 - General Storage / Supply Closets	100	10' x 10'	1	100	
DIV.12 - Mud Room / Wash Area	96	8' x 12'	1	96	
DIV.13 - General Computer Area *	NA			-	Central Computer area - See Also DIV.5 - Field Staff / Open Office
DIV.14 - Laundry Facility *	NA			-	
DIV.10g - Mechanical and Electrical Room	408	15% of supported	1	408	
ADMINISTRATIVE AREA SUBTOTAL				3,128	
CIRCULATION @ 30%				938	
TOTAL				4,066	

CONDITIONED VEHICLE STORAGE (WARM)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	0	0	Parking Spaces Only
Medium Space	288	12'x24'	6	1,843	Parking Spaces Only
Pickup Space	200	10'x20'	4	800	Parking Spaces Only
VEHICLE PARKING SUBTOTAL	2,643				
DOUBLE TRAFFIC LANE STORAGE INCREASE	3,172			5,815	Parking plus traffic lane serving parking
Mezzanine Storage				1,938	Maximum 1/3 of open storage area (IBC)
General Storage area				727	Area created by angled parking, used for small implement storage
				TOTAL	
CONDITIONED VEHICLE STORAGE SUBTOTAL				5,815	Parking plus traffic lane serving parking
CIRCULATION @ 15%				872	
TOTAL				7,414	Sum of parking and traffic lanes, plus additional circ and storage

* Sharing potential across Divisions

DIVISION OPERATION CRITICAL SPACES	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
TRAF.2 - Fabrication Shop	750	25' x 30'	1	750	
TRAF.3 - Sign Shop	1,500	30' x 50'	1	1,500	
TRAF.4 - Sign Making Material Storage	1,600	40' x 40'	1	1,600	
TRAF.5 - Signal Equipment Storage Shop	4,000	50' x 80'	1	4,000	
TRAF.6 - Cabinet Testing Shop	300	15' x 20'	1	300	
TRAF.7 - Tactics Central Unit	400	20' x 20'	1	400	
TRAF.8 - Secure Storage	256	16' x 16'	1	256	
TRAF.9 - Hazardous Storage	450	15' x 30'	1	450	
TRAF Division Opertion Critical Spaces	9,256				
DIVISION OPERATION SPACES SUBTOTAL				9,256	
CIRCULATION @ 30%				2,777	
TOTAL				12,033	

UNCONDITIONED VEHICLE STORAGE (COLD)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	0	0	Parking Spaces Only
Medium Space	288	12'x24'	0	0	Parking Spaces Only
Pickup Space	200	10'x20'	0	0	Parking Spaces Only
					Maximum 1/3 of open storage area (IBC)
VEHICLE PARKING SUBTOTAL	0				
DOUBLE TRAFFIC LANE STORAGE INCREASE	0			0	Parking plus traffic lane serving parking
Mezzanine Storage				0	Maximum 1/3 of open storage area (IBC)
General Storage area				0	Area created by angled parking, used for small implement storage
UNCONDITIONED VEHICLE STORAGE SUBTOTAL				0	Parking plus traffic lane serving parking
CIRCULATION @ 15%				0	
TOTAL				0	Sum of parking and traffic lanes, plus additional circ and storage

SITE PROGRAM REQUIREMENTS	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Staff Parking and Drive Aisle	284	9' x 18'	10	2,835	1 per staff on largest shift
Exterior Equipment Parking Demands	288	12' x 24'	6	1,843	
ADA Space plus Aisle	306	9' x 18' +8' Aisle	1	306	
TRAF.10 - Exterior Fleet Parking	0	0	0	0	
TRAF.12 - Pole Storage and Laydown Area	3,000	100' x 30'	1	3,000	
SITE PROGRAM SUB-TOTAL				7,984	
SITE CIRCULATION @ 150%				11,976	Accounts for access to all sides of separated site functions
TOTAL				19,961	

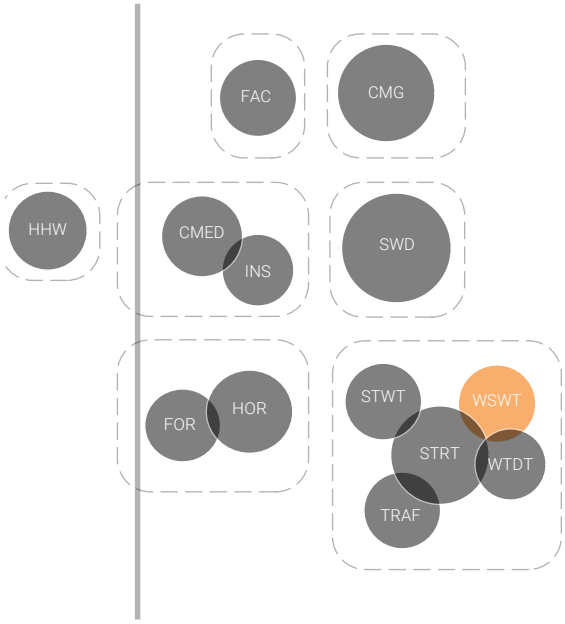
SITE AREA TOTALS					
MAIN BUILDING	23,513				
CIRCULATION AROUND BUILDING	5,878	25% of subtotal			
COLD STORAGE	0				
CIRCULATION AROUND BUILDING	0	25% of subtotal			
SITE PROGRAM REQUIREMENTS	19,961				
CIRCULATION AROUND BUILDING	4,990	25% of subtotal			
Program Totals	54,342				
25% GREEN SPACE	13,586				
Stormwater Management	13,586	25% of subtotal			
GRAND TOTAL SITE AREA NEEDED	105,968	3.16			*Total squarefootage and acreage, plus added 30% of programmed acreage for drainage paths, easements, setbacks, etc.*

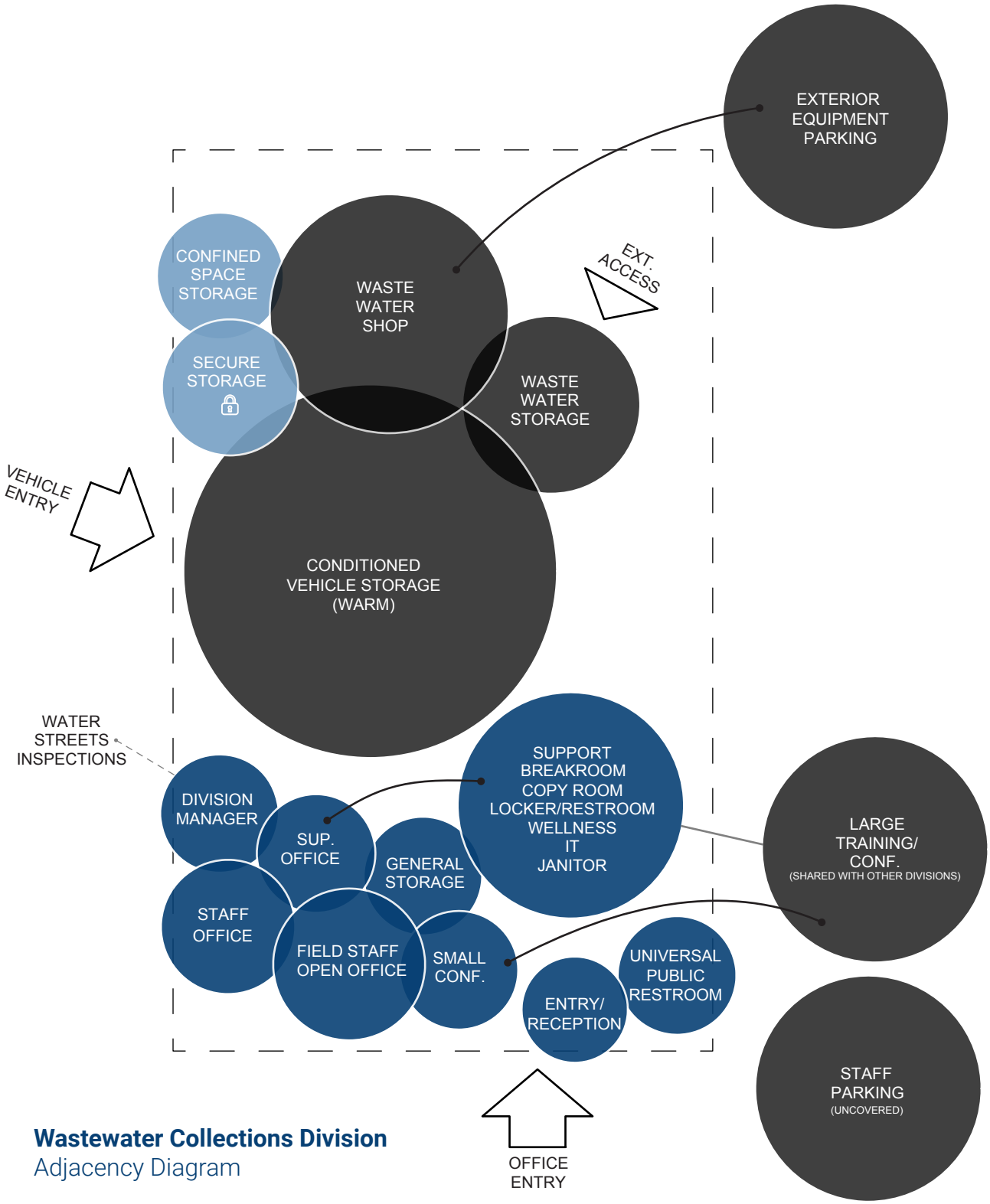
WSWT – Wastewater Collections Division

Wastewater has a significant amount of programmatic synergies with other MSO divisions, specifically Water Distribution. There is a need for separated private offices for manager or supervisor positions, however, open office and administrative support spaces, break space, locker and restroom functions, meeting and training rooms can be combined with several like function divisions to take advantage of those relationships.

As a singular division, there is a separate need for specialized workshop spaces for individualized work tasks. This would include a general purpose Wastewater Workshop but could also utilize other specialized workshops listed under other divisions, as well as mezzanine level storage.

Wastewater has a need for warm vehicle storage, minimal cold storage, outdoor and covered storage, as well as site storage areas to support operations, based on operational best practices for storage and handling of the current and anticipated future vehicle and equipment inventory.





Wastewater Collections Division
Adjacency Diagram

- Standardized Spaces
- Division Specific Spaces
- Shared Spaces

* Some shared spaces are defined in the Space Standards section

Wastewater Division Space Needs Summary

ADMINISTRATIVE	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
DIV.1a - Building Entry / Vestibule *	100	10'x10'	1	100	
DIV.1b - Reception *	100	10' x 10'	0	0	
DIV.2 - Division Manager Office	180	12' x 15'	1	180	
DIV.3 - Supervisor Office	150	10' x 15'	1	150	
DIV.4 - Staff Office	120	12' x 10'	1	120	
DIV.5 - Field Staff Workstation / Open Office	468	6'x6' x (FTE+1/2PTE)	1	468	
DIV.6a - Small Conference Room *	120	12' x 10'	1	120	
DIV.6b - Standard Conference Room *	NA			-	
DIV.7 - Large Conference Room-Training Room *	500	20' x 25'	0	0	Not included in program, shared with another division
DIV.8 - Copy Area / Document Work Room *	216	12' x 18'	1	216	
DIV.9 - Breakroom *	400	25 sf x Staff #	1	400	
DIV.10a - Universal Public Restroom *	72	8' x 9'	2	144	
DIV.10b - Men's Locker and Restroom *	340	Varies	1	340	
DIV.10c - Women's Locker and Restroom *	260	Varies	1	260	
DIV.10d - Wellness Room *	168	12' x 14'	1	168	
DIV.10e - IT Closet *	48	6' x 8'	1	48	
DIV.10f - Janitorial *	63	7' x 9'	1	63	
DIV.11 - General Storage / Supply Closets	100	10' x 10'	1	100	
DIV.12 - Mud Room / Wash Area	96	8' x 12'	1	96	
DIV.13 - General Computer Area *	NA			-	Central Computer area - See Also DIV.5 - Field Staff / Open Office
DIV.14 - Laundry Facility *	NA			-	
DIV.10g - Mechanical and Electrical Room	417	15% of supported	1	417	
ADMINISTRATIVE AREA SUBTOTAL				3,390	
CIRCULATION @ 30%				1,017	
TOTAL				4,406	

CONDITIONED VEHICLE STORAGE (WARM)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	3	2,880	Parking Spaces Only
Medium Space	288	12'x24'	11	3,226	Parking Spaces Only
Pickup Space	200	10'x20'	0	0	Parking Spaces Only
VEHICLE PARKING SUBTOTAL	6,106				
DOUBLE TRAFFIC LANE STORAGE INCREASE	7,327			13,432	Parking plus traffic lane serving parking
Mezzanine Storage				4,477	Maximum 1/3 of open storage area (IBC)
General Storage area				1,679	Area created by angled parking, used for small implement storage
CONDITIONED VEHICLE STORAGE SUBTOTAL				13,432	Parking plus traffic lane serving parking
CIRCULATION @ 15%				2,015	
TOTAL				17,126	Sum of parking and traffic lanes, plus additional circ and storage

* Sharing potential across Divisions

DIVISION OPERATION CRITICAL SPACES	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
WSWT.2 - Wastewater Shop	400	20' x 20'	1	400	
WSWT.3 - Wastewater Storage Area	200	20' x 10'	1	200	
WSWT.4 - Secure Storage	256	16' x 16'	1	256	
WSWT.5 - Confined Space Storage Unit	64	8' x 8'	1	64	
WSWT Division Opertion Critical Spaces	920				
DIVISION OPERATION SPACES SUBTOTAL				920	
CIRCULATION @ 30%				276	
TOTAL				1,196	

UNCONDITIONED VEHICLE STORAGE (COLD)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	0	0	Parking Spaces Only
Medium Space	288	12'x24'	0	0	Parking Spaces Only
Pickup Space	200	10'x20'	0	0	Parking Spaces Only
VEHICLE PARKING SUBTOTAL	0				
DOUBLE TRAFFIC LANE STORAGE INCREASE	0			0	Parking plus traffic lane serving parking
Mezzanine Storage				0	Maximum 1/3 of open storage area (IBC)
General Storage area				0	Area created by angled parking, used for small implement storage
					Maximum 1/3 of open storage area (IBC)
UNCONDITIONED VEHICLE STORAGE SUBTOTAL				0	Parking plus traffic lane serving parking
CIRCULATION @ 15%				0	
TOTAL				0	Sum of parking and traffic lanes, plus additional circ and storage

SITE PROGRAM REQUIREMENTS	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Staff Parking and Drive Aisle	284	9' x 18'	16	4,536	1 per staff on largest shift
Exterior Equipment Parking Demands	288	12' x 24'	0	0	
ADA Space plus Aisle	306	9' x 18' +8' Aisle	1	306	
SITE PROGRAM SUB-TOTAL				4,842	
SITE CIRCULATION @ 150%				7,263	Accounts for access to all sides of separated site functions
TOTAL				12,105	

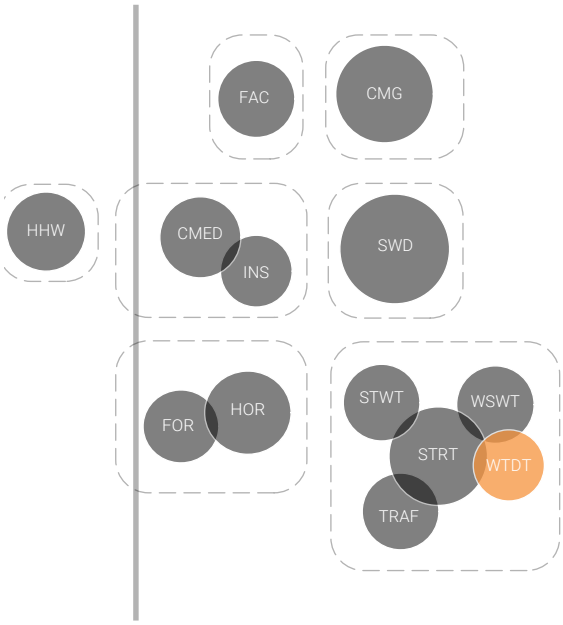
SITE AREA TOTALS					
MAIN BUILDING	22,729				
CIRCULATION AROUND BUILDING	5,682	25% of subtotal			
COLD STORAGE	0				
CIRCULATION AROUND BUILDING	0	25% of subtotal			
SITE PROGRAM REQUIREMENTS	12,105				
CIRCULATION AROUND BUILDING	3,026	25% of subtotal			
Program Totals	43,542				
25% GREEN SPACE	10,886				
Stormwater Management	10,886	25% of subtotal			
GRAND TOTAL SITE AREA NEEDED	84,907	2.53			*Total squarefootage and acreage, plus added 30% of programmed acreage for drainage paths, easements, setbacks, etc.*

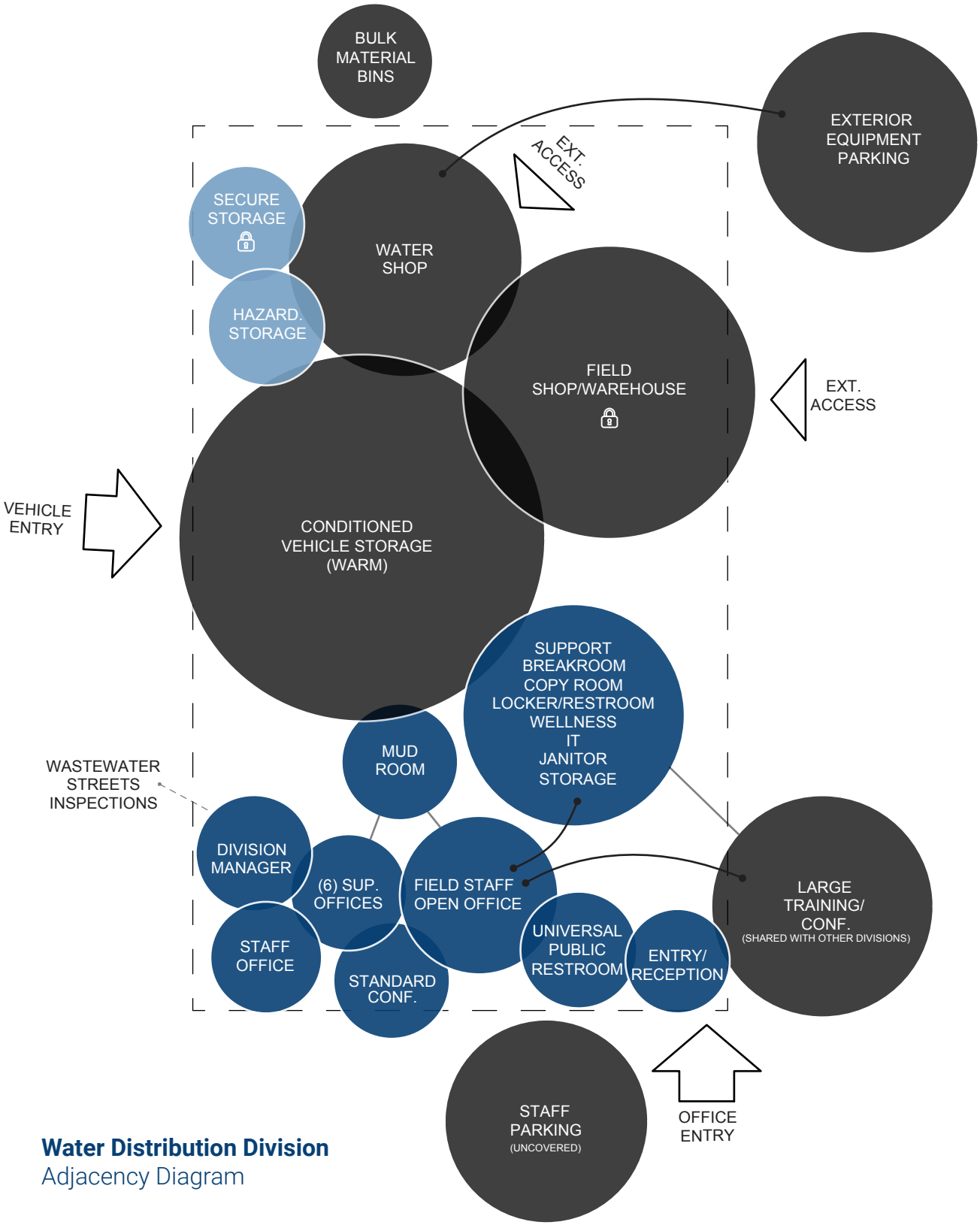
WTDT – Water Distribution Division

Water has a significant amount of programmatic synergies with other MSO divisions, specifically Streets and Wastewater Collections. There is a need for separated private offices for manager or supervisor positions, however, open office and administrative support spaces, break space, locker and restroom functions, meeting and training rooms can be combined with several like function divisions to take advantage of those relationships.

As a singular division, there is a separate need for specialized workshop spaces for specialized work tasks. This would include a general purpose Water Workshop but could also utilize other specialized workshops listed under other divisions, as well as mezzanine level storage.

Water Distribution has a need for warm vehicle storage, cold storage, outdoor and covered storage, as well as site storage areas to support operations, based on operational best practices for storage and handling of the current and anticipated future vehicle and equipment inventory.





Water Distribution Division
Adjacency Diagram

- Standardized Spaces
- Division Specific Spaces
- Shared Spaces

* Some shared spaces are defined in the Space Standards section

Water Distribution Division Space Needs Summary

ADMINISTRATIVE	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
DIV.1a - Building Entry / Vestibule *	100	10'x10'	1	100	
DIV.1b - Reception *	100	10' x 10'	0	0	
DIV.2 - Division Manager Office	180	12' x 15'	2	360	
DIV.3 - Supervisor Office	150	10' x 15'	6	900	
DIV.4 - Staff Office	120	12' x 10'	1	120	
DIV.5 - Field Staff Workstation / Open Office	1,548	6'x6' x (FTE+1/2PTE)	1	1,548	
DIV.6a - Small Conference Room *	120	12' x 10'	0	0	
DIV.6b - Standard Conference Room *	240	12' x 20'	2	480	
DIV.7 - Large Conference Room-Training Room *	500	20' x 25'	0	0	Not included in program, shared with another division
DIV.8 - Copy Area / Document Work Room *	216	12' x 18'	1	216	
DIV.9 - Breakroom *	1,300	25 sf x Staff #	1	1,300	
DIV.10a - Universal Public Restroom *	72	8' x 9'	4	288	
DIV.10b - Men's Locker and Restroom *	610	Varies	1	610	
DIV.10c - Women's Locker and Restroom *	350	Varies	1	350	
DIV.10d - Wellness Room *	168	12' x 14'	1	168	
DIV.10e - IT Closet *	48	6' x 8'	1	48	
DIV.10f - Janitorial *	63	7' x 9'	1	63	
DIV.11 - General Storage / Supply Closets	100	10' x 10'	1	100	
DIV.12 - Mud Room / Wash Area	96	8' x 12'	1	96	
DIV.13 - General Computer Area *	NA			-	Central Computer area - See Also DIV.5 - Field Staff / Open Office
DIV.14 - Laundry Facility *	NA			-	
DIV.10g - Mechanical and Electrical Room	1,012	15% of supported	1	1,012	
ADMINISTRATIVE AREA SUBTOTAL				7,759	
CIRCULATION @ 30%				2,328	
TOTAL				10,087	

CONDITIONED VEHICLE STORAGE (WARM)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	6	5,760	Parking Spaces Only
Medium Space	288	12'x24'	18	5,069	Parking Spaces Only
Pickup Space	200	10'x20'	13	2,520	Parking Spaces Only
VEHICLE PARKING SUBTOTAL	13,349				
DOUBLE TRAFFIC LANE STORAGE INCREASE	16,019			29,367	Parking plus traffic lane serving parking
Mezzanine Storage				9,789	Maximum 1/3 of open storage area (IBC)
General Storage area				3,671	Area created by angled parking, used for small implement storage
CONDITIONED VEHICLE STORAGE SUBTOTAL				29,367	Parking plus traffic lane serving parking
CIRCULATION @ 15%				4,405	
TOTAL				37,443	Sum of parking and traffic lanes, plus additional circ and storage

* Sharing potential across Divisions

DIVISION OPERATION CRITICAL SPACES	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
WTDT.2 - Field Shop	6,890	106' x 65'	1	6,890	
WTDT.3 - Water Distribution Shop	1,248	48' x 26'	1	1,248	
WTDT.4 - Secure Storage	256	16' x 16'	1	256	
WTDT.5 - Hazardous Storage	36	6' x 6'	3	108	
WTDT Division Opertion Critical Spaces	8,502				
DIVISION OPERATION SPACES SUBTOTAL				8,502	
CIRCULATION @ 30%				2,551	
TOTAL				11,053	

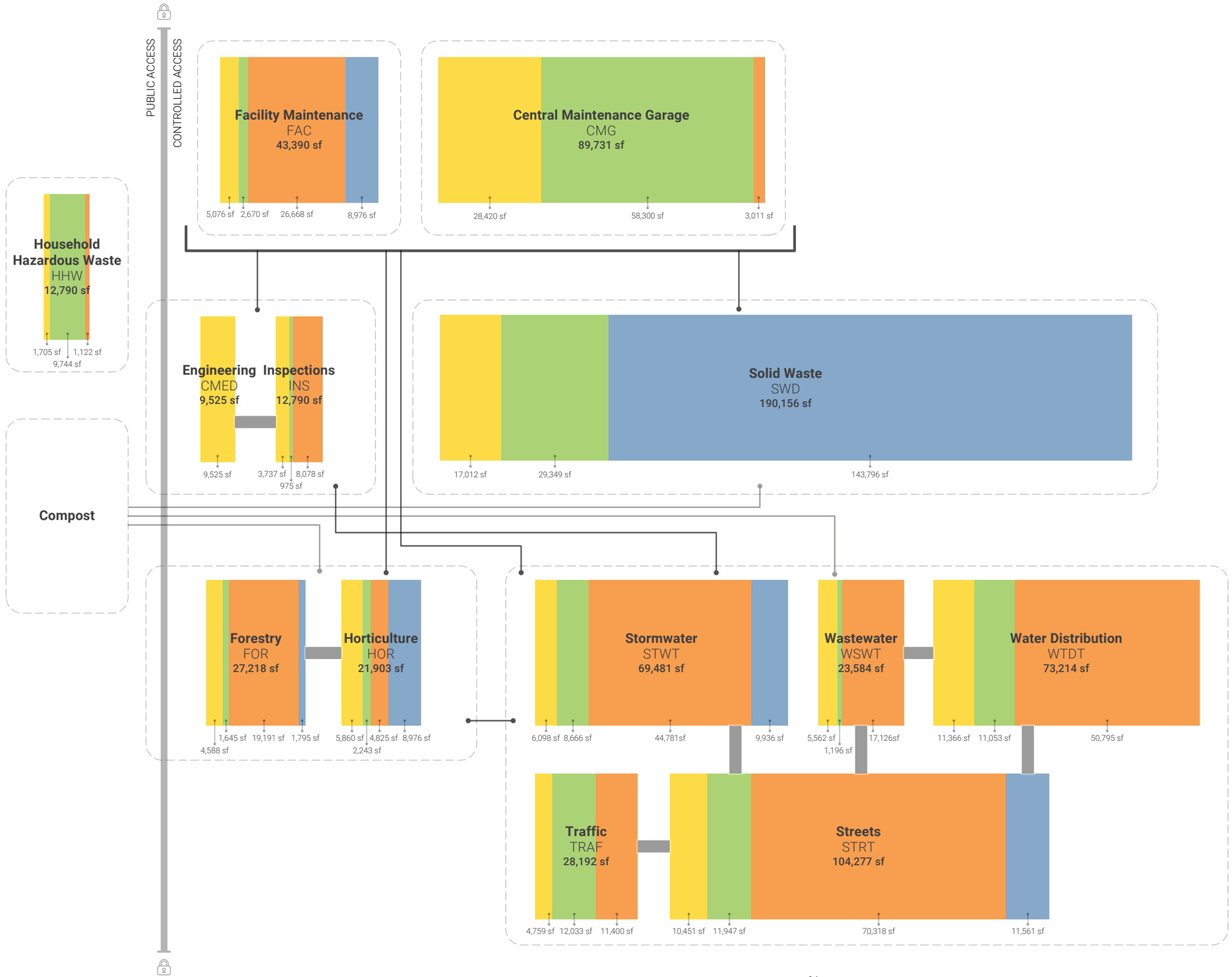
UNCONDITIONED VEHICLE STORAGE (COLD)	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Large Space	900	20'x45'	0	0	Parking Spaces Only
Medium Space	288	12'x24'	0	0	Parking Spaces Only
Pickup Space	200	10'x20'	22	4,320	Parking Spaces Only
VEHICLE PARKING SUBTOTAL	4,320				
DOUBLE TRAFFIC LANE STORAGE INCREASE	5,184			9,504	Parking plus traffic lane serving parking
Mezzanine Storage				3,168	Maximum 1/3 of open storage area (IBC)
General Storage area				1,188	Area created by angled parking, used for small implement storage
UNCONDITIONED VEHICLE STORAGE SUBTOTAL				9,504	Maximum 1/3 of open storage area (IBC) Parking plus traffic lane serving parking
CIRCULATION @ 15%				1,426	
TOTAL				12,118	Sum of parking and traffic lanes, plus additional circ and storage

SITE PROGRAM REQUIREMENTS	SF	SIZE (rough dim)	#	TOTAL SF	NOTES
Staff Parking and Drive Aisle	284	9' x 18'	52	14,742	1 per staff on largest shift
Exterior Equipment Parking Demands	288	12' x 24'	35	10,138	
ADA Space plus Aisle	306	9' x 18' +8' Aisle	2	636	
WTDT.7 - Bulk Material Bins	750	30' x 25'	3	2,250	
SITE PROGRAM SUB-TOTAL				27,766	
SITE CIRCULATION @ 150%				41,649	Accounts for access to all sides of separated site functions
TOTAL				69,415	

SITE AREA TOTALS					
MAIN BUILDING	58,583				
CIRCULATION AROUND BUILDING	14,646	25% of subtotal			
COLD STORAGE	12,118				
CIRCULATION AROUND BUILDING	6,059	25% of subtotal			
SITE PROGRAM REQUIREMENTS	69,415				
CIRCULATION AROUND BUILDING	17,354	25% of subtotal			
Program Totals	178,174				
25% GREEN SPACE	44,543				
Stormwater Management	44,543	25% of subtotal			
GRAND TOTAL SITE AREA NEEDED	347,439	10			*Total squarefootage and acreage, plus added 30% of programmed acreage for drainage paths, easements, setbacks, etc.*

3 - Master Programming Needs Diagram

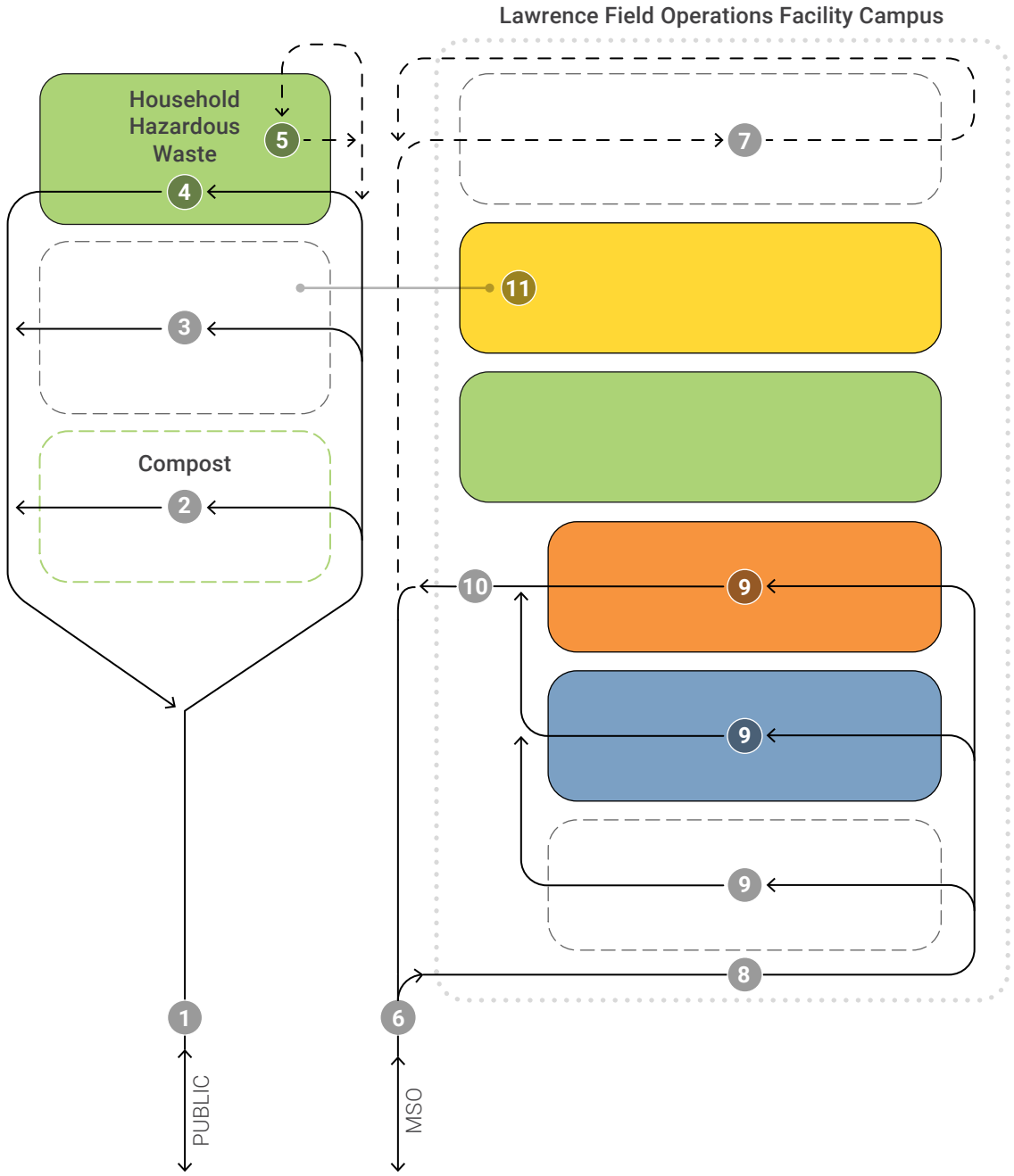
This diagram shows the relative size of the different Divisions, and the adjacencies that would result in the most beneficial campus operation. Each Division is color-coded to show the proportional distribution of Administrative, Division Critical, Conditioned Vehicle Storage and Unconditioned Vehicle Storage Spaces. Some Divisions, such as Central Maintenance Garage and Solid Waste, are shown as stand-alone, and some are shown as being so closely linked operationally that they would benefit from being grouped together, sharing conference, training, and other support spaces. The diagram focuses on Interior spaces--exterior spaces are shown on a different diagram.



Master Programming Needs Diagram

- Secure entry
- External connection
- Internal connection
- Administrative
- Division Operation Critical Spaces
- Conditioned Vehicle Storage (Warm)
- Unconditioned Vehicle Storage (Cold)

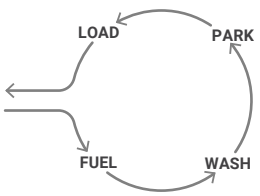
4 - Site Flow Diagram



- Administrative
- Division Operation Critical Spaces
- Conditioned Vehicle Storage (Warm)
- Unconditioned Vehicle Storage (Cold)
- Outdoor Parking

1. Public and vendor access
2. Public compost pick up and drop off
3. Public parking
4. Public household hazardous waste drop off
5. Vendor household hazardous waste pick up
6. Secure access point
7. Staff vehicle parking near main entrance
8. Fueling & washing
9. Fleet parking
10. Load materials
11. Limited public access

DAILY FLEET MOVEMENT



5 - Space Standards

Following a review of the Divisional Programming Worksheets, and during the course of the Design Team's tours and interviews of each Division, some spaces were noted as typical between Divisions. Standardizing such spaces is a key component of the programming process for the Lawrence Field Operations Facility. These typical spaces would be necessary in whole or part if each division was located within their own facility. Sizes are based on factors such as, code based requirements and industry standards / best practices.

In a combined facility, there would be redundancies between each Division that can be combined for joint use. The following is a list of terms and definitions that describe a variety of functions and spaces in the program for the facility.

"Dirty" Functions
Daily operational work activities that are directly related to in-field operations, such as vehicle maintenance, any vehicle or equipment operation, workshop labor, etc.

"Clean" Functions
Daily operational work activities that are directly related to office or administrative work tasks, such as time-card execution, email correspondence, break time, etc.

Multi-Purpose Room
A large, multi-function space, typically combining a facility or divisional break room space and large conference / training room functions. These spaces are typically cleaner than "Crew Rooms" and located in administrative areas, rather than operational areas. These rooms may be accessed by other groups outside of the specific operational division, such as outside vendors, external / visiting agencies, or potential after-hour events (city council or planning workshops, for example).

Crew Room
A single, multi-function space that houses large meeting functions including workflow planning meetings (tailgate or muster), training events, break space (w/ kitchenette) for specific work groups, and field staff workstations. Typically, ideally sized for operational work groups typically no larger than 12 staff, all the same institutional hierarchy. Commonly, Crew Rooms are adjacent to a divisional operational workshop space, rather than a singular administrative work area, to separate "dirty" operations.
Larger staffing numbers require individual break rooms with kitchens, meeting rooms and offices / workstations.

Tailgate / Muster
A quick, operational meeting of work crews to discuss and assign daily work tasks. Typically occurring in work specific areas (workshops) or crew rooms.

Warm Storage
This is interior, HVAC conditioned storage space for the storage of vehicles and operational equipment. This is referred to also as Conditioned Vehicle Storage (Warm). Conditioning is providing a heating and ventilation requirement as dictated by building code for the climatological region. The building is fully insulated to meet regional energy code requirements.

Warm Storage is heated to a level to prevent freezing of any portion of the building infrastructure or components stored within the facility. Typical design heating is between 50 and 60 degrees Fahrenheit.

Warm Storage is typically not cooled due to the size of the facility, and the frequency of mechanical air change required to meet safety considerations for fume and particulate pollution. Facilities of significant size will be protected with a wet-pipe automated fire suppression system.

Cold Storage
This is fully enclosed storage, generally constructed in such a manner like Warm Storage. However, heating is only minimally maintained within the facility, but not fully prevented from technically freezing. Typical installations area utilized for seasonal or rotational equipment that does not require consistent operating.

Heating may be limited to keeping interior temperatures of around 40 degrees Fahrenheit and is sometimes referred to as Sem-Conditioned or Unconditioned Storage (based on local energy codes). Facilities of significant size can be protected with a dry-pipe automated fire suppression system.

Covered (lean-to) Storage
This storage methodology is not fully enclosed but will have overhead protection from precipitation. As the area is open to the exterior, heating is not permitted by energy codes. Lighting is provided at minimum acceptable levels to not provide light pollution to adjacent properties. Open air storage does not limit exposure to freezing temperatures, vermin exposure or provide fully secure storage.

Outdoor Storage
Outdoor storage is simply exterior space, paved or not, for on-site storage of bulk materials or other supporting equipment that is not daily mission critical.

Workshop
An enclosed, open plan work area that is used for specialized division work tasks. Often given both interior and exterior access. Work benches, tool and material storage areas and mezzanine storage and access are often incorporated into these spaces. Sizes vary based on inclusion of specialized vehicle parking, size of operational equipment or material storage (water meters vs. lumber storage racks) etc. Crew Rooms are often found adjacent to Workshops but separated to keep Clean and Dirty work activities separated.

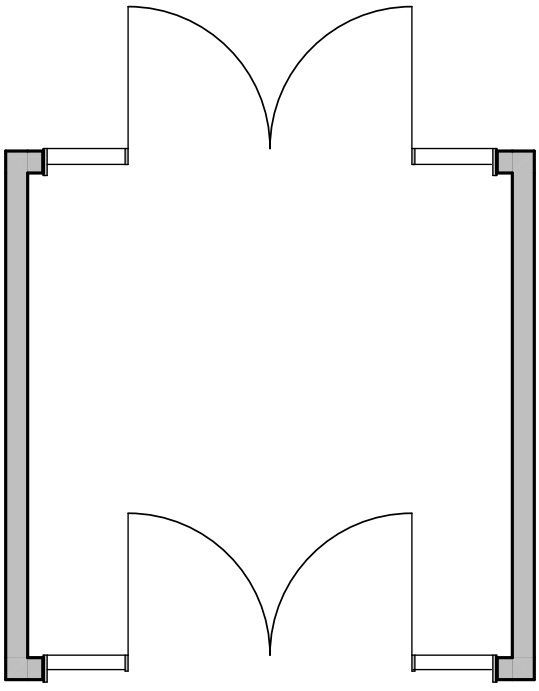
Bone-Yard
A large area of open site space, organized by either material laydown areas or material storage bins (constructed with large concrete blocks / panels, timber walls or cast concrete partitions) to store non-critical, weather exposed building materials or equipment. Often located to the rear of a site and significantly screened from adjacent property uses.

DIV.1a - Building Entry / Vestibule

Area: 100 Net SF
Size: 10’ x 10’

Description: A primary or secondary environmentally controlled entry point that provides an airlock separation between exterior and interior spaces, or separation between two building uses that need air separation.
Key Adjacencies: Reception; Office Spaces; Small Conference Room

Floor: Concrete (polish); traffic mat
Walls: CMU or steel framing / gypsum board (paint); Glass (windows)
Ceiling: ACT/ gypsum / decorative
Doors/Windows: Secure commercial entry door; exterior aluminum windows
Lighting: Direct / indirect LED lay-in fixtures
Mechanical: Airlock from exterior to interior; standard air distribution; cabinet unit heater
Electrical: Standard electrical power distribution.
Technology Requirements: Key fob access; Buzzer / communication from reception

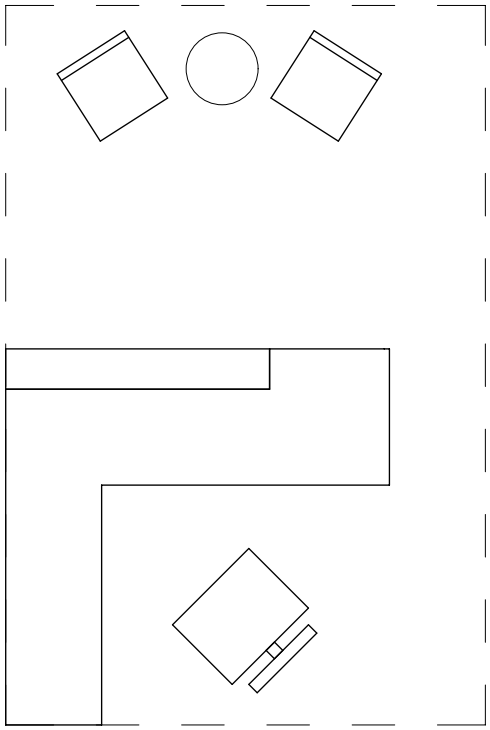


DIV.1b - Reception

Area: 150 Net SF
Size: 10' x 15'

Description: An interior space inside the primary entry that provides a secure buffer between public and operationally private areas. Inclusion depends on Divisional operation receiving visitors for any reason, including public billing, parts or tool delivery, sales calls, outside agency training events.
Key Adjacencies: Building Entry; Staff Offices; Small Conference Room; Circulation to work bays
FFE: L-shaped secure workstation with standing height transaction area; confirm file/ drawer units under workstation; task chair and two guest chairs with small side table.

Floor: Concrete (polish)
Walls: CMU or steel framing / gypsum board (paint)
Ceiling: ACT/ gypsum / decorative
Doors/Windows: Secure door to offices; exterior aluminum windows
Lighting: Direct / Indirect LED Lay-In Fixtures; daylighting control
Mechanical: Standard air distribution; pressurized air to prevent vehicle fume intrusion
Electrical: Standard outlet locations
Technology Requirements: Voice data distribution; buzzer / communication to entry / waiting

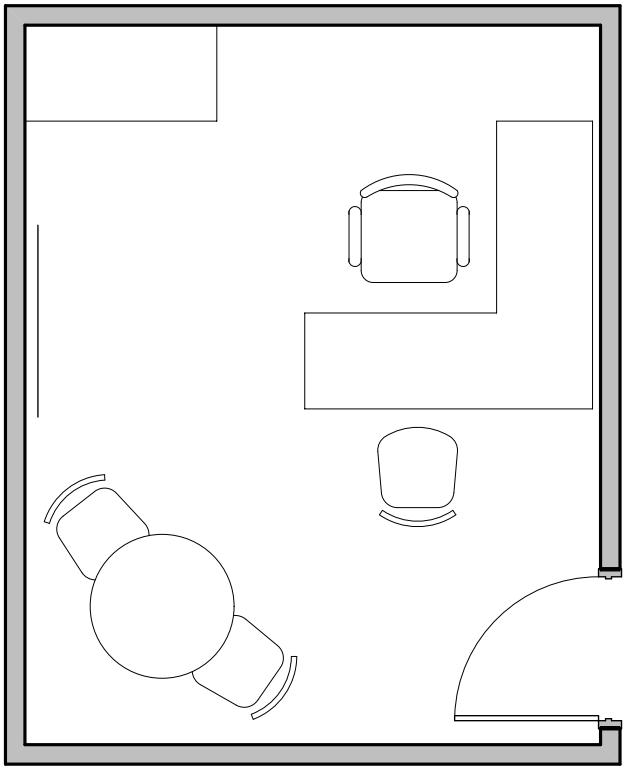


DIV.2 - Division Manager Office

Area: 180 Net SF
Size: 12’ x 15’

Description: Private office for the manager of the overall operational division.
Key Adjacencies: Division Supervisor Office; Staff Offices / Field Staff Open Office; Reception; Small Conference Room
FFE: L-shaped workstation with task chair and one guest chair; confirm file/drawer units under workstation; small conference table with two guest chairs; credenza/filing unit; small magnetic whiteboard.

Floor: Concrete (carpet)
Walls: Steel framing / gypsum board (paint)
Ceiling: ACT/ gypsum
Doors/Windows: Hollow metal frames; wood doors; exterior aluminum windows
Acoustical Requirements: STC 52+
Lighting: Standard office lighting levels; task lighting; daylighting control
Mechanical: Standard HVAC
Electrical: Standard outlet locations
Technology Requirements: A/V and voice/date connections
Special Criteria: Lockable / securable

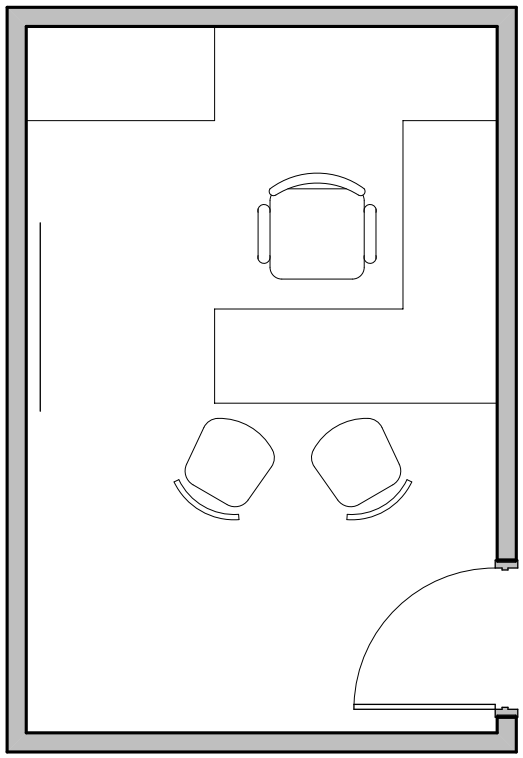


DIV.3 - Supervisor Office

Area: 150 Net SF
Size: 10' x 15'

Description: Private office for a supervisor of specific divisional operations.
Key Adjacencies: Division Manager Office; Staff Offices / Field Staff Open Office; Reception; Small Conference Room
FFE: L-shaped workstation with task chair and two guest chairs; confirm file/drawer units under workstation; credenza/filing unit; small magnetic whiteboard.

Floor: Concrete (carpet)
Walls: Steel framing / gypsum board (paint)
Ceiling: ACT/ gypsum
Doors/Windows: Hollow metal frames; wood doors, exterior aluminum windows
Acoustical Requirements: STC 52+
Lighting: Standard office lighting levels; task lighting; daylighting control
Mechanical: Standard HVAC
Electrical: Standard outlet locations
Technology Requirements: A/V and voice/date connections
Special Criteria: Lockable / securable

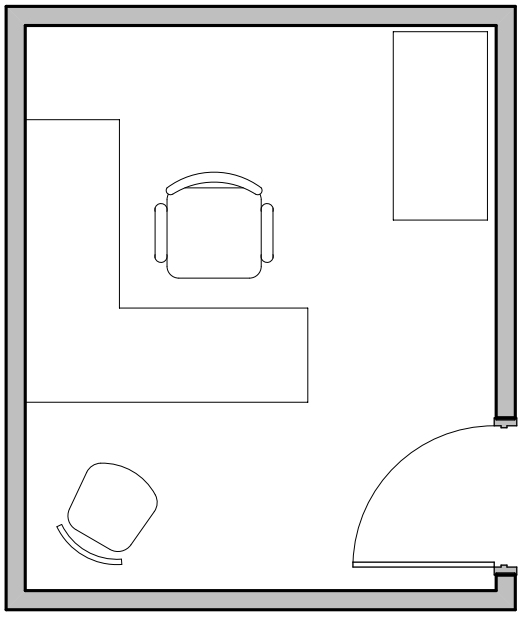


DIV.4 - Staff Office

Area: 120 Net SF
Size: 10' x 12'

Description: Private office for divisional staff such as a technician / specialist or other working staff member requiring a private workspace.
Key Adjacencies: Division Manager Office; Division Supervisor Office; Reception; Small Conference Room; Work Bays; Breakroom
FFE: L-shaped workstation with task chair and one guest chair; confirm file/drawer units under workstation; credenza/filing unit

Floor: Concrete (carpet)
Walls: Steel framing / gypsum board (paint)
Ceiling: ACT/ gypsum
Doors/Windows: Hollow metal frames; wood doors; exterior aluminum windows
Acoustical Requirements: STC 52+
Lighting: Standard office lighting levels; task lighting; daylighting control
Mechanical: Standard HVAC
Electrical: Standard outlet locations
Technology Requirements: A/V and voice/date connections
Special Criteria: Lockable / securable



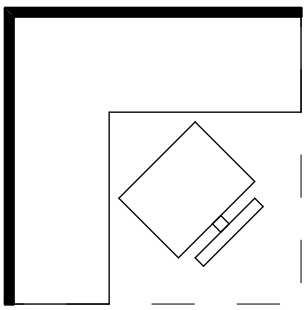
DIV.5 - Field Staff Workstation / Open Office

Area: 36 Net SF

Size: 6’ x 6’

Description: An open office style workstation (sitting or standing) that can be utilized by a divisional field staff. Cubicle or office furniture can be utilized to separate. These are non-staff dedicated and are typical one per a specific number of staff. Typically found in an open office scenario.
Key Adjacencies: Division Manager Office; Division Supervisor Office; Reception; Work Bays; Breakroom; Small Conference Room
FFE: L-shaped workstation with partitions; one task chair; confirm file/drawer units under workstation; confirm partition height

Floor: Concrete (carpet)
Walls: Steel framing / gypsum board (paint)
Ceiling: ACT/ gypsum
Doors/Windows: Hollow metal frames; wood doors; exterior aluminum windows
Acoustical Requirements: STC 52+
Lighting: Standard office lighting levels; task lighting; daylighting control
Mechanical: Standard HVAC
Electrical: Standard outlet locations
Technology Requirements: A/V and voice/date connections
Special Criteria: Lockable / securable

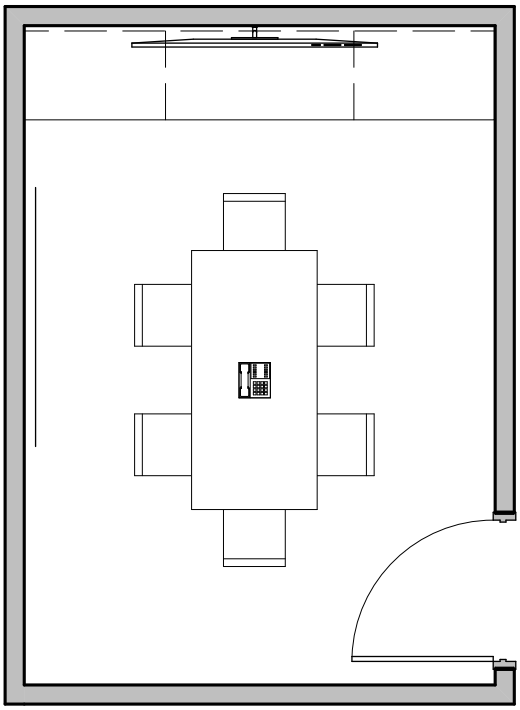


DIV.6a - Small Conference Room

Area: 120 Net SF
Size: 10' x 12'

Description: Small meeting room for 4-6 person meetings. Typically, adjacent to private offices.
Key Adjacencies: Entry; Reception; Office Spaces
FFE: 36"x48" conference table for 6 people; 6 conference chairs; 70" (min.) monitor with integrated presentation technologies; magnetic whiteboard; built in base cabinets with drawers/doors/solid surface counter top

Floor: Concrete (carpet)
Walls: Steel framing / gypsum board (paint)
Ceiling: ACT/ gypsum
Doors/Windows: Hollow metal frames; wood doors; exterior aluminum windows
Acoustical Requirements: STC 52+
Lighting: Direct / indirect LED lay-in fixtures; dimmable; occupant timer ; daylighting control
Mechanical: Standard HVAC
Electrical: Standard outlet locations; floor box; A/V equipment
Technology Requirements: A/V and voice/date connections
Special Criteria: Accommodation for computer; teleconferencing

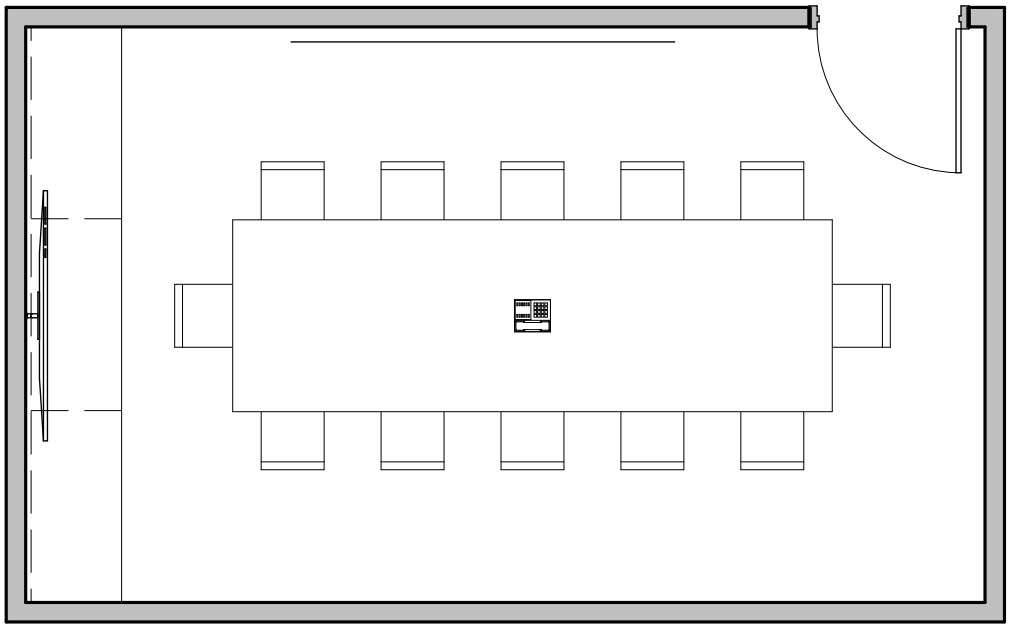


DIV.6b - Standard Conference Room

Area: 240 Net SF
Size: 12' x 20'

Description: Large meeting room for a comfortable setting of 12 people, with large conference table and audio-visual presentation equipment.
Key Adjacencies: Entry; Reception; Office Spaces
FFE: 14' x 48" conference table for 12 people; 70" (min.) monitor with integrated presentation technologies; magnetic whiteboard; built in base cabinet with drawers/ doors/ solid surface counter top

Floor: Concrete (carpet)
Walls: Steel framing / gypsum board (paint)
Ceiling: ACT/ gypsum
Doors/Windows: Hollow metal frames; wood doors; exterior aluminum windows
Acoustical Requirements: STC 52+
Lighting: Direct / indirect LED lay-in fixtures; dimmable; occupant timer; daylighting control
Mechanical: Standard HVAC
Electrical: Standard outlet locations; floor box; A/V equipment
Technology Requirements: A/V and voice/date connections
Special Criteria: Accommodation for computer; teleconferencing



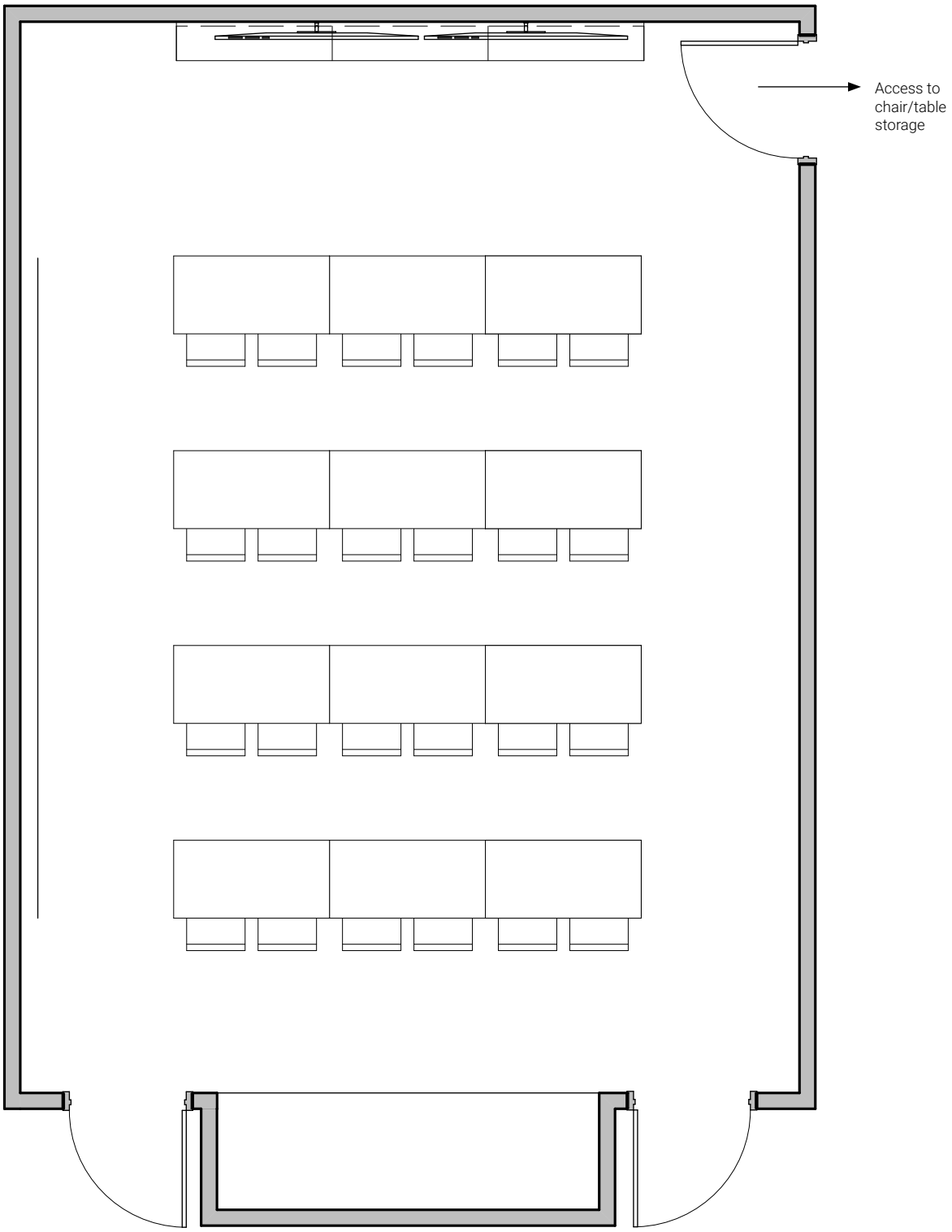
DIV.7 - Large Conference Room / Training Room

Area: 500 Net SF Min.

Size: 20' x 25' Min.

Description: Meeting room for a comfortable setting of a minimum of 25 people. Seating configurations based on unconcentrated tables and chairs set up in a row format. Larger groups can be accommodated by combining multiple conference rooms (via operable partition), or by creating multi-purpose rooms or crew rooms – see Glossary.
Key Adjacencies: Entry; Reception; Office Spaces; Breakroom
FFE: (12) 30"x60" nesting training tables; (2) 70" (min.) monitors with integrated presentation technologies including integrated speakers; (24) stackable chairs; magnetic whiteboard; built-in base cabinet with drawers / doors/ solid surface counter top

Floor: Concrete (carpet)
Walls: Steel framing / gypsum board (paint)
Ceiling: ACT/ gypsum
Doors/Windows: Hollow metal frames; wood doors; exterior aluminum windows
Acoustical Requirements: STC 52+
Lighting: Direct / indirect LED lay-in fixtures; dimmable; occupant timer; daylighting control
Mechanical: Standard HVAC
Electrical: Standard outlet locations; floor box; AV equipment
Technology Requirements: A/V and voice/date connections
Special Criteria: Accommodation for computer; teleconferencing

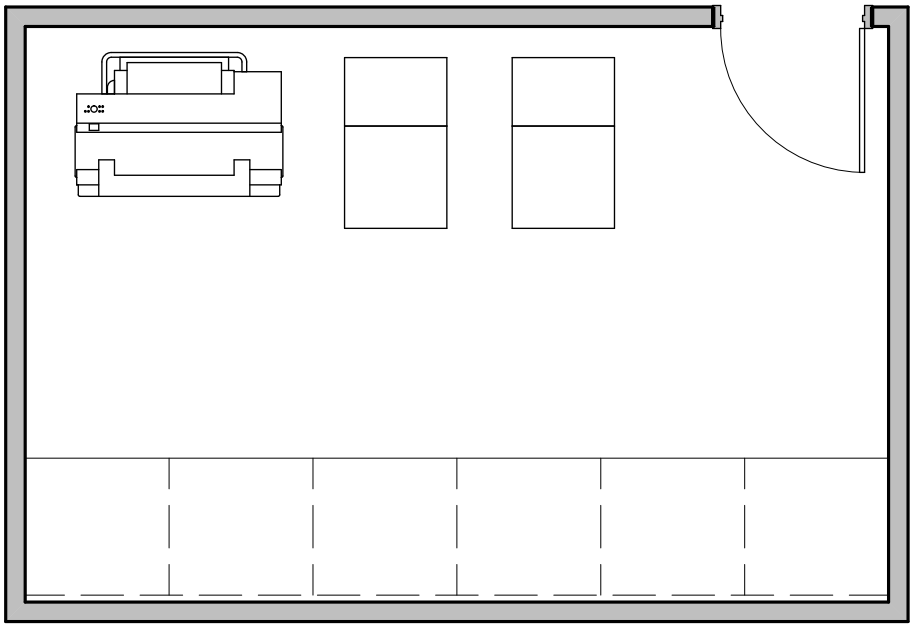

Access to
chair/table
storage

DIV.8 - Copy Area / Document Work Room

Area: 216 Net SF
Size: 12’ x 18’

Description: An area for the preparation and processing of documents, copy machine and printer location. Includes a work counter and general office product storage. Size can be variable based on number of office / administration staff by division.
Key Adjacencies: Office Spaces
FFE: Copiers, printers, document and assembly equipment; verify all required equipment, storage and work surfaces.

Floor: Concrete (carpet)
Walls: Steel framing / gypsum board (paint)
Ceiling: ACT/ gypsum
Doors/Windows: Hollow metal frames; wood doors; exterior aluminum windows
Acoustical Requirements: STC 52+
Lighting: Standard lighting levels; task lighting; daylighting control
Mechanical: Standard HVAC
Electrical: Specifically located outlets
Technology Requirements: A/V and voice/date connections



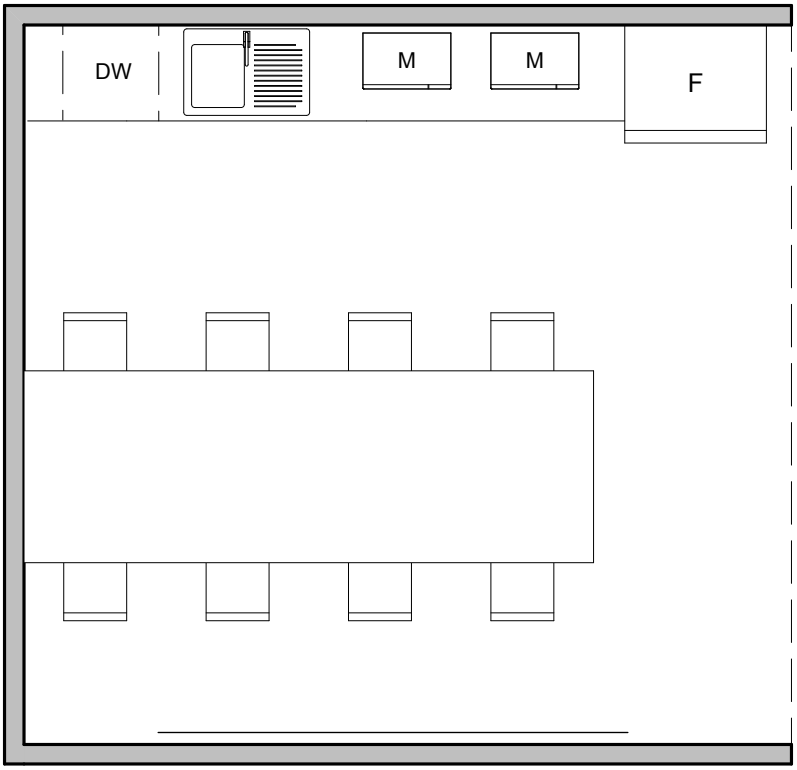
DIV.9 - Break Room

Area: 25 SF / Staff

Size: Varies

Description: Dedicated space for taking periodic breaks during the workday. Space includes dedicated area for food preparation and storage. Size depends on number of divisional staff, and day to day activities.
Key Adjacencies: Work Bays; Office Spaces; Locker Rooms; Janitorial; Meeting Rooms; Exterior access
FFE: Verify all required kitchen appliances, furniture and storage

Floor: Concrete (hard floor finish)
Walls: CMU or steel framing; gypsum board (paint)
Ceiling: ACT/ gypsum
Doors/Windows: Hollow metal frames; wood doors; exterior aluminum windows
Lighting: Standard lighting levels; daylighting control
Mechanical: Standard HVAC
Electrical: Standard outlet spacing
Technology Requirements: A/V and voice/date connections
Special Criteria: Daylighting; exterior access

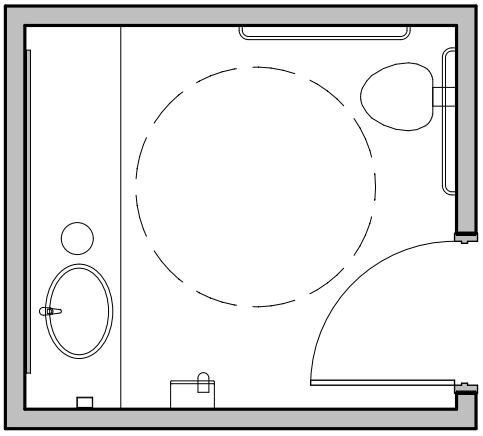


DIV.10 - Universal Public Restroom

Area: 72 Net SF
Size: 8’ x 9’

Description: Public access ADA restroom, non-gender specific for use by visiting public.
Key Adjacencies: Entry; Reception; Office Spaces
FFE: Plumbing fixtures; hand dryers; mirror

Floor: Concrete (hard floor finish)
Walls: Steel framing / gypsum board or concrete (paint)
Ceiling: ACT/ gypsum
Doors/Windows: Hollow metal frames; wood doors
Lighting: Standard lighting levels
Mechanical: Standard HVAC; plumbing fixtures
Electrical: Standard outlet spacing



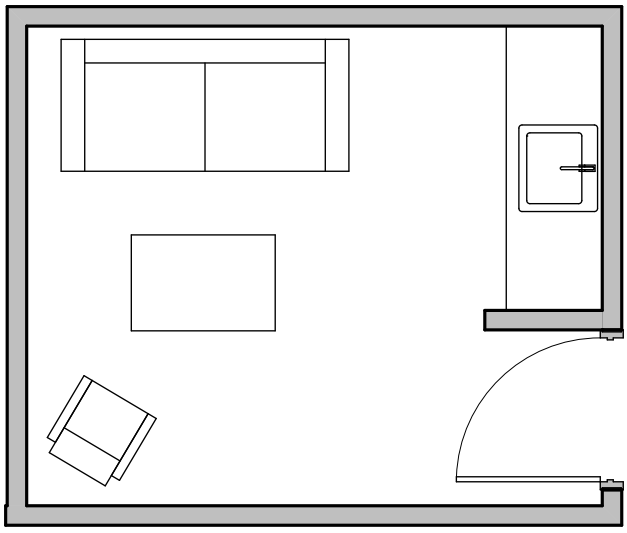
DIV.10 - Wellness Room

Area: 168 Net SF

Size: 12’ x 14’

Description: This room serves as a quiet, personal break area for single user function. This has been typically dedicated as a mother’s room, or for operations that frequently require overnight or long-term stays at the facility due to emergency conditions.
Key Adjacencies: Entry; Reception; Office Spaces
FFE: Comfortable seating ; side table

Floor: Concrete (carpet)
Walls: CMU or steel framing; gypsum board (paint)
Ceiling: ACT/ gypsum
Doors/Windows: Hollow metal frames; wood doors; exterior aluminum windows
Lighting: Direct / indirect LED lay-in fixtures; dimmable; occupancy timer; daylighting control
Mechanical: Standard HVAC
Electrical: Standard outlet spacing



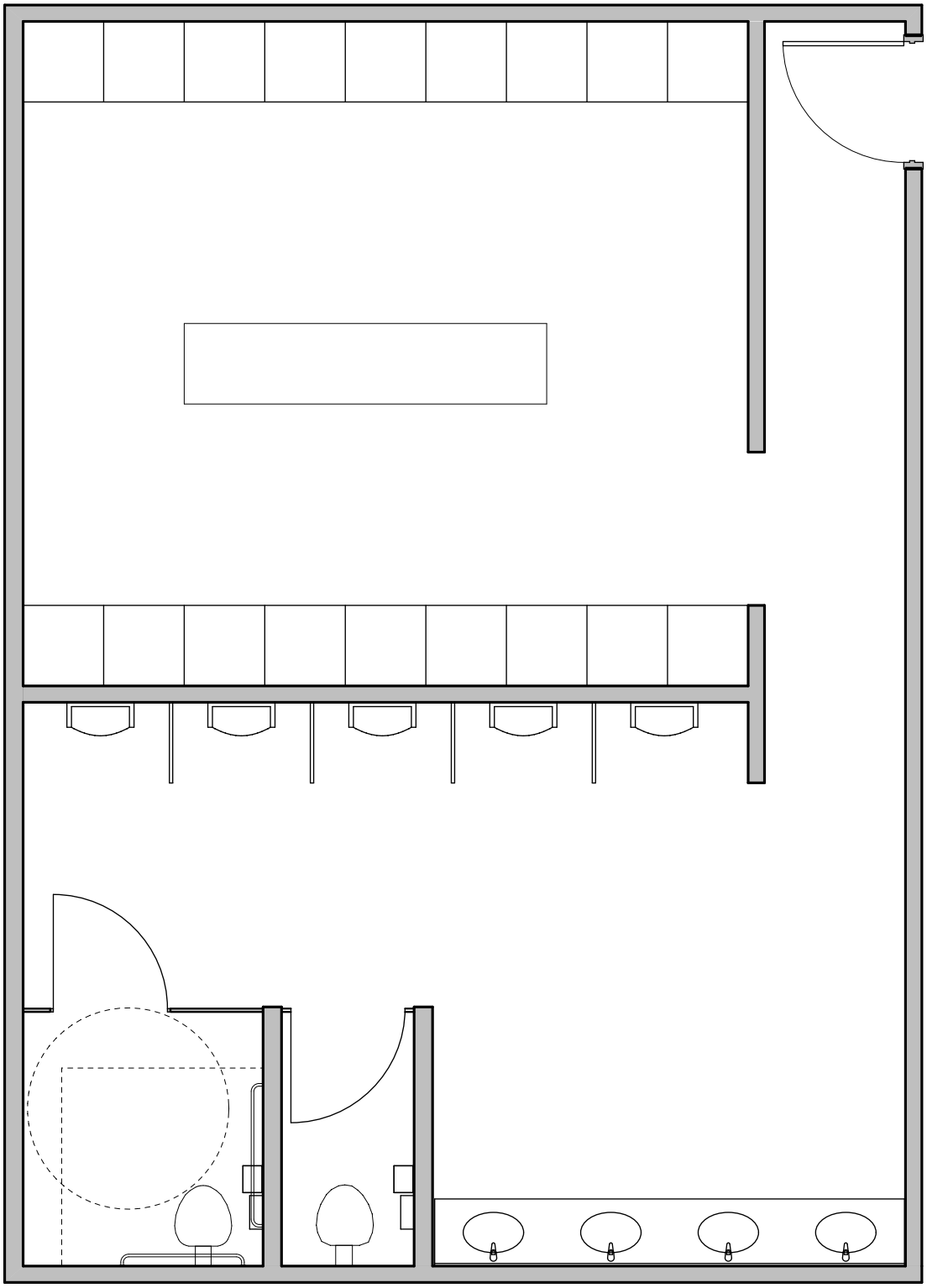
DIV.10 - Locker Room

Area: 12 - 15 SF/ Staff

Size: Varies

Description: Locker facility for personal storage locker per each operational staff member. Space includes dedicated 2' x 2' nominal, secure personal storage locker. Specific operations may require additional lockers, depending on uniform services, dirty or wet divisional operations. Locker facilities also include sex specific restroom facilities, with number of fixtures based on code based calculations for use/occupancy and additional owner request, and personal shower and changing areas.
Key Adjacencies: Vehicle Areas; Office Spaces; Breakroom; Janitorial
FFE: 2'x2'x6' lockers (verify count); plumbing fixtures, clothing hooks, verify all required fixtures and furniture

Floor: Concrete (hard floor finish)
Walls: CMU or steel framing; gypsum board (paint)
Ceiling: ACT/ gypsum
Doors/Windows: Hollow metal frames; wood doors; exterior aluminum windows
Lighting: Standard lighting levels
Mechanical: Standard HVAC
Electrical: Standard outlet spacing



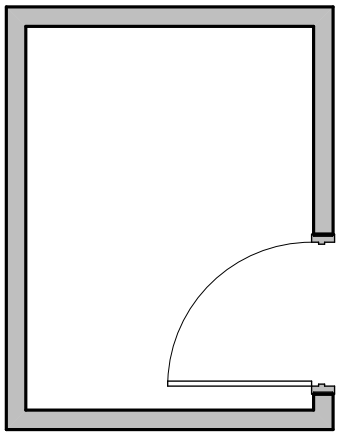
DIV.10 - IT Closet

Area: 48 Net SF

Size: 6’ x 8’

Description: Minimum size for the inclusion of IT distribution systems for a divisional use facility. Larger space is required for large administrative work purposes (large number of computers), or multiple locations when facilities are large enough to require additional signal infrastructure.
Key Adjacencies: Office Spaces
FFE: IT racking provided by owner

Floor: Concrete (static sensitive flooring)
Walls: Steel framing; gypsum board or concrete (paint)
Ceiling: ACT/ gypsum
Doors/Windows: Hollow metal frames; wood doors
Lighting: Standard lighting levels; task lighting
Mechanical: Standard HVAC requirements
Electrical: Specifically located outlets
Technology Requirements: A/V and voice/date connections



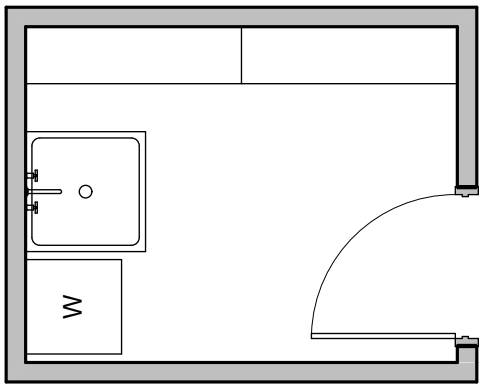
DIV.10 - Janitorial

Area: 63 Net SF

Size: 7’ x 9’

Description: General, minimal size for the storage of facility cleaning supplies, wet sink and building maintenance items.
Key Adjacencies: Work Bays; Office Spaces; Breakroom; Conference Rooms
FFE: Standard washer and dryer; shelving and storage cabinets, service sink

Floor: Concrete (hard floor finish)
Walls: CMU or steel framing; gypsum board (paint)
Ceiling: ACT/ gypsum
Doors/Windows: Hollow metal frames and doors
Lighting: Standard lighting levels
Mechanical: Standard HVAC requirements
Electrical: Standard outlet spacing

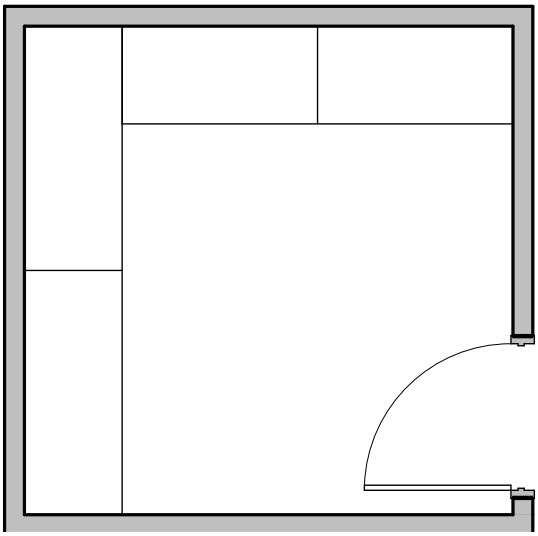


DIV.11 - General Storage / Supply Closet

Area: Varies
Size: Varies

Description: Storage of various office needs
Key Adjacencies: Office Spaces
FFE: Shelving; verify size and count

Floor: Concrete
Walls: CMU or steel framing; gypsum board (paint)
Ceiling: ACT/ gypsum
Doors/Windows: Hollow metal frames; wood doors
Lighting: Standard lighting levels
Mechanical: Standard HVAC requirements
Electrical: Specifically located outlets
Technology Requirements: A/V and voice/date connections

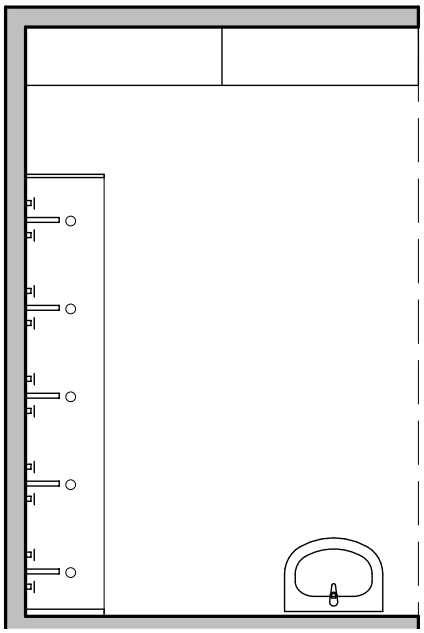


DIV.12 - Mud Room / Wash Area

Area: 96 Net SF
Size: 8' x 12'

Description: Interior, wet area for staff to wash hands and/or boots, remove dirty or wet outer layer of clothing to contain dirt or contaminated clothing in an operational area prior to entering an administrative space. Typically an interior air-lock vestibule to provide temperature and air pressurization difference between differing facility functions.
Key Adjacencies: Work Bays; Vehicle Parking; Office Spaces
FFE: Hand wash units; bootwash/cleaning area; wet lockers/clothing hooks

Floor: Concrete (hard finish)
Walls: CMU or steel framing; gypsum board (paint)
Ceiling: ACT/ gypsum
Doors/Windows: Hollow metal doors and frames
Lighting: Industrial/wet condition fixtures
Mechanical: Hot/cold Water, floor drains and containment; wash fixtures; heated and well ventilated; standard HVAC requirements
Electrical: Wet condition outlets
Technology Requirements: N/A
Special Criteria: Wet locker/clothing conditions; often combined with facility laundry facilities



6 - Building Program and Cost Summary

BULIDING PROGRAM SUMMARY (BY DIVISION)		SF	Cost Per SF	Cost Subtotal
Central Maintenance Group	Administrative	6650	$ 265.00	$ 1,762,186.40
	Conditioned Vehicle Storage (warm)	3366	$ 145.00	$ 488,070.00
	Division Operation Critical Space	47362	$ 215.00	$ 10,182,830.00
	Unconditioned Vehicle Storage (cold)	0	$ 125.00	$ -
	Total	**57378**	$ 208.33	**$ 12,433,086.40**
Construction Management Engineering	Administrative	8490	$ 265.00	$ 2,249,877.83
	Conditioned Vehicle Storage (warm)	0	$ 145.00	$ -
	Division Operation Critical Space	0	$ 185.00	$ -
	Unconditioned Vehicle Storage (cold)	0	$ 125.00	$ -
	Total	**8490**	$ 265.00	**$ 2,249,877.83**
Facilities Maintenance	Administrative	4185	$ 265.00	$ 1,109,083.30
	Conditioned Vehicle Storage (warm)	26668	$ 145.00	$ 3,866,815.92
	Division Operation Critical Space	2054	$ 185.00	$ 379,990.00
	Unconditioned Vehicle Storage (cold)	2670	$ 125.00	$ 333,775.00
	Total	**35577**	$ 180.00	**$ 5,689,664.22**
Forestry	Administrative	3829	$ 265.00	$ 1,014,802.26
	Conditioned Vehicle Storage (warm)	19191	$ 145.00	$ 2,782,649.76
	Division Operation Critical Space	1265	$ 185.00	$ 234,025.00
	Unconditioned Vehicle Storage (cold)	1645	$ 125.00	$ 205,562.50
	Total	**25930**	$ 180.00	**$ 4,237,039.52**
Horticulture	Administrative	4789	$ 265.00	$ 1,269,138.00
	Conditioned Vehicle Storage (warm)	4825	$ 145.00	$ 699,567.00
	Division Operation Critical Space	1725	$ 185.00	$ 319,125.00
	Unconditioned Vehicle Storage (cold)	2243	$ 125.00	$ 280,312.50
	Total	**13581**	$ 180.00	**$ 2,568,142.50**
Household Hazardous Waste	Administrative	1877	$ 265.00	$ 497,397.71
	Conditioned Vehicle Storage (warm)	561	$ 145.00	$ 81,345.00
	Division Operation Critical Space	7495	$ 185.00	$ 1,386,575.00
	Unconditioned Vehicle Storage (cold)	0	$ 125.00	$ -
	Total	**9933**	$ 180.00	**$ 1,965,317.71**
Inspections	Administrative	3738	$ 265.00	$ 990,609.75
	Conditioned Vehicle Storage (warm)	0	$ 145.00	$ -
	Division Operation Critical Space	750	$ 145.00	$ 108,750.00
	Unconditioned Vehicle Storage (cold)	0	$ 125.00	$ -
	Total	**4488**	$ 205.00	**$ 1,099,359.75**

		SF	Cost Per SF	Cost Subtotal
Solid Waste	Administrative	14235	$ 265.00	$ 3,772,378.35
	Conditioned Vehicle Storage (warm)	0	$ 145.00	$ -
	Division Operation Critical Space	22576	$ 215.00	$ 4,853,840.00
	Unconditioned Vehicle Storage (cold)	0	$ 125.00	$ -
	Total	**36811**	$ 240.00	**$ 8,626,218.35**
Stormwater Collections	Administrative	5243	$ 265.00	$ 1,389,385.73
	Conditioned Vehicle Storage (warm)	39898	$ 145.00	$ 5,785,256.40
	Division Operation Critical Space	4986	$ 185.00	$ 922,410.00
	Unconditioned Vehicle Storage (cold)	9936	$ 125.00	$ 1,242,054.00
	Total	**60064**	$ 180.00	**$ 9,339,106.13**
Streets	Administrative	8808	$ 265.00	$ 2,334,065.01
	Conditioned Vehicle Storage (warm)	61055	$ 145.00	$ 8,852,939.04
	Division Operation Critical Space	7510	$ 185.00	$ 1,389,350.00
	Unconditioned Vehicle Storage (cold)	11561	$ 125.00	$ 1,445,136.00
	Total	**88934**	$ 180.00	**$ 14,021,490.05**
Traffic	Administrative	4066	$ 265.00	$ 1,077,596.00
	Conditioned Vehicle Storage (warm)	7414	$ 145.00	$ 1,075,055.52
	Division Operation Critical Space	9256	$ 185.00	$ 1,712,360.00
	Unconditioned Vehicle Storage (cold)	0	$ 125.00	$ -
	Total	**20737**	$ 180.00	**$ 3,865,011.52**
Wastewater Collections	Administrative	4406	$ 265.00	$ 1,167,699.98
	Conditioned Vehicle Storage (warm)	0	$ 145.00	$ -
	Division Operation Critical Space	920	$ 185.00	$ 170,200.00
	Unconditioned Vehicle Storage (cold)	0	$ 125.00	$ -
	Total	**5326**	$ 225.00	**$ 1,337,899.98**
Water Distribution	Administrative	10087	$ 265.00	$ 2,672,992.73
	Conditioned Vehicle Storage (warm)	37443	$ 145.00	$ 5,429,290.68
	Division Operation Critical Space	8502	$ 185.00	$ 1,572,870.00
	Unconditioned Vehicle Storage (cold)	0	$ 125.00	$ -
	Total	**56032**	$ 198.33	**$ 9,675,153.41**

7 - Site Program and Cost Summary

Site Program Requirements		SF		Cost	
Central Maintenance	Exterior Equipment Parking	0		$	-
	Staff Parking	8872		$	29,014.65
	Other Site Costs	31308		$	213,233.10
	Fuel Island	1500		$	450,000.00
	Subtotal	**41681**		**$**	**692,247.75**
Construction Management Engineering	Exterior Equipment Parking	2765		$	9,360.00
	Staff Parking	6827		$	22,336.13
	Other Site Costs	0		$	-
	Subtotal	**9591**		**$**	**31,696.13**
Facilities Maintenance	Exterior Equipment Parking	0		$	-
	Staff Parking	5409		$	17,729.25
	Other Site Costs	10364		$	78,769.50
	Subtotal	**15773**		**$**	**96,498.75**
Forestry	Exterior Equipment Parking	0		$	-
	Staff Parking	2574		$	8,515.50
	Other Site Costs	8111		$	77,402.00
	Subtotal	**10685**		**$**	**85,917.50**
Horticulture	Exterior Equipment Parking	4147		$	13,104.00
	Staff Parking	11777		$	40,436.55
	Other Site Costs	107887		$	792,508.30
	Subtotal	**123812**		**$**	**846,048.85**
Household Hazardous Waste	Exterior Equipment Parking	0		$	-
	Staff Parking	3164		$	10,581.38
	Other Site Costs	27588		$	178,865.63
	Subtotal	**30752**		**$**	**189,447.00**
Inspections	Exterior Equipment Parking	4147		$	13,104.00
	Staff Parking	4559		$	14,965.13
	Other Site Costs	0		$	-
	Subtotal	**8706**		**$**	**28,069.13**
Solid Waste	Exterior Equipment Parking	31334		$	102,024.00
	Staff Parking	32236		$	105,007.88
	Other Site Costs	142250		$	815,110.00
	Fuel Island - Rapid Fill	1500		$	2,500,000.00
	Subtotal	**207320**		**$**	**3,522,141.88**

		SF		Cost	
Stormwater	Exterior Equipment Parking	3686		$	12,168.00
	Staff Parking	4842		$	15,886.50
	Other Site Costs	21989		$	269,120.20
	Subtotal	**30517**		**$**	**297,174.70**
Streets	Exterior Equipment Parking	7949		$	26,208.00
	Staff Parking	11534		$	38,222.63
	Other Site Costs	72150		$	1,534,050.00
	Fuel Island	1500		$	450,000.00
	Subtotal	**93133**		**$**	**2,048,480.63**
Traffic	Exterior Equipment Parking	1843		$	5,616.00
	Staff Parking	3141		$	10,358.25
	Other Site Costs	14976		$	93,284.10
	Subtotal	**19961**		**$**	**109,258.35**
Wastewater Collections	Exterior Equipment Parking	0		$	-
	Staff Parking	4842		$	15,886.50
	Other Site Costs	5682		$	39,775.09
	Subtotal	**10524**		**$**	**55,661.59**
Water Distribution	Exterior Equipment Parking	10138		$	32,760.00
	Staff Parking	15378		$	49,056.00
	Other Site Costs	34249		$	283,996.41
	Subtotal	**59766**		**$**	**365,812.41**
Site General					
Phase 1 Loop Road - 15th Street	Street & Storm Sewer			$	856,450.00
	Waterline			$	379,700.00
Phase 1 Loop Road - Buisness Park	Street & Storm Sewer			$	6,239,266.83
	Waterline			$	863,848.21
Phase 1 Site	Site & Storm Sewer			$	2,043,029.64
	Waterline			$	53,500.00
Remaining Loop Road	Street & Storm Sewer			$	2,026,777.50
	Waterline			$	197,400.00
Remaining Site	Site & Storm Sewer			$	5,961,000.00
	Waterline			$	580,000.00

CFS ENGINEERS
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LAWRENCE FIELD OPERATIONS FACILITY
Combined Facility for the Municipal Services and Operations Organization (MSO)
Northeast of E 19th Street & O'Connell Road
CFS Project Number 191196

Traffic Study

July 2, 2020

Owner:
The City of Lawrence
6 East 6th Street, Lawrence, Kansas 66044
Architect / Prime Contract Holder:
Dake Wells Architecture
(833) 518-4545

Prepared by:
Andrew Robertson, PE, PTOE, and Xiang Yu, EI
Cook, Flatt & Strobel Engineers, P.A.
2121 Moodie Road
Lawrence, Kansas 66046
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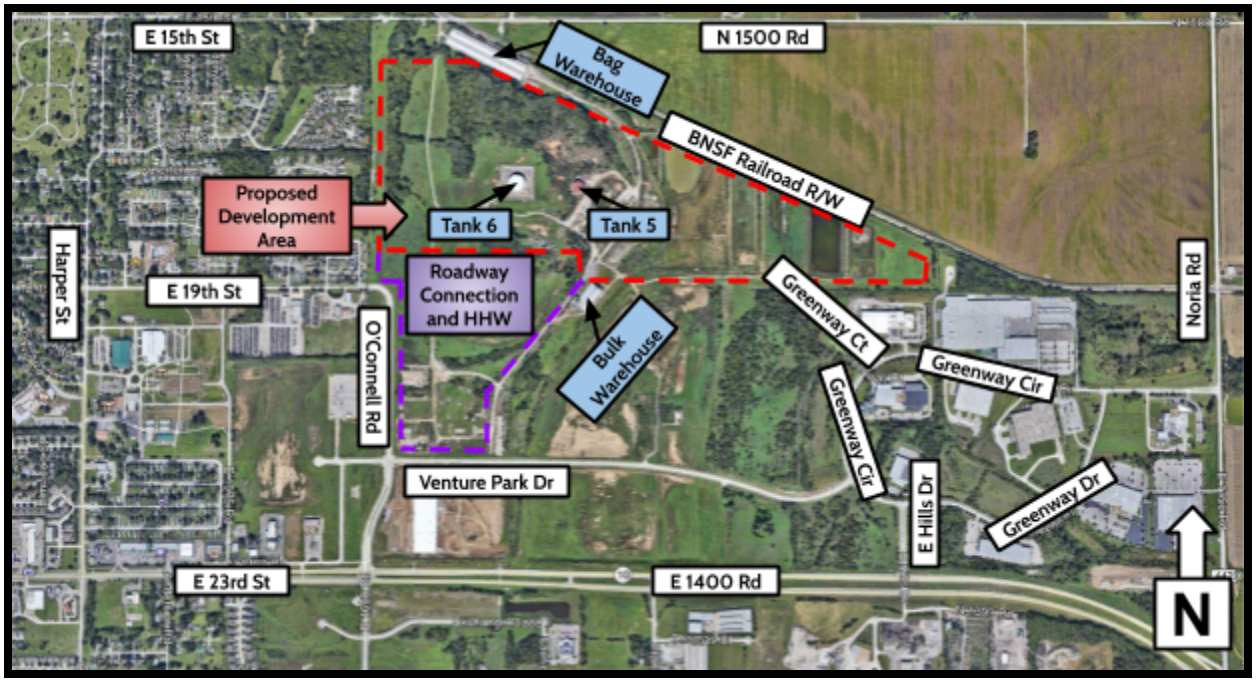
Appendix VIII - Scenario 5 - Proposed street/after-development conditions, Weekday AM Peak Traffic 2040
Appendix IX - Scenario 6 - Proposed street/after-development conditions, Weekday PM Peak Traffic 2040
Appendix X - Truck Turning Envelopes - Fire Truck

Introduction

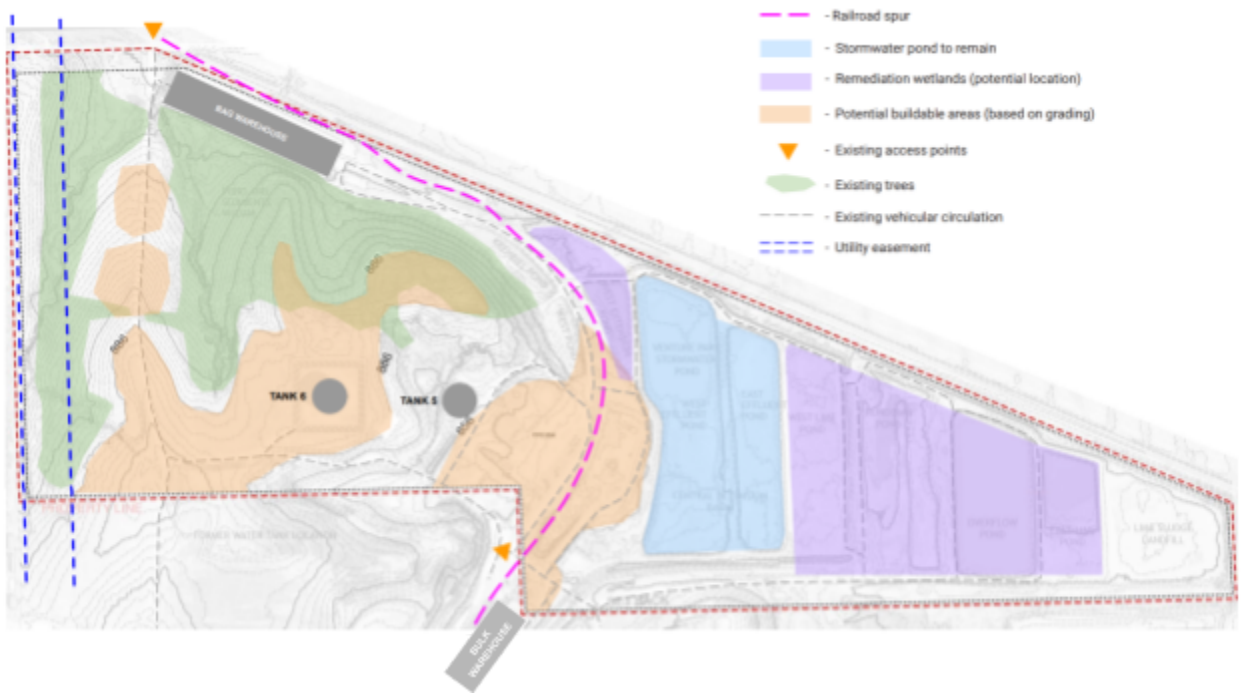
This traffic study for the field operations campus in the City of Lawrence, Kansas, has been prepared at the request of the City of Lawrence in accordance with the City's Traffic Study Guidelines. The City of Lawrence is constructing a new field operations campus on the eastern side of the city which will consolidate several departments into one secure location. The 168 acre site will be northwest of the intersection of E 19th Street & O'Connell Road. Proposed staff includes 223 full-time and 13 part-time personnel with some individuals making multiple site trips to and from the facility throughout the day. The facility will be constructed to accommodate a growth in city staff to align with the growth of Lawrence over the next 50 years with an estimated 355 full-time and 21 part-time personnel.

There will be at least one new roadway connection to public streets with a major access point connecting to the intersection of E 19th Street & O'Connell Road. Although the current orientation of buildings and circulation roadway within the campus is still under development, an additional roadway access connection is being considered for either Greenway Circle and/or E 15th Street to meet emergency service access requirements. The intersection of E 19th Street & O'Connell Road will be reconfigured into a stop-controlled T-intersection with O'Connell Road extending to the north.



Site Location Map, Lawrence, Kansas

Many of the vacated improvements currently on site will be removed, including Tank 5 and Tank 6. The bulk warehouse and bag warehouse buildings are planned to remain unchanged due to this development but other options are being discussed at this time. Additional details for the existing site conditions are shown in the image below.



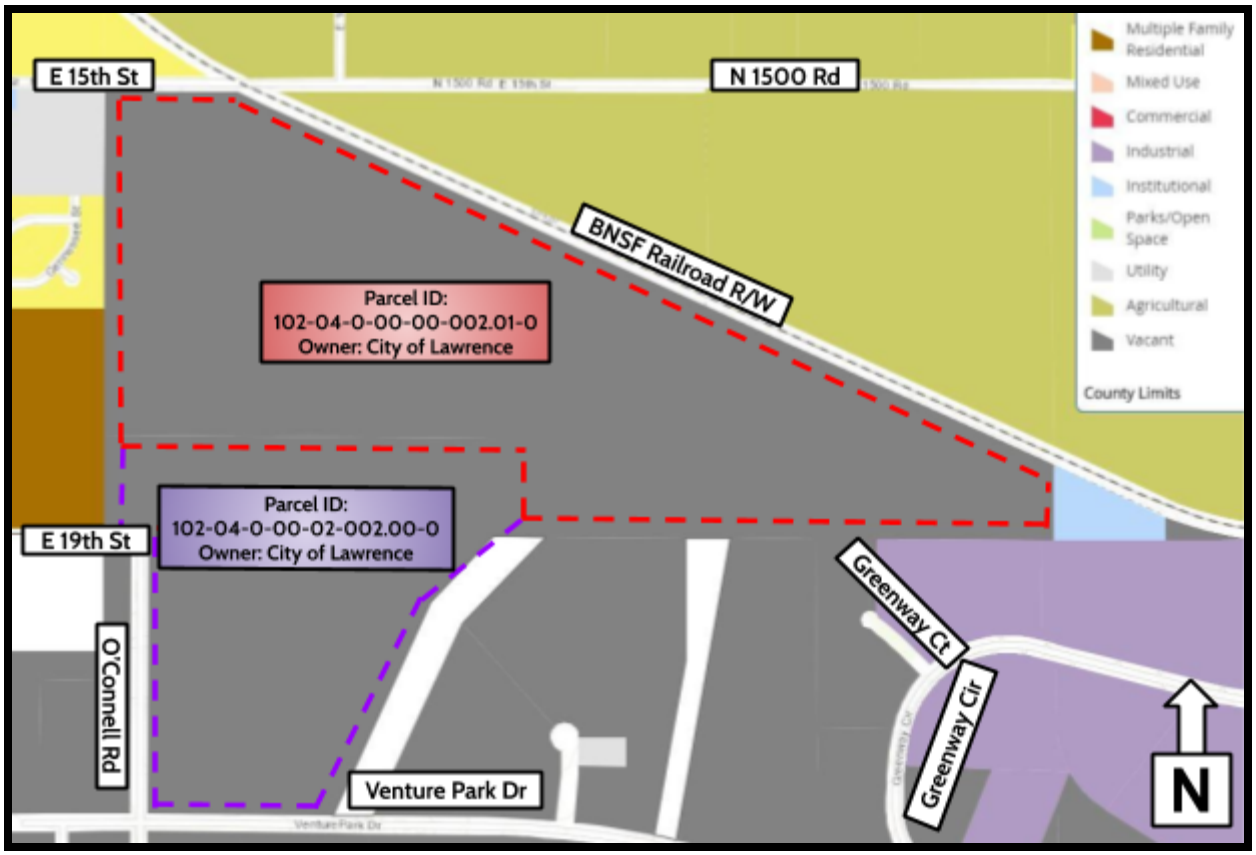
Existing Conditions Site Map, Lawrence, Kansas

The overall objective of the report is to look at proposed land uses and nearby intersections to determine if additional improvements are needed based on trip generation levels. The report will provide details on planned site improvements, provide traffic generation volumes, use available traffic data to distribute volumes for peak hour analysis, provide a Synchro analysis using performance measures, analyze multi-modal aspects of the facility, and provide details on the proposed roadways and access points.

Section 1: Specific Development Plan and Land Use

Land Use of Development: The land use for the site will be converted from the "Former Farmland/Vacant" category to "Institution" category. The site includes portions of two parcels currently owned by the City of Lawrence, Parcel ID 102-04-0-00-00-002.01-0 and Parcel ID

102-04-0-00-02-002.00-0. New improvements to Parcel ID 102-04-0-00-00-002.01-0 will include 3-6 combined-use buildings, bulk storage, fueling station, new roadways, and parking. New improvements to Parcel ID 102-04-0-00-02-002.00-0 will include a roadway connection or other improvements, such as the Household Hazardous Waste (HHW) building, depending on the final building footprint arrangement.



Land Use Map, Lawrence, Kansas

There will be 3 distinct land uses for the development which include the following:

(1) Office and Maintenance Combined Campus

(a) This includes several related-use buildings, offices, conference rooms, workshops, garages, storage bays, a refueling pump, and other building elements needed for city operations. Divisions within the Office and Maintenance Campus include the central maintenance garage, construction management engineering division, facility maintenance, forestry, horticulture, inspections, stormwater, streets, traffic division, wastewater collections, and water distribution.

(b) For trip generation purposes, operating hours are Monday through Friday. It was estimated that 95% of the employees make at least one additional trip throughout the day if not two. Most employees will arrive around 6:30am, leave between

6:45am-7:00am to go to their scheduled field work, and return to the campus around 5:00pm-5:15pm. About 50% of staff will return for lunch around 11:30am-12:00pm. Inspectors leave for the field around 8:00am and return at 5:00pm. Some of the supervisory staff may make 3 or 4 trips throughout the day for meetings. Maintenance operations hours are 7:30am to 3:30pm with cart delivery trucks and maintenance trucks entering and exiting the shop area throughout the day.

(2) Solid Waste Division
   (a) This includes trash truck operations.
   (b) For trip generation purposes, operation hours are slightly different than Office and Maintenance operations since trash trucks operate Monday through Saturday. About 70% of the collection services operation starts at 6:00am with the other 30% at 7:00am. There is a single "late truck" that starts at 7:30am. Trucks leaving at 6:00am are expected to return back from their route at around 2:00-2:15pm to be clocked out by 2:30pm. Trucks leaving at 7:00am are expected to return back from their route at around 3:00-3:15pm to be clocked out by 3:30pm. The single "late truck" works until 4:00pm. Inclement weather slows down operations as well as when students move out meaning that, on occasion, the 6:00am trucks don't return until 3:00-3:30pm. Only 3 trucks run on Saturdays with a start time of 6:00am and ending around 12:00pm.

(3) Household Hazardous Waste
   (a) This includes household hazardous waste operations as well as a drop-off area for the public. This building will be outside of the fenced-in section of the campus.
   (b) For trip generation purposes, the facility is open to the public 8:00am-1:00pm Tuesday, Wednesday, and Thursday. The number of public trips is expected to be 7 per hour.

Land Use of Surrounding Properties: To the north, across the BNSF Railroad rail line, the land use category is Agriculture. To the east, the land use category is Industrial. To the south of the site is vacant which is undeveloped/partially developed. To the west of the site, the land use categories are Vacant on the southside of E 19th Street and Multiple Family Residential on the northside of E 19th Street.

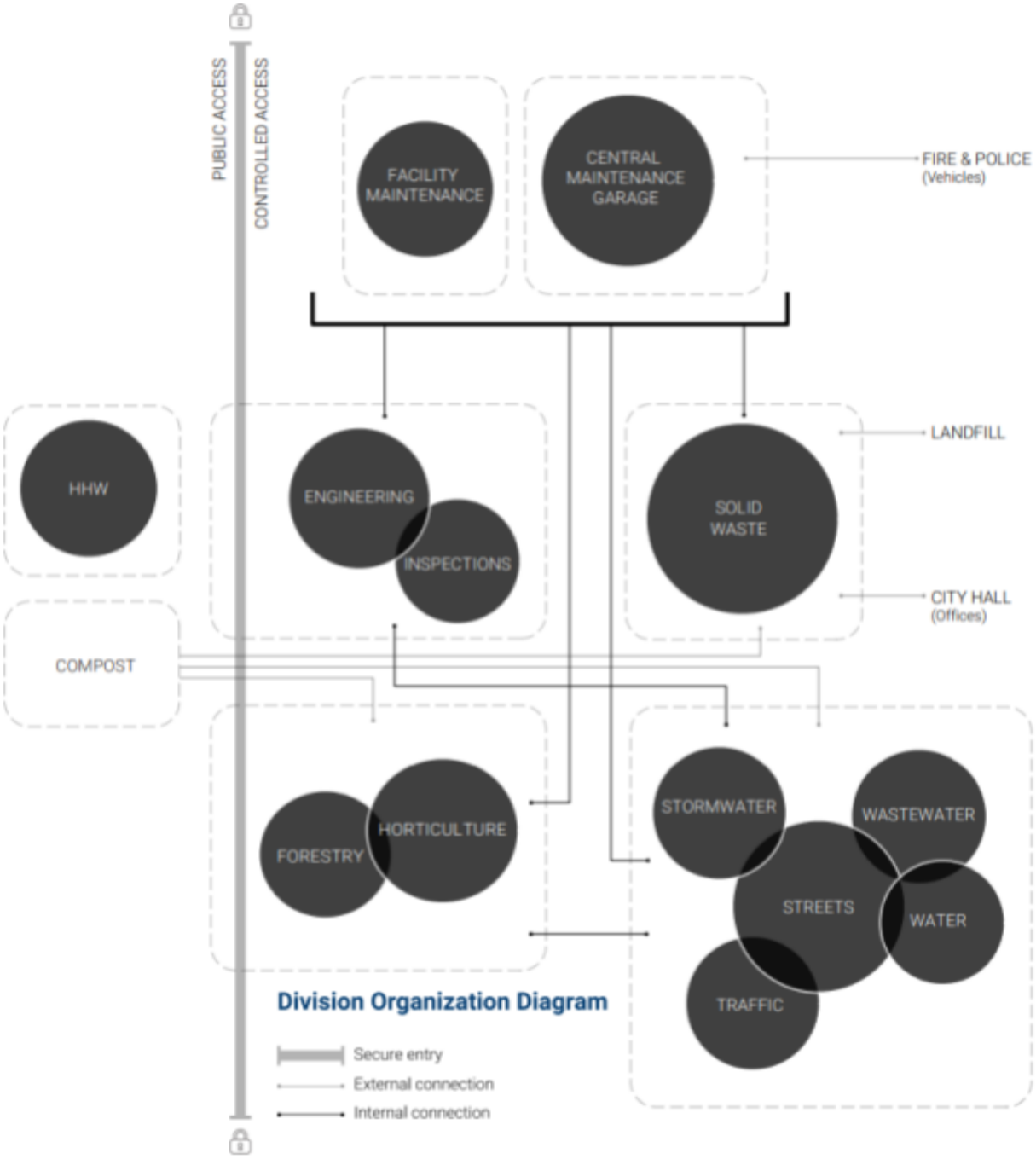
Development Plan: The following Facility Divisions will share space in the new campus:

- CMG – Central Maintenance Garage
  - Service and repair for all City-owned equipment
  - 73,770 sq ft for Main Building, 8.25 acres for total site requirements
  - 17 full-time employees
- CMED – Construction Management Engineering Division

    - Engineering oversight and management for construction projects in the City
    - 8,490 sq ft for Main Building, 2.71 acres for total site requirements
    - 14 full-time employees
- FAC – Facility Maintenance Division
    - Maintenance and operations for 258 City-owned buildings/structures and grounds
    - 33,523 sq ft for Main Building, 4.60 acres for total site requirements
    - 10 full-time employees and 1 part-time employee
- FOR – Forestry Division
    - Protect and maintain street trees
    - 24,665 sq ft for Main Building, 2.70 acres for total site requirements
    - 5 full-time employees and 3 part-time employee
- HOR – Horticulture Division
    - Maintenance of landscaping and natural areas
    - 11,856 sq ft for Main Building, 10.52 acres for total site requirements
    - 5 full-time employees and 5 part-time employee
- HHW – Household Hazardous Waste Division
    - City and County drop off location for household hazardous waste
    - 12,181 sq ft for Main Building, 2.78 acres for total site requirements
    - 1 full-time employee and 4 part-time employees
- INS – Inspections Division
    - Inspection of construction and repair projects
    - 4,713 sq ft for Main Building, 1.93 acres for total site requirements
    - 9 full-time employees
- SWD – Solid Waste Division
    - Collection of trash, recycling, yard waste, bulky items and tires
    - 43,584 sq ft for Main Building, 14.48 acres for total site requirements
    - 80 full-time employees
- STWT – Stormwater Division
    - Stormwater system oversight and management
    - 51,623 sq ft for Main Building, 6.56 acres for total site requirements
    - 10 full-time employees
- STRT – Streets Division
    - Roadway oversight and management
    - 79,626 sq ft for Main Building, 11.93 acres for total site requirements
    - 24 full-time employees
- TRAF – Traffic Division
    - Street signage and intersection traffic signal oversight and management
    - 23,513 sq ft for Main Building, 3.16 acres for total site requirements
    - 6 full-time employees

- WSWT – Wastewater Collections Division
    - Sanitary sewer system oversight and management
    - 22,729 sq ft for Main Building, 2.53 acres for total site requirements
    - 10 full-time employees
- WTDT – Water Distribution Division
    - Water distribution system oversight and management
    - 58,583 sq ft for Main Building, 10.00 acres for total site requirements
    - 32 full-time employees

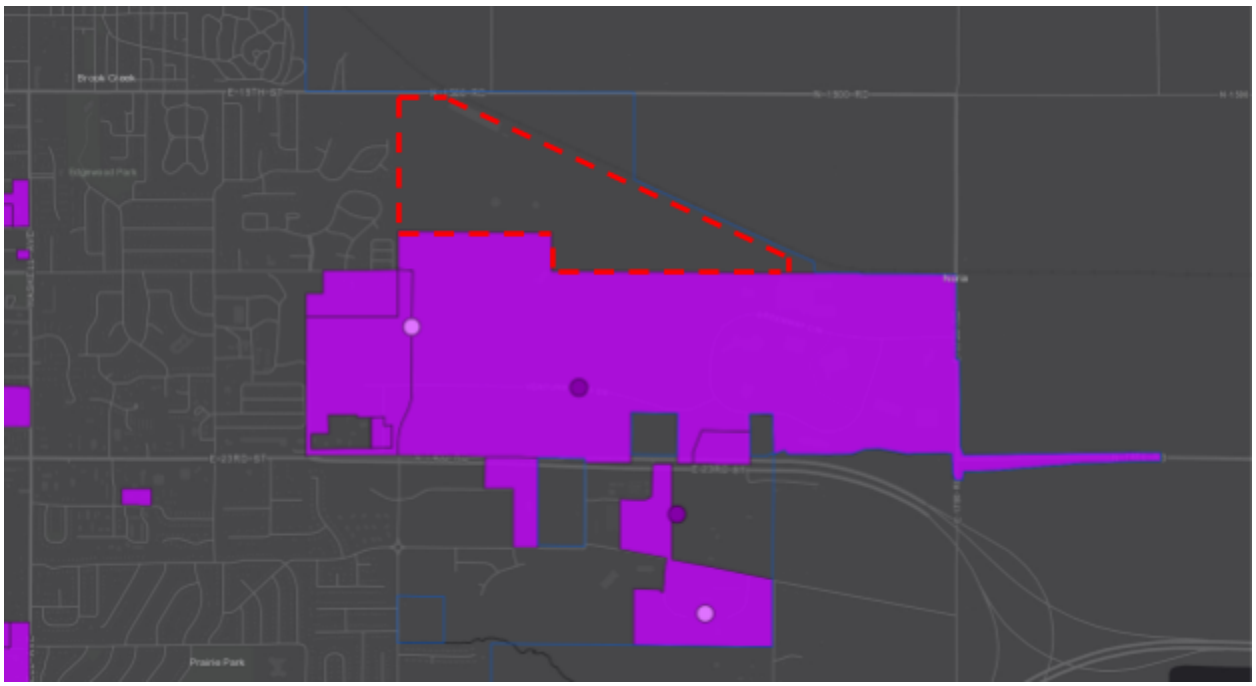
For the Office and Maintenance Combined Campus including the Household Hazardous Waste division, the total building square footage is 448,856 sq ft and the total acreage is 82.15 acres. The final building layout is being refined at the time of writing this report. The general concept of the buildings is shown in the image below.



Schematic Building Layout

Section 2: Land Use Shown in the Lawrence/Douglas County Comprehensive Plan

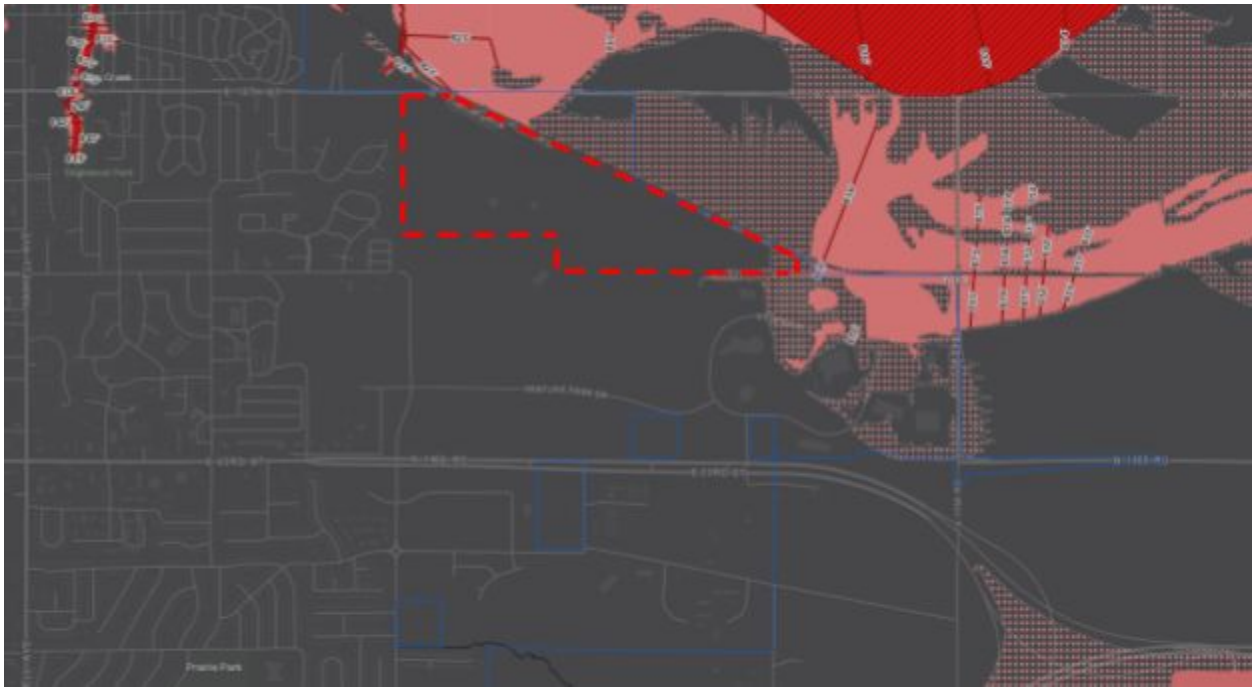
Land Uses in the Lawrence/Douglas County Comprehensive Plan: The land use shown in the Plan 2040 GIS maps show that the site is partially vacant and partially industrial.



Plan 2040 Industrial Map (Purple)

Shown below are the nearby commercial areas and flood areas which will not be impacted by the new development.

Plan 2040 Commercial Map (Blue)

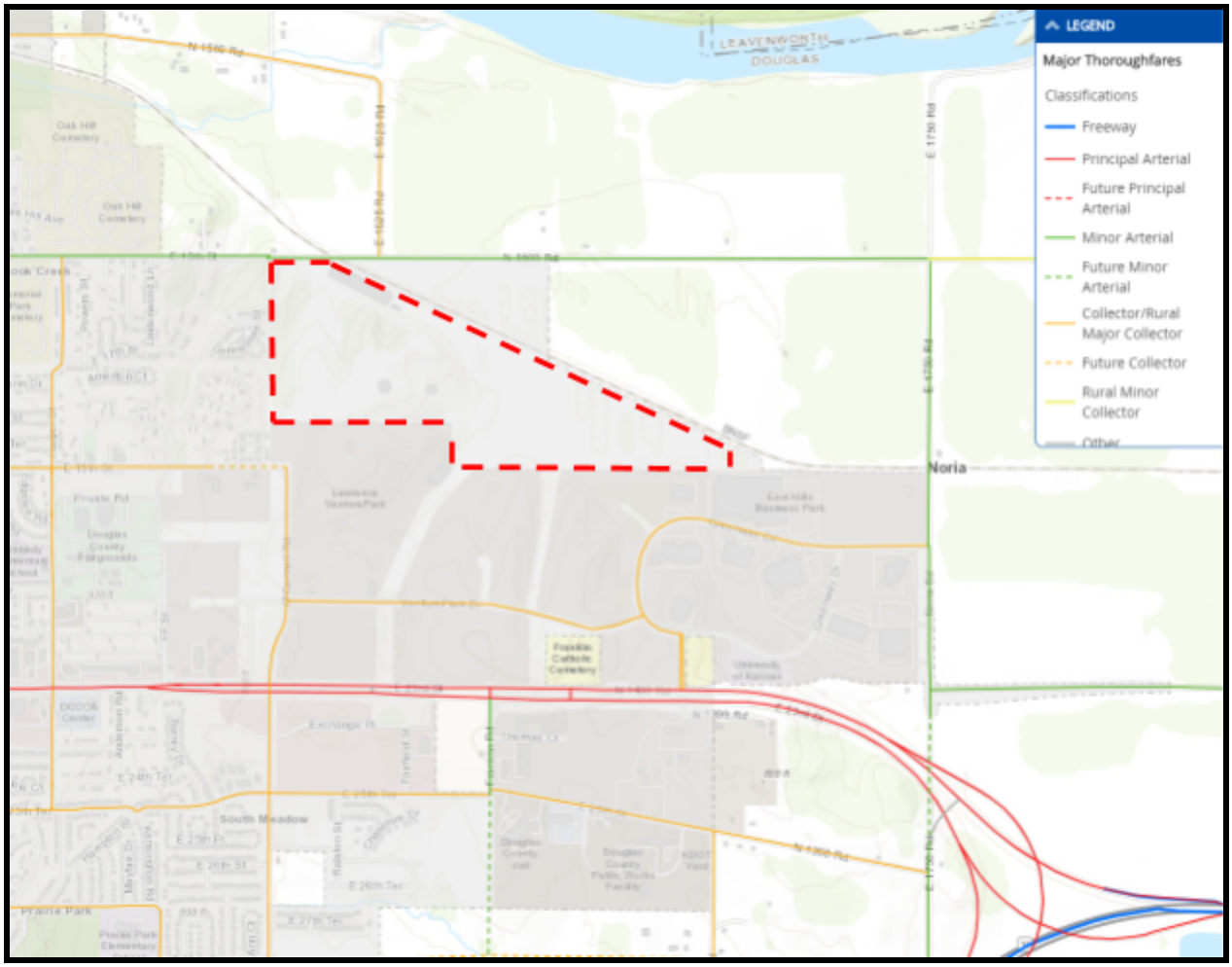


Plan 2040 Flood Zone Map (Red)

There is no conflict between the proposed land use for the new development and the Comprehensive Plan.

Section 3: Functional Classification of the Public Streets Bordering the Site

Surrounding Public Streets and Highway Network: As shown in the Transportation 2040 (T2040) report developed by the Metropolitan Transportation Plan of Lawrence and Douglas County, the functional classification of the surrounding streets is shown in the map below.



Roadway Functional Classification Map

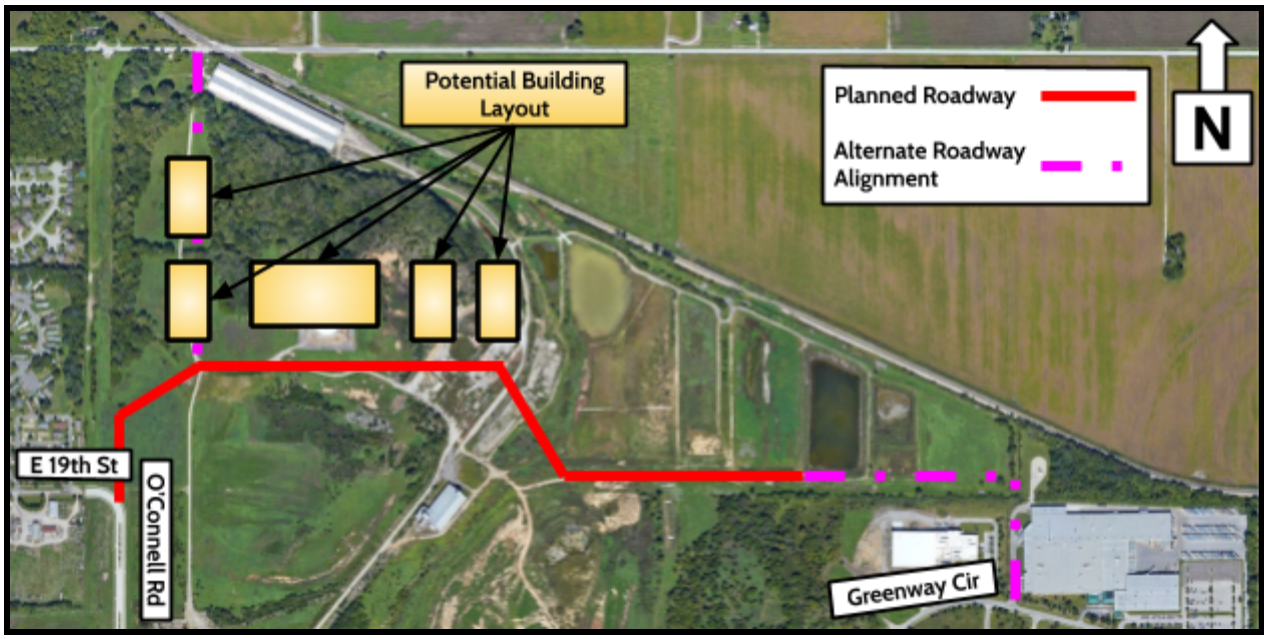
Surrounding Roadways include the following:

- E 23rd Street/N 1400 Road - Principal Arterial
- O'Connell Road/E 1600 Road - Collector/Rural Major Collector
- Venture Park Drive - Collector/Rural Major Collector

- Greenway Circle - Collector/Rural Major Collector
- Noria Road/E 1750 Road - Minor Arterial
- E 19th Street - Collector/Rural Major Collector
- Harper Street - Collector/Rural Major Collector

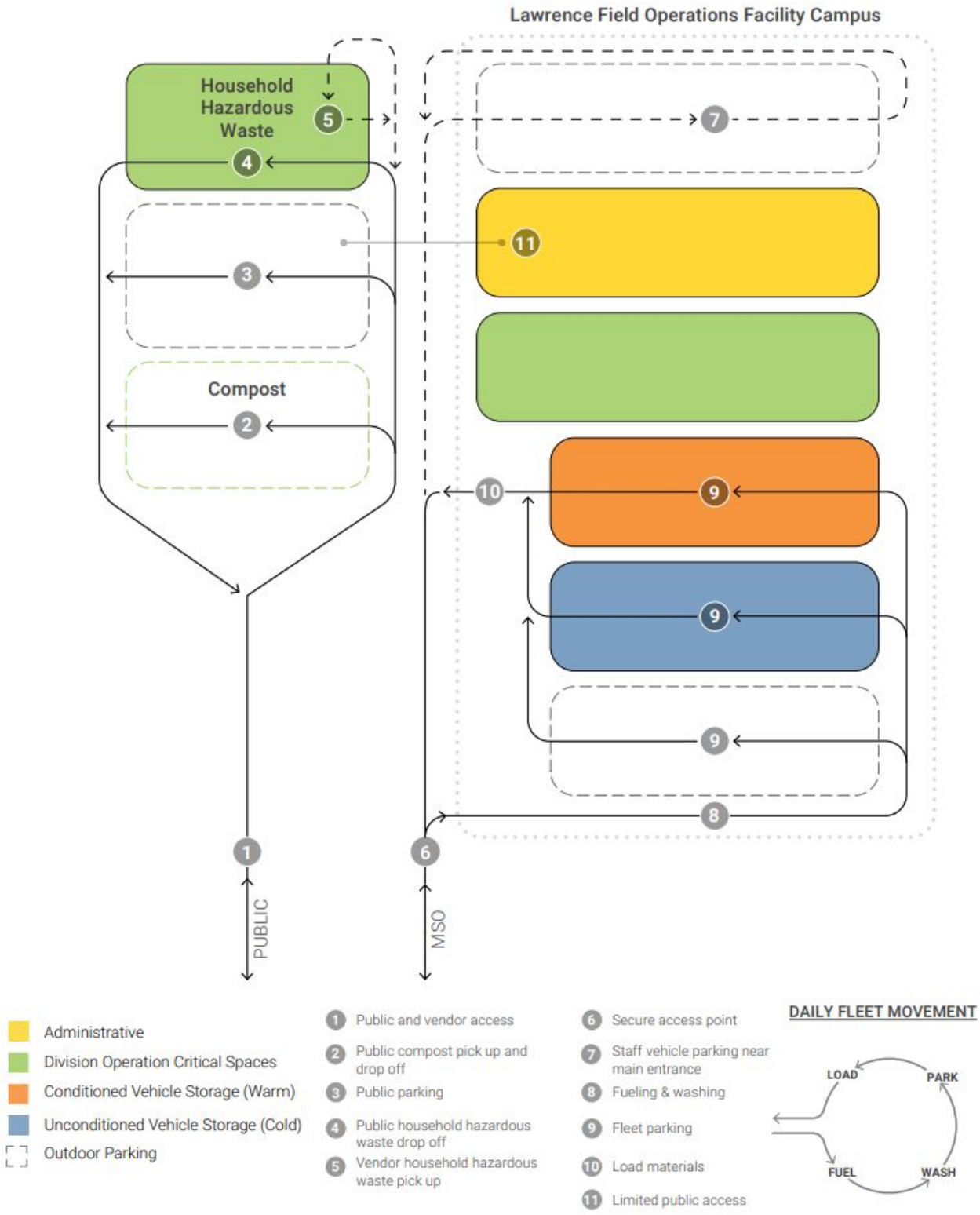
Section 4: Access to the Development, Internal Circulation, and Truck Turning Movements

Access to the Development: The main access to the development will be an extension of O'Connell Road to the north of 19th Street. North of O'Connell Road & 19th Street will be a security gate entrance. The roadway will provide internal circulation through the site and will be used by vehicles traveling between buildings, vehicle maintenance bays, and workshops. Several options for a back entrance are being considered as an alternative egress for emergency/fire access.



Potential Layout

Internal Circulation and Parking: The final parking lot layout and circulation plan is being refined at the time of writing this report. The general concept of vehicle flow is shown in the image below.



The Facility Divisions within the campus will share parking spaces although parking space requirements per division have been calculated separately to ensure parking needs are satisfied. The number of vehicle parking spaces is outlined below:

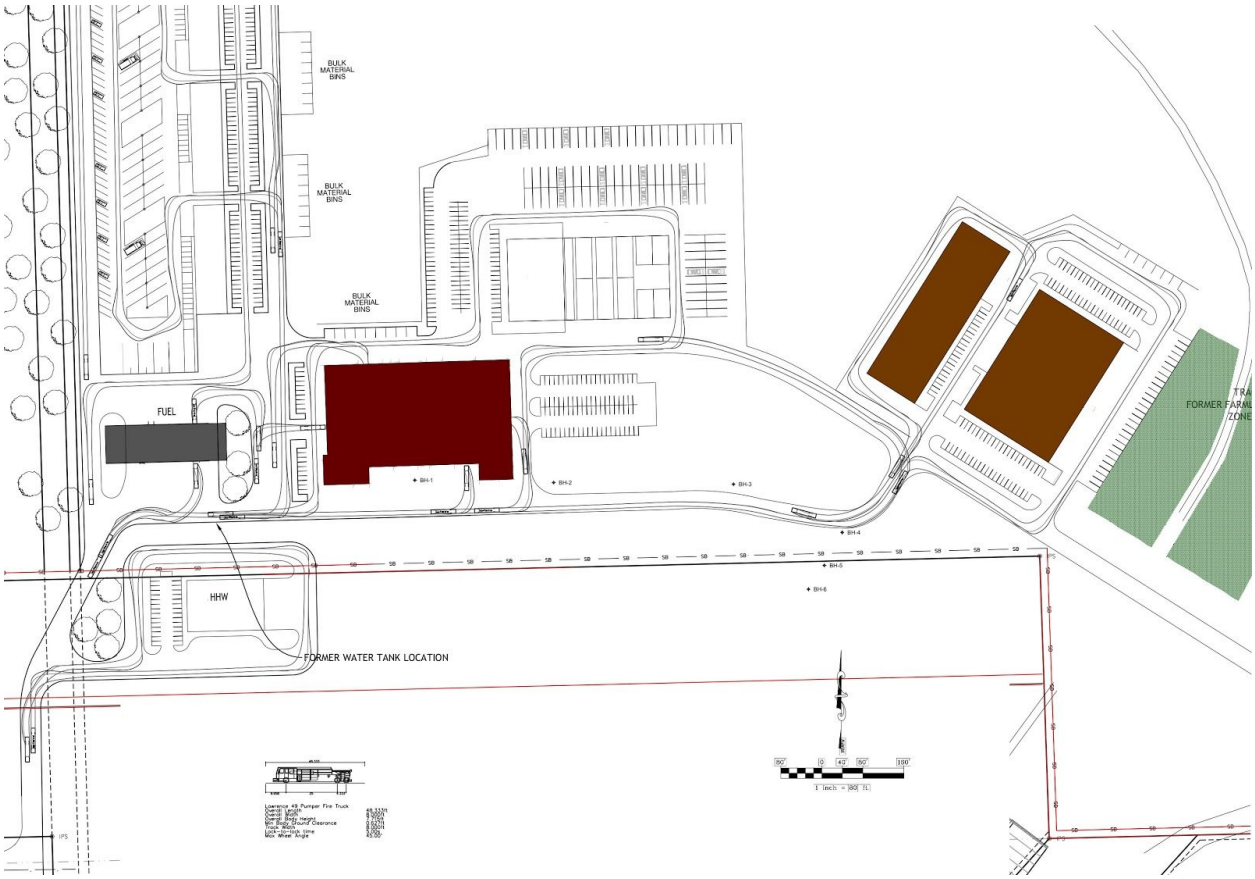
- CMG – Central Maintenance Garage
    - Staff Parking - 30 spaces
    - ADA Reserved Parking - 1 space
    - Conditioned Vehicle Storage (Warm) - 3,366 sq ft total
        - Pickup - 6 spaces at 10 ft x 20 ft
    - Large Service Bays - 18 spaces at 28 ft x 52 ft
    - Small Service Bays - 12 spaces at 22 ft x 32 ft
    - Tire Service Bay - 1 space at 28 ft x 52 ft
    - Fleet Staging Area - 6 spaces at 20 ft x 45 ft
    - Wash Bay - 1 space at 30 ft x 56 ft
    - Fuel Island - 1 space at 30 ft x 50 ft
    - Trash / Recycling Area - 1 space at 30 ft x 30 ft
- CMED – Construction Management Engineering Division
    - Staff Parking - 23 spaces
    - ADA Reserved Parking - 1 space
    - Exterior Equipment Parking - 10 spaces at 12 ft x 24 ft
- FAC – Facility Maintenance Division
    - Staff Parking - 18 spaces
    - ADA Reserved Parking - 1 space
    - Conditioned Vehicle Storage (Warm) - 26,668 sq ft total
        - Large - 5 spaces at 20 ft x 45 ft
        - Medium - 14 spaces at 12 ft x 24 ft
        - Pickup - 5 spaces at 10 ft x 20 ft
    - Unconditioned Vehicle Storage (Cold) - 8,976 sq ft total
        - Pickup - 16 spaces at 10 ft x 20 ft
    - Trash / Recycling Area - 1 space at 30 ft x 30 ft
- FOR – Forestry Division
    - Staff Parking - 8 spaces
    - ADA Reserved Parking - 1 space
    - Conditioned Vehicle Storage (Warm) - 19,191 sq ft total
        - Large - 5 spaces at 20 ft x 45 ft
        - Medium - 3 spaces at 12 ft x 24 ft
        - Pickup - 8 spaces at 10 ft x 20 ft
    - Unconditioned Vehicle Storage (Cold) - 1,795 sq ft total
        - Pickup - 3 spaces at 10 ft x 20 ft
    - Trash / Recycling Area - 1 space at 30 ft x 30 ft
- HOR – Horticulture Division
    - Staff Parking - 26 spaces
    - ADA Reserved Parking - 1 space

    - Conditioned Vehicle Storage (Warm) - 4,825 sq ft total
        - Pickup - 9 spaces at 10 ft x 20 ft
    - Unconditioned Vehicle Storage (Cold) - 8,976 sq ft total
        - Pickup - 16 spaces at 10 ft x 20 ft
    - Exterior Equipment Parking - 14 spaces at 12 ft x 24 ft
    - Trash / Recycling Area - 1 space at 30 ft x 30 ft
- HHW – Household Hazardous Waste Division
    - Staff Parking - 9 spaces
    - ADA Reserved Parking - 2 spaces
    - Visitor Parking - 17 spaces
    - Visitor Drive-thru - 1 space at 15 ft x 15 ft
    - Conditioned Vehicle Storage (Warm) - 561 sq ft total
        - Pickup - 1 spaces at 10 ft x 20 ft
    - Household Hazardous Waste Dumpster Containers - 3 spaces at 8 ft x 13 ft
- INS – Inspections Division
    - Staff Parking - 15 spaces
    - ADA Reserved Parking - 1 space
    - Exterior Equipment Parking - 14 spaces at 12 ft x 24 ft
- SWD – Solid Waste Division
    - Staff Parking - 109 spaces
    - ADA Reserved Parking - 4 spaces
    - Exterior Equipment Parking - 109 spaces at 12 ft x 24 ft
    - Wash Bay - 2 spaces at 30 ft x 56 ft
    - Fuel Island - 1 space at 30 ft x 50 ft
    - Dumpster and Cart Storage Area - 1 space at 160 ft x 300 ft
- STWT – Stormwater Division
    - Staff Parking - 16 spaces
    - ADA Reserved Parking - 1 space
    - Conditioned Vehicle Storage (Warm) - 39,898 sq ft total
        - Large - 13 spaces at 20 ft x 45 ft
        - Medium - 8 spaces at 12 ft x 24 ft
        - Pickup - 2 spaces at 10 ft x 20 ft
    - Unconditioned Vehicle Storage (Cold) - 12,629 sq ft total
        - Medium - 5 spaces at 12 ft x 24 ft
        - Pickup - 16 spaces at 10 ft x 20 ft
    - Exterior Equipment Parking - 13 spaces at 12 ft x 24 ft
    - Wash Bay - 1 space at 30 ft x 56 ft
- STRT – Streets Division
    - Staff Parking - 39 spaces

    - ADA Reserved Parking - 2 spaces
    - Conditioned Vehicle Storage (Warm) - 61,055 sq ft total
        - Large - 19 spaces at 20 ft x 45 ft
        - Medium - 13 spaces at 12 ft x 24 ft
        - Pickup - 4 spaces at 10 ft x 20 ft
    - Unconditioned Vehicle Storage (Cold) - 11,561 sq ft total
        - Medium - 3 spaces at 12 ft x 24 ft
        - Pickup - 16 spaces at 10 ft x 20 ft
    - Exterior Equipment Parking - 28 spaces at 12 ft x 24 ft
    - Wash Bay - 1 space at 30 ft x 56 ft
    - Fuel Island - 1 space at 30 ft x 50 ft
    - Trash / Recycling Area - 1 space at 30 ft x 30 ft
- TRAF – Traffic Division
    - Staff Parking - 10 spaces
    - ADA Reserved Parking - 1 space
    - Conditioned Vehicle Storage (Warm) - 7,414 sq ft total
        - Medium - 6 spaces at 12 ft x 24 ft
        - Pickup - 4 spaces at 10 ft x 20 ft
    - Exterior Equipment Parking - 6 spaces at 12 ft x 24 ft
- WSWT – Wastewater Collections Division
    - Staff Parking - 16 spaces
    - ADA Reserved Parking - 1 space
    - Conditioned Vehicle Storage (Warm) - 17,126 sq ft total
        - Large - 3 spaces at 20 ft x 45 ft
        - Medium - 11 spaces at 12 ft x 24 ft
- WTDT – Water Distribution Division
    - Staff Parking - 52 spaces
    - ADA Reserved Parking - 2 spaces
    - Conditioned Vehicle Storage (Warm) - 37,443 sq ft total
        - Large - 6 spaces at 20 ft x 45 ft
        - Medium - 18 spaces at 12 ft x 24 ft
        - Pickup - 13 spaces at 10 ft x 20 ft
    - Unconditioned Vehicle Storage (Cold) - 12,118 sq ft total
        - Pickup - 22 spaces at 10 ft x 20 ft
    - Exterior Equipment Parking - 35 spaces at 12 ft x 24 ft

Truck Turning Movements: Internal circulation routes will provide sufficient space for truck turning maneuvers. Most large trucks are less than 45 ft although the combination of a truck and trailer could be longer. The following image is a draft layout that provides sufficient turning

space for a Lawrence 49 Pumper Fire Truck. A larger version of this illustration has been included in the appendix.



Potential Layout showing Lawrence 49 Pumper Fire Truck Turning Movements

Section 5: Current Public Street Characteristics Adjacent to the Site

Surrounding Roadways: The following list provides a recap of roadways surrounding the MSO facility.

- E 23rd Street/N 1400 Road - Principal Arterial
    - East of O'Connell Road/E 1600 Road
        - 4 lane divided roadway with a speed limit of 55 mph
    - West of O'Connell Road/E 1600 Road
        - 4 lane divided roadway transition to a 5 lane undivided roadway with a speed limit of 45 mph

- O'Connell Road/E 1600 Road - Collector/Rural Major Collector
    - South of Venture Park Drive
        - 4 lane divided roadway with a speed limit of 35 mph and bike lanes
    - North of Venture Park Drive
        - 2 lane divided roadway with a speed limit of 35 mph and bike lanes
- Venture Park Drive - Collector/Rural Major Collector
    - 2 lane undivided roadway with a speed limit of 35 mph and bike lanes
- Greenway Circle - Collector/Rural Major Collector
    - 2 lane undivided roadway with a speed limit of 35 mph
- Noria Road/E 1750 Road - Minor Arterial
    - 2 lane undivided roadway with a speed limit of 45 mph
- E 19th Street - Collector/Rural Major Collector
    - 2 lane undivided roadway with a speed limit of 30 mph
- Harper Street - Collector/Rural Major Collector
    - 2 lane undivided roadway with a speed limit of 35 mph between 19th Street and 23rd Street, otherwise the speed limit is 30 mph

There are several proposed improvements to surrounding roadways as listed in the T2040 report. The report states that Harper Street, from 15th Street to 19th Street, is planned to be reconstructed. 19th Street, from Harper Street to O'Connell Road, is also planned to be reconstructed in 2021. The reconstruction is necessary due to pavement deterioration and would allow the continuation of bike lanes and sidewalks to match the rest of 19th Street. Future design plans would include curb & gutter, stormwater improvements, and address the current disconnection between O'Connell Road and 19th Street. T2040 lists the intersection of Harper Street & 19th Street as a candidate for a roundabout.

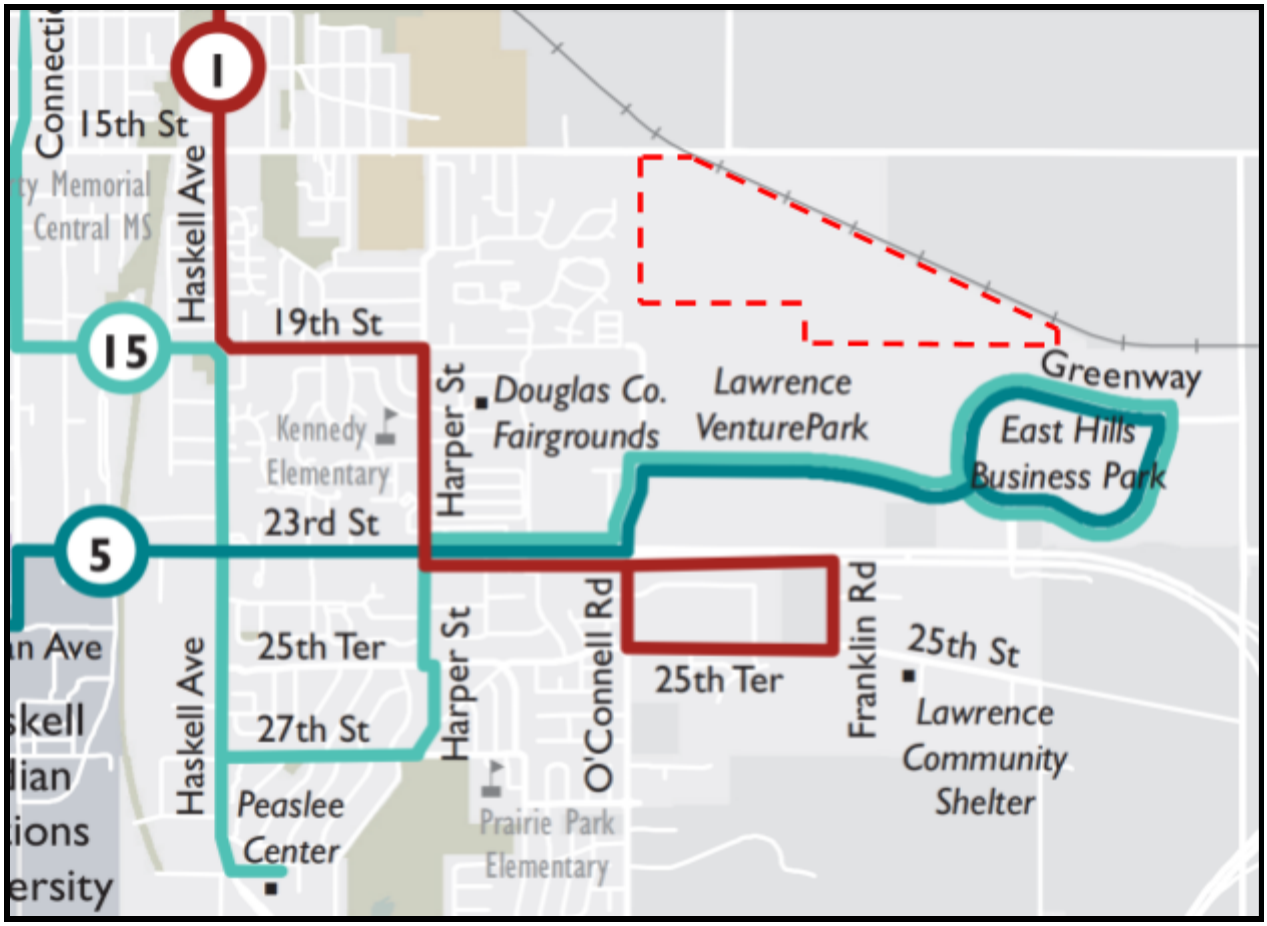
Public feedback from the T2040 report included several comments in regards to 19th Street improvements. Due to concerns that 19th Street will experience more traffic and will be treated like an arterial roadway rather than a collector roadway, many residents and representatives of the 19th Street Neighborhoods Coalition question whether connecting O'Connell Road to 19th Street is necessary. Since 19th Street is currently a "No Outlet" collector, the roadway does not experience thru traffic.

Current Condition of O'Connell Road & 19th Street

The public feedback centers on the potential level of traffic in conflict with walkability goals and neighborhood safety. This report does not cover any further detail of the future design of 19th Street improvements. If 19th Street is connected to O'Connell Road, some new trips generated by the MSO Facility might utilize 19th Street for emergency vehicle service, trash truck service, or other city vehicles in-service to the neighborhood; Most trips to and from the MSO facility will not utilize 19th Street because the layout of the MSO facility's main access drive will be an extension of O'Connell Road and vehicles that utilize O'Connell Road will have a quicker travel time to access a majority of Lawrence. Since 19th Street is not on the City's truck routing map, all trucks will be required to utilize O'Connell Road to get to E 23rd Street.

Water Conflicts: The flood map for the selected area is number 20045C0179E, effective on 09/02/2015, showed that the site was located outside of the 500 year flood zone.

Existing Alternative Transportation Mode Choices: Currently, there are sidewalks along both sides of O'Connell Road and Venture Park Drive. There is an existing sidewalk segment on the northside of E 19th Street. There are bicycle lanes on O'Connell Road and Venture Park Drive. Transit buses are routed along O'Connell Road and Venture Park Drive (Routes 5 and 15) and along Harper St and 19th Street (Route 1) which serve the area for the new development.



Bus Routes

Crash Analysis: The analysis of crash data near the vicinity of the MSO Facility was limited to the previous 5 years, January 2014 to December 2018. During the 5 years, all observed crashes occurred along E 23rd Street/N 1400 Road or Venture Park Drive or at the intersections of K-10/E 23rd Street & O'Connell Road/E 1600 Road and O'Connell Road & Venture Park Drive.

Crash Locations near the vicinity of the MSO Facility, Jan 2014 to Dec 2018

Details of total crashes are summarized in the tables below:

Table 1. Number of Crashes in Each Year

Year	# of Crashes	Percentage
2014	14	12.5%
2015	33	29.5%
2016	34	30.4%
2017	18	16.1%
2018	13	11.6%
Grand Total	**112**	100%

Table 2. Number of Crashes per Category | Location Type

Location Type	# of Crashes	Percentage	# of Vehicles	Percentage
INTERSECTION-ON ROAD	11	9.8%	23	9.8%
INTERSECTION-RELATED-ON ROAD	66	58.9%	145	62.0%
MEDIAN-OFF ROAD	2	1.8%	3	1.3%
NON-INTERSECTION-ON ROAD	31	27.7%	61	26.1%
ROADSIDE-NO SHLDR-OFF ROAD	2	1.8%	2	0.9%
Grand Total	**112**	100.0%	**234**	100.0%

Of the 112 total crashes, 58.9% occurred on a roadway related to the presence of an intersection, 27.7% occurred on a roadway without being related to the presence of an intersection, 9.8% occurred within an intersection, 1.8% occurred off of a roadway within the median, and 1.8% occurred within the roadside.

Table 3. Number of Crashes per Category | Collision Type

Collision Type	# of Crashes	Percentage	# of Vehicles	Percentage
WITH ANIMAL	3	2.7%	3	1.3%
WITH FIXED OBJECT	8	7.1%	9	3.8%
WITH OTHER MOTOR VEHICLE	99	88.4%	220	94.0%
WITH PEDESTRIAN	2	1.8%	2	0.9%
Grand Total	**112**	100.0%	**234**	100.0%

Of the 112 total crashes, 88.4% occurred with at least one other motor vehicle, 7.1% occurred with fixed objects, 2.7% occurred with animals, and 1.8% occurred with pedestrians.

Table 4. Number of Vehicles | Location Type vs Collision Type

Location Type vs Collision Type	WITH ANIMAL	WITH FIXED OBJECT	WITH OTHER MOTOR VEHICLE	WITH PEDESTRIAN	**Grand Total**
INTERSECTION-ON ROAD		1	22		23
INTERSECTION-RELATED-ON ROAD		1	144		145
MEDIAN-OFF ROAD		3			3
NON-INTERSECTION-ON ROAD	3	2	54	2	61
ROADSIDE-NO SHLDR-OFF ROAD		2			2
Grand Total	**3**	**9**	**220**	**2**	**234**

The table above illustrates the total number of vehicles when considering location type and collision type. The two pedestrian crashes occurred on the roadway not at an intersection.

Table 5. Number of Crashes per Category | Lighting Conditions

Lighting Conditions	# of Crashes	Percentage	# of Vehicles	Percentage
DARK--NO STREET LIGHTS	3	2.7%	5	2.1%
DARK--STREET LIGHTS ON	18	16.1%	35	15.0%
DAWN	4	3.6%	9	3.8%
DAYLIGHT	84	75.0%	177	75.6%
DUSK	3	2.7%	8	3.4%
Grand Total	**112**	100%	**234**	100.0%

Of the 112 total crashes, 75% occurred during daylight hours, 16.1% occurred during dark with street lights turned on, 2.7% occurred during dark without street lights, 3.6% occurred during dawn, and 2.7% occurred during dusk.

Table 6. Number of Crashes per Category | Weather Conditions

Weather Conditions	# of Crashes	Percentage	# of Vehicles	Percentage
FOG	2	1.8%	4	1.7%
FREEZING RAIN	1	0.9%	3	1.3%
NO ADVERSE CONDITIONS	94	83.9%	196	83.8%
RAIN, MIST, OR DRIZZLE	14	12.5%	29	12.4%
SNOW	1	0.9%	2	0.9%
Grand Total	**112**	100%	**234**	100.0%

Of the 112 total crashes, 83.9% occurred during no adverse conditions, 12.5% occurred during rain, mist or drizzle, 1.8% occurred during fog, 0.9% occurred during snow, and 0.9% occurred during freezing rain.

Table 7. Number of Crashes per Category | Crash Type

Crash Type	# of Crashes	Percentage	# of Vehicles	Percentage
UNKNOWN	13	11.6%	14	6.0%
ANGLE - SIDE IMPACT	10	8.9%	20	8.5%
HEAD ON	1	0.9%	2	0.9%
REAR END	83	74.1%	186	79.5%
SIDESWIPE: SAME DIRECTION	5	4.5%	12	5.1%
Grand Total	**112**	100%	**234**	100.0%

Of the 112 total crashes, 74.1% involved a rear end, 8.9% involved an angle-side impact, 4.5% involved a sideswipe in the same direction, 0.9% involved a head on, and 11.6% where left unknown.

Table 8. Severity Distribution per Crash Type

Crash Type	# of Crashes	# of Injury	Percentage	# of PDO	Percentage
UNKNOWN	13	3	23.1%	10	76.9%
ANGLE - SIDE IMPACT	10	4	40.0%	6	60.0%
HEAD ON	1	0	0.0%	1	100.0%
REAR END	83	17	20.5%	66	79.5%
SIDESWIPE: SAME DIRECTION	5	1	20.0%	4	80.0%
Grand Total	**112**	**25**	22.3%	**87**	77.7%

Most of the collisions are clustered around E 23rd Street/N 1400 Road & O'Connell Road with 74.1% rear end crashes. Of the 25 injury crashes, most were rear end crashes; however, if an angle/side impact crash occurred, the probability of an injury increased. Head on collisions are rare and the only recorded head-on was at a low enough speed so that there were no injuries. Based on the existing traffic crashes and new trips generated by the MSO facility, no improvements of the surrounding roadway network are recommended at this time.

Section 6: Proposed Access Compared with Design Criteria and Sight Distance Requirements

For the proposed access locations, the design speed is 35 mph resulting in a required stopping sight distance of 250 ft and an intersection sight distance of 390 ft. Although the layout of the access drives are currently under design consideration, the sight distance requirements given the current layout of the existing roadways is met. The new access drives will be laid out to meet these design constraints.

Section 7: Estimate of Trips Generated by Existing and Proposed Development

Existing Trip Generation: No trips are currently generated by the current land use.

Proposed Trip Generation: Since the City of Lawrence has defined how many employees will be working within each division and when they are expected to arrive and depart throughout the day, the number of trips can be estimated.

Trip Generation Summary						
	TOTAL DIVISIONS	**BUILDING FLOOR AREA** (sq ft)	**TOTAL SITE** (acres)	**STAFF SUBCATEGORY**	**OPERATING DAYS OF THE WEEK**	**APPROX. OPERATING HOURS**
Office and Maintenance Combined Campus (Staff)	11	393,091	65	Campus-only Staff	MON-FRI	7:00am - 5:00pm
				Site Visiting Staff	MON-FRI	6:30am - 5:00pm
				Inspectors	MON-FRI	8:00am - 5:00pm
				Maintenance Staff	MON-FRI	7:30am - 3:30pm
Solid Waste Division (Staff)	1	43,584	14	Fleet Round 1	MON-SAT	6:00am - 2:00pm
				Fleet Round 2	MON-SAT	7:00am - 3:00pm
				Fleet Round 3	MON-SAT	7:30am - 4:00pm
Household Hazardous Waste (Staff)	1	12,181	3	Campus-only Staff	MON-FRI	6:30am - 5:00pm
Household Hazardous Waste (Public Drop Off)				Public	TUES-THUR	8:00am - 1:00pm

Trip Generation Summary 2020								
	NUMBER OF EMPLOYEES (Full and Part Time)		**EXPECTED DAILY TRIPS PER STAFF SUBCATEGORY** (Veh / Day / Employee)	**ESTIMATED DAILY TRIPS** (Veh / Day)	**A.M. PEAK HOUR, 7-9am** (Veh / Hour)		**P.M. PEAK HOUR, 4-6pm** (Veh / Hour)	
					IN	OUT	IN	OUT
Office and Maintenance Combined Campus (Staff)	8	Employees	2	16	8			8
	117	Employees	6	702	117	117	117	117
	9	Employees	8	72	9	9	9	9
	17	Employees	2	34	17			17
Solid Waste Division (Staff)	56	Employees	2	112				
	23	Employees	2	46	23	23		
	1	Employee	2	2	1	1	1	1
Household Hazardous Waste (Staff)	5	Employees	2	10	5			5
Household Hazardous Waste (Public Drop Off)				35	7	7		
Total	**236**	**Employees**		**1029**	**187**	**157**	**127**	**157**

Verification of Trip Generation Rates and Design Hour Volume Data: To verify the trips produced by the proposed development, trip generation volumes were compared utilizing the land use types categorized by the Institute of Transportation Engineer's Trip Generation Guidelines, 10th Edition. "Government Office Complex" (ITE Code 733) and "Utility" (ITE Code 170) were the ITE Land Use categories used to compare against the expected trips for the campus. The estimated number of trips were based on the number of employees. Copies of the applicable ITE Trip Generation Manual pages are included in the appendix. The following tables show the parameters for measurement units, total trip generation rates for peak hour traffic volumes, and corresponding total vehicles for peak hour traffic at the site.

ITE Traffic Generation Parameters Comparison Chart

ITE Category	Government Office Complex (ITE Code 733)	Utility (ITE Code 170)	Expected Trips (Based on City-Provided Data)
Weekday Total	13.29	4.11	4.36
Weekday In	50%	50%	50%
Weekday Out	50%	50%	50%
Peak Hour of Adjacent Street Traffic, One Hour			
AM Peak Total	0.83	0.70	0.70
AM Peak In	89%	81%	81%
AM Peak Out	11%	19%	19%
PM Peak Total	1.10	0.76	0.76
PM Peak In	31%	15%	15%
PM Peak Out	69%	85%	85%

ITE Traffic Generation Volumes Comparison Chart

ITE Category	Government Office Complex (ITE Code 733)	Utility (ITE Code 170)	Expected Trips (Based on City-Provided Data)
Units	*Employee*	*Employee*	*Employee*
Expected Units	*236*	*236*	*236*
Weekday Total	3,136	970	1,029
Weekday In	1,568	485	514.5
Weekday Out	1,568	485	514.5
AM Peak Total	196	165	344
AM Peak In	174	134	187
AM Peak Out	22	31	157
PM Peak Total	260	179	284
PM Peak In	80	27	127
PM Peak Out	179	152	157

The expected trips most closely resemble trip generation parameters for the Utility category with only a slight increase in volume (6% difference).

Reductions for Pass-By and Diverted-Link Trips: The land-use is not applicable to pass-by trip generation. No diverted-link analysis was done for this analysis.

Section 8: Traffic Data

Existing Traffic Volumes: Traffic count data was provided at the intersection of E 23rd Street/N 1400 Road & O'Connell Road/E 1600 Road on Tuesday, December 3, 2019. Although this study occurred during the COVID-19 pandemic, which caused a drastic change in traffic volumes, the data used for the analysis was taken December 3rd, 2019 well before the event. Counts were taken over a 24-hour period and were recorded in 15 minutes intervals. Recorded vehicle classifications included the following: light vehicles (motorcycles, cars, and light goods vehicles), buses and single-unit trucks, articulated trucks, bikes on the crosswalk, and pedestrians on the crosswalk. Inclement weather conditions or national holiday traffic did not impact the traffic counts.

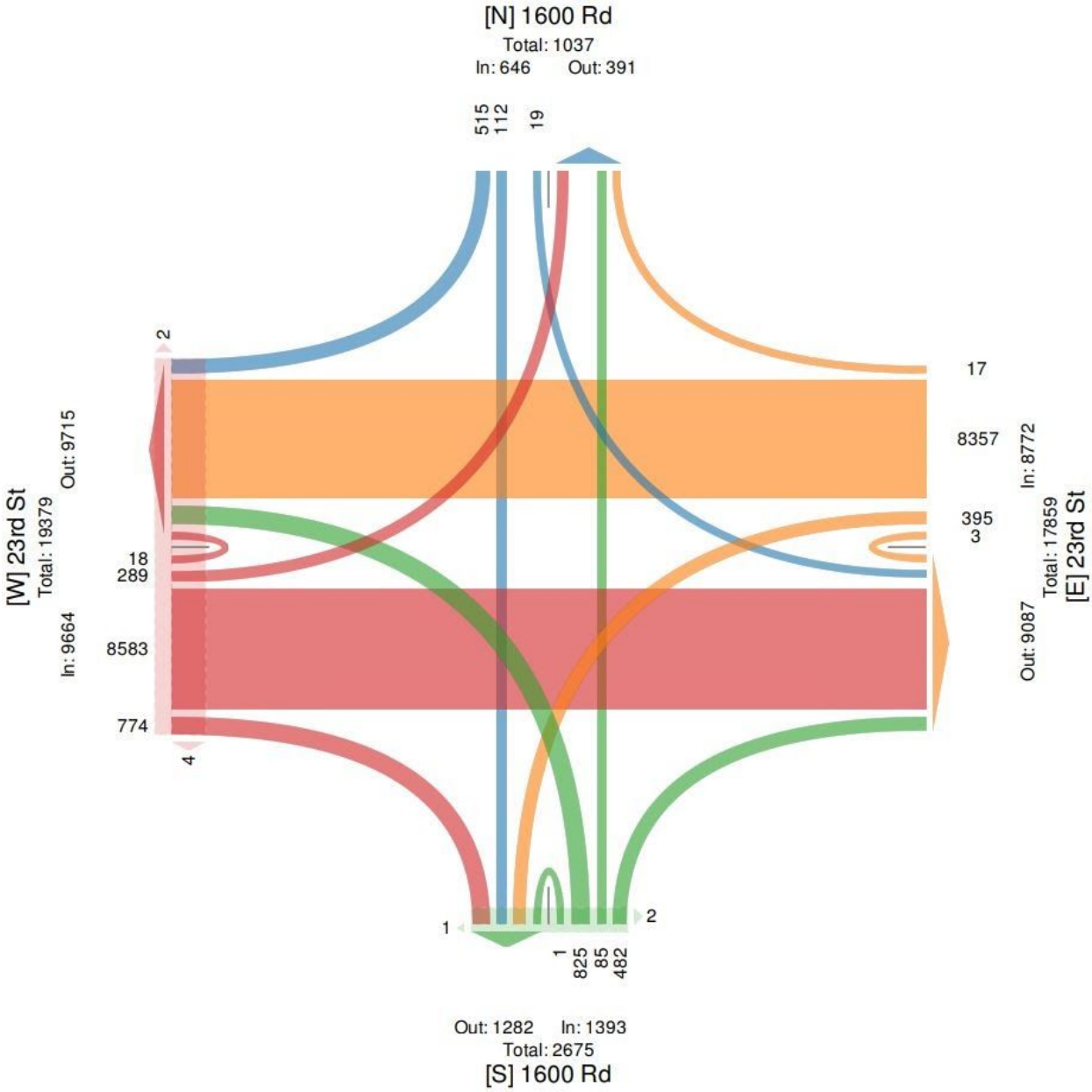
The combined daily traffic through the intersection was 20,475 vpd. There are 1,037 vpd currently using O'Connell Road/E 1600 Road to the north of E 23rd Street/N 1400 Road. With the new trips from the MSO facility, the daily trips are expected to grow to about 2,000 vpd.

For the AM Peak, between 7:45AM - 8:45 AM, all trips headed toward the new development came from the west or south meaning that existing commuters entering the Venture Park area from the east are not likely to use O'Connell Road. On O'Connell Road/E 1600 Road to the north of E 23rd Street/N 1400 Road, there were 45 trips headed northbound and 47 trips headed southbound. The AM peak hour factor was 0.938.

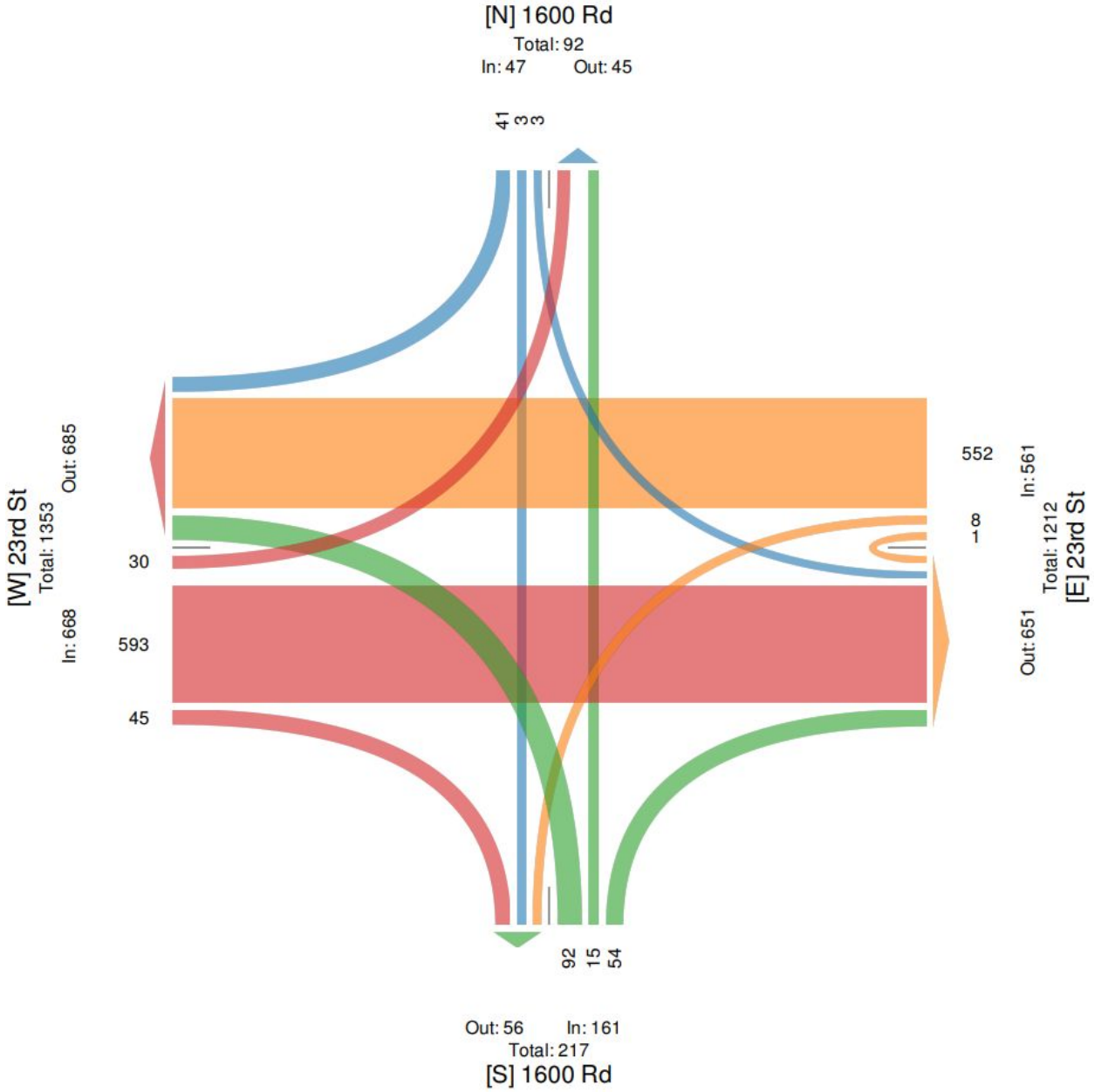
For the PM Peak, between 4:45PM - 5:45 PM, there were not many vehicles headed toward the new development using O'Connell Road. On O'Connell Road/E 1600 Road to the north of E 23rd Street/N 1400 Road, there were 18 trips headed northbound and 65 trips headed southbound. The PM peak hour factor was 0.953.

The following tables summarize the daily traffic volumes and AM and PM peak hour traffic volumes:

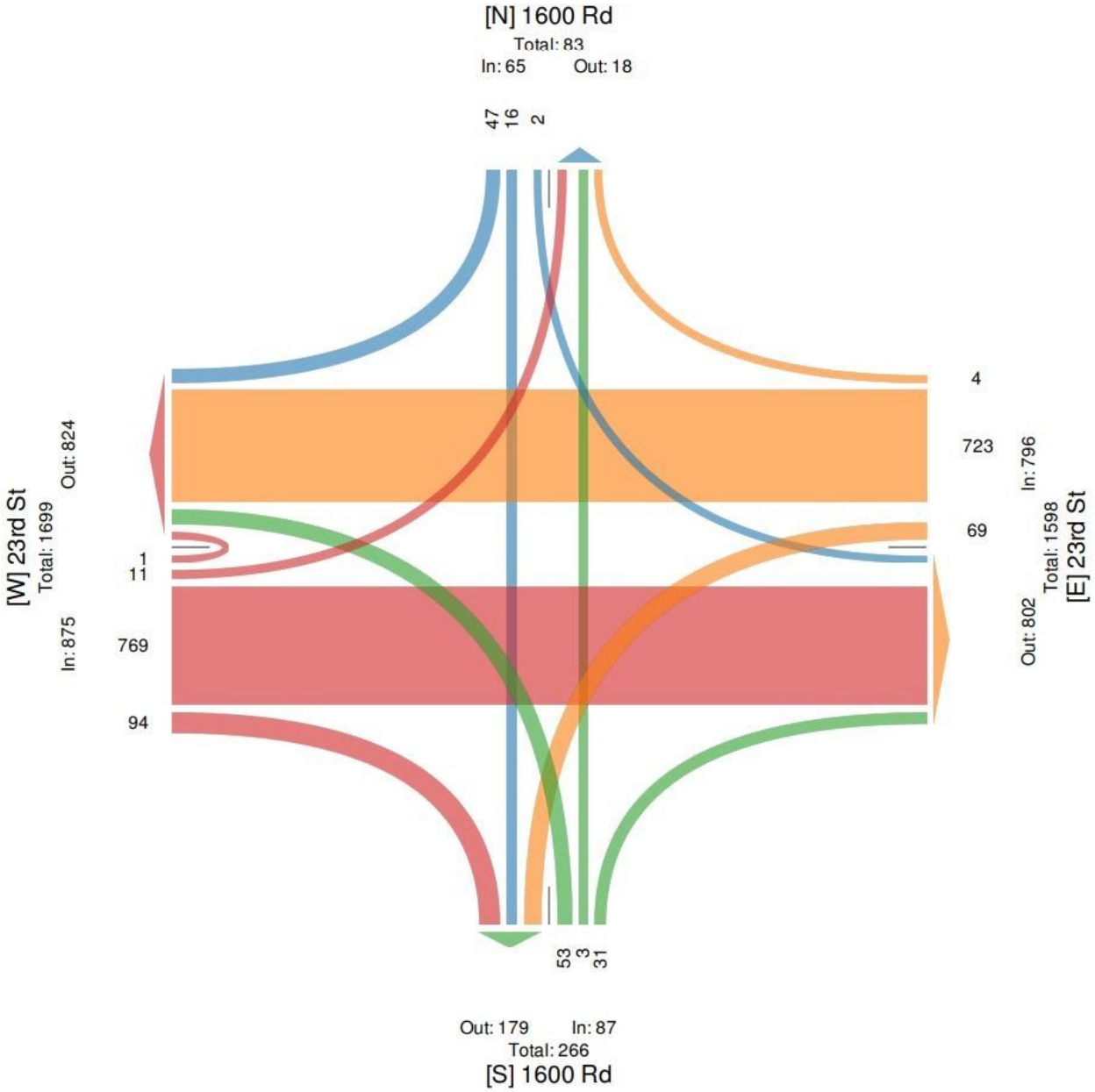
	Daily Total, E 23rd Street & O'Connell Road Turning Movement Counts											
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Existing	307	8583	774	398	8357	17	826	85	482	19	112	515



	AM Peak Hour, E 23rd Street & O'Connell Road Turning Movement Counts											
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Existing	30	593	45	9	552	0	92	15	54	3	3	41



	PM Peak Hour, E 23rd Street & O'Connell Road Turning Movement Counts											
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Existing	12	769	94	69	723	4	53	3	31	2	16	47



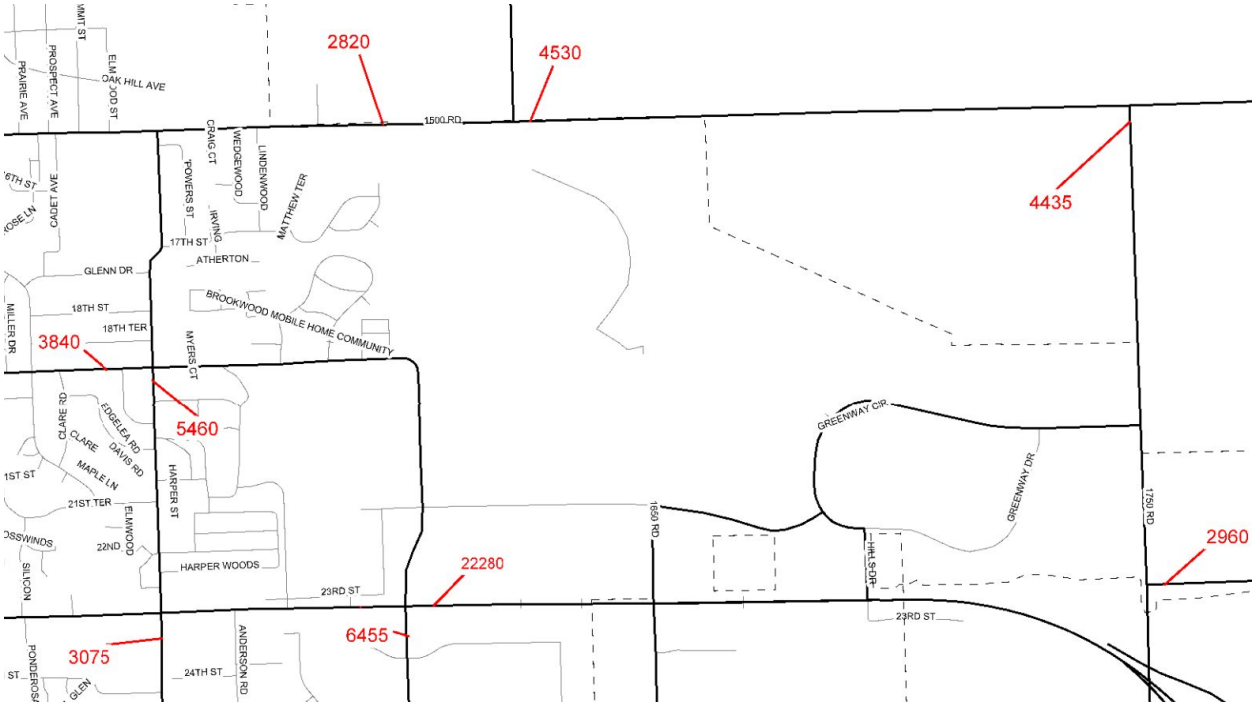
Average Daily Traffic Volumes: An estimate of the average daily traffic on the connecting roadway segments between each intersection is given below:

Based on Dec 3rd, 2019 traffic counts

1. E 23rd Street/N 1400 Road (East of O'Connell Road/E 1600 Road) ADT = 17,859 vpd
2. E 23rd Street/N 1400 Road (West of O'Connell Road/E 1600 Road) ADT = 19,409 vpd
3. O'Connell Road/E 1600 Road (South of E 23rd Street/N 1400 Road) ADT = 2,675 vpd
4. O'Connell Road/E 1600 Road (North of E 23rd Street/N 1400 Road) ADT = 1,037 vpd
    a. Expected ADT post-development construction ADT = 2,000 vpd

Based on 2016 KDOT traffic counts

5. Harper Street (South of E 19th Street) ADT = 5,460 vpd
6. E 19th Street (West of Harper Street) ADT = 3,840 vpd
7. Noria Road/E 1750 Road (North of Greenway Circle) ADT = 4,435 vpd



2016 KDOT traffic counts

Buses and Single-unit Trucks: For Buses and Single-unit Trucks, there were a total of 646 vehicles for the 24 hour period making up 3.2% of total traffic. For the daily total, the highest percentage per movement were EBL and NBL. On O'Connell Road/E 1600 Road to the north of E 23rd Street/N 1400 Road, there were 114 Bus and Single-unit Truck trips making up 11% of the total traffic on the roadway. The tables below show the amount of Buses and Single-unit Trucks per movement:

	Daily Total, E 23rd Street & O'Connell Road Turning Movement Counts											
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Existing	50	200	47	4	163	0	113	1	6	1	5	56
Percentage %	17.3	2.3	6.1	1.0	2.0	0	13.7	1.2	1.2	5.3	4.5	10.9

	AM Peak Hour, E 23rd Street & O'Connell Road Turning Movement Counts											
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Existing	3	9	9	1	15	0	17	0	1	0	1	6
Percentage %	10.0	1.5	20.0	12.5	2.7	0	18.5	0	1.9	0	33.3	14.6

	PM Peak Hour, E 23rd Street & O'Connell Road Turning Movement Counts											
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Existing	3	8	0	0	10	0	4	1	1	0	0	2
Percentage %	27.3	1.0	0	0	1.4	0	7.5	33.3	3.2	0	0	4.3

Articulated Trucks: For Articulated Trucks, there were a total of 198 vehicles for the 24 hour period making up 1.0% of total traffic. For the daily total, the highest percentage per movement were SBL and EBL. On O'Connell Road/E 1600 Road to the north of E 23rd Street/N 1400 Road, there were 27 Articulated Truck trips making up 2.6% of the total traffic on the roadway. The tables below show the amount of Articulated Trucks per movement:

	Daily Total, E 23rd Street & O'Connell Road Turning Movement Counts											
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Existing	15	90	3	2	68	0	2	0	6	1	2	9
Percentage %	5.2	1.0	0.4	0.5	0.8	0	0.2	0	1.2	5.3	1.8	1.7

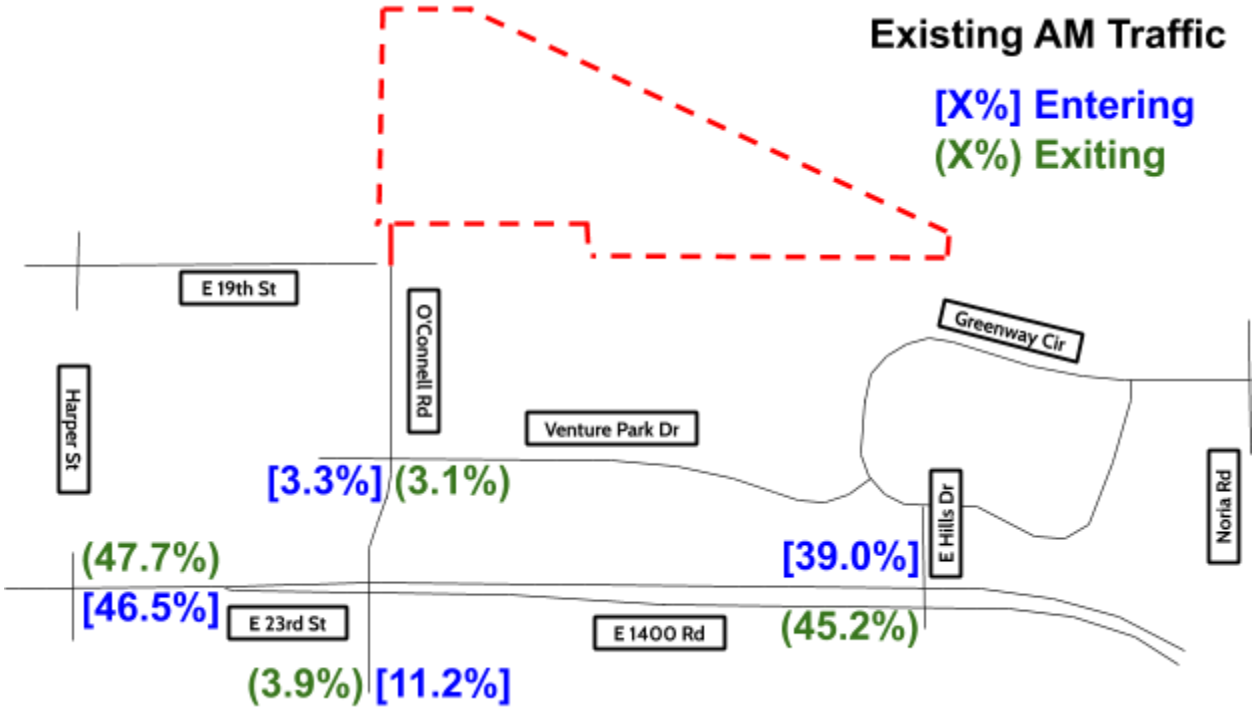
	AM Peak Hour, E 23rd Street & O'Connell Road Turning Movement Counts											
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Existing	0	5	0	0	4	0	0	0	0	0	0	0
Percentage %	0	0.8	0	0	0.7	0	0	0	0	0	0	0

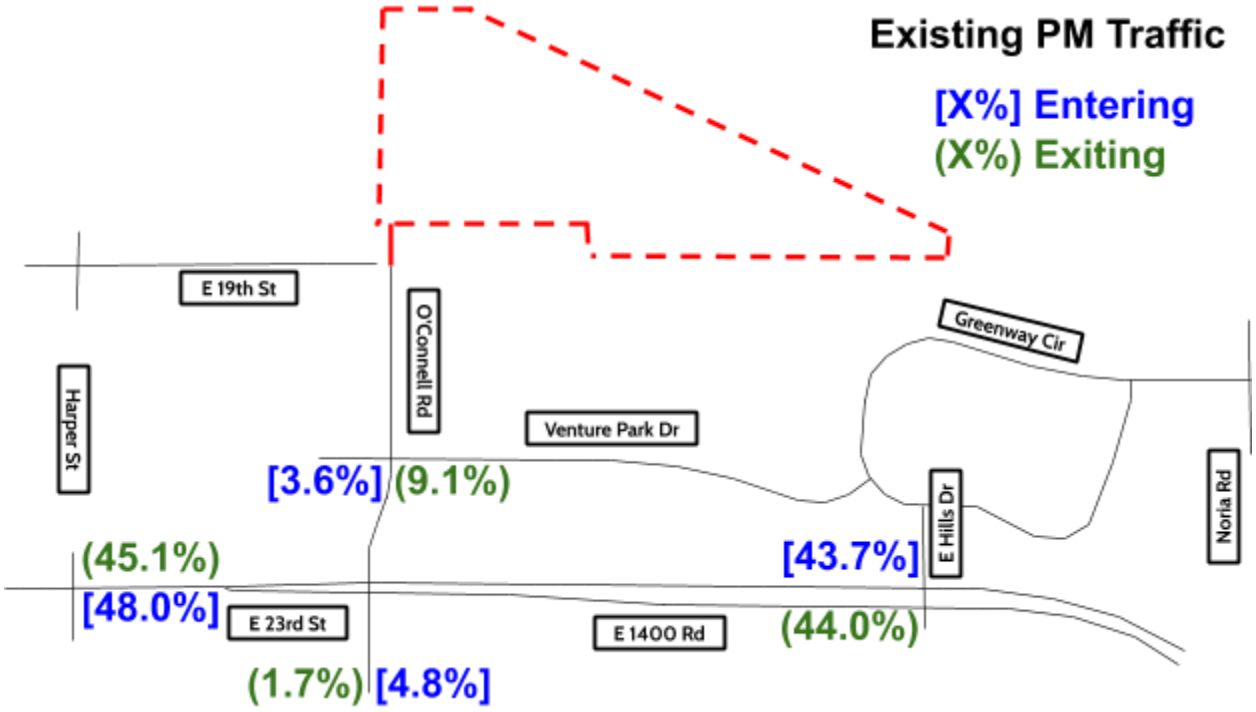
	PM Peak Hour, E 23rd Street & O'Connell Road Turning Movement Counts											
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Existing	2	3	1	0	4	0	0	0	1	0	0	2
Percentage %	18.2	0.4	1.1	0	0.6	0	0	0	3.2	0	0	4.3

Bikes on the Crosswalk: There was only one bicyclist observed on December 3rd.

Pedestrians on the Crosswalk: 8 total pedestrians were observed on December 3rd with 5 crossing the east leg and 3 crossing the south leg of the intersection.

Trip Distribution: Trip distribution patterns were determined based on a gravity model using the peak hour counts around the development's surrounding origins and destinations. Directional percentages were applied along entry and exit paths so that trips could be distributed proportionally and are shown in the following figures.

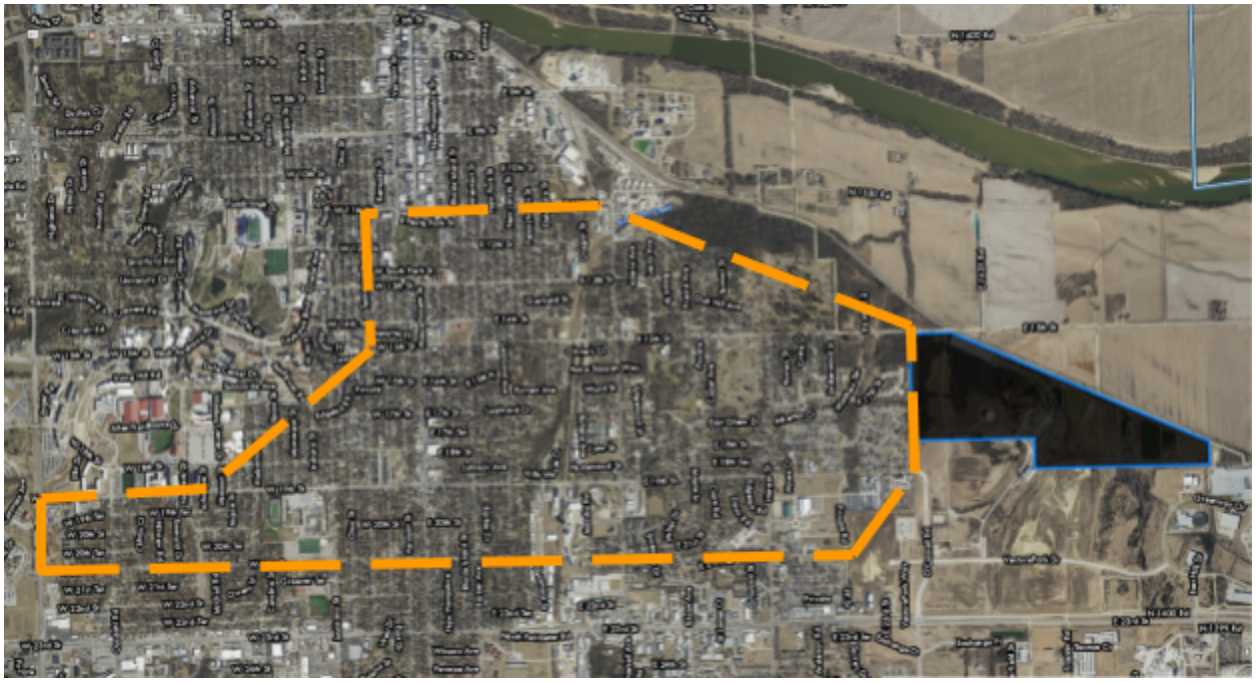




The trip distribution pattern also considered how many trips generated by the development would travel along 19th Street if 19th Street was connected to O'Connell Road. A previous Traffic Impact Study for Venture Park listed up to 30% of trips generated by the Venture Park

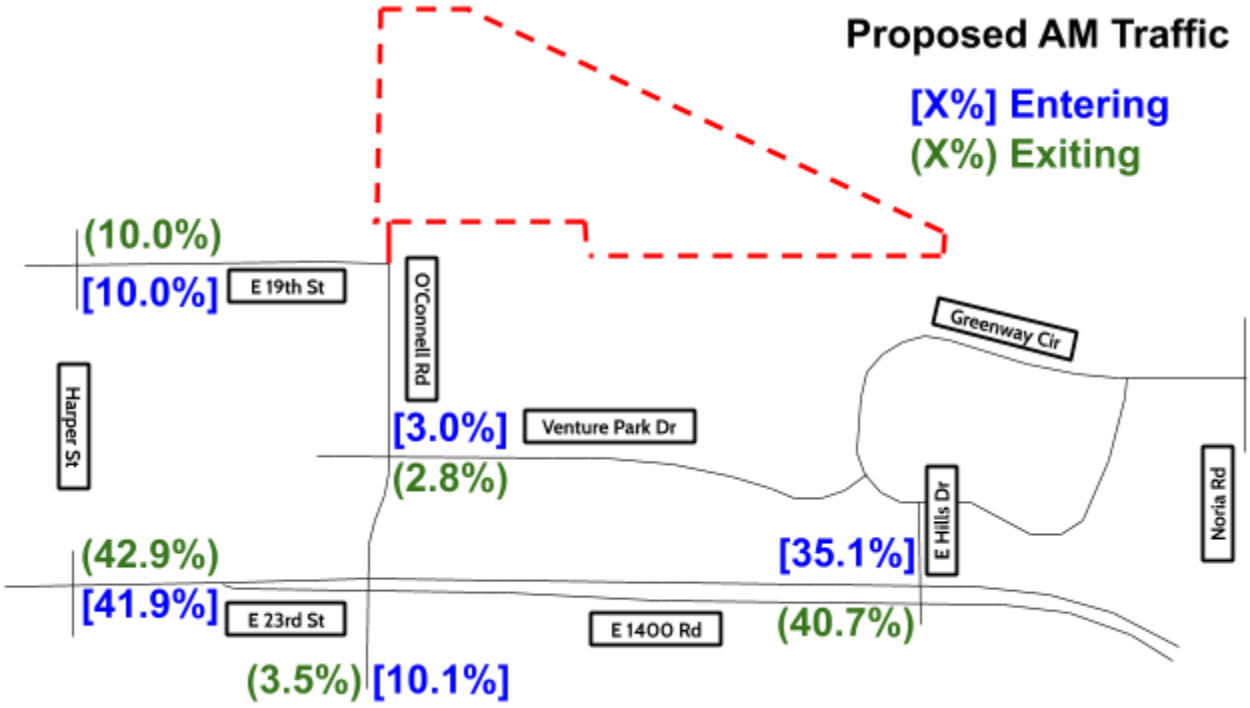
commercial zone to be routed along 19th Street; however, the trip distribution in that report included a lot of unknown assumptions for the area. Based on the MSO facility's land uses and 19th Street not being listed as a truck route, it was determined that a refined representation of potential trip distribution was needed.

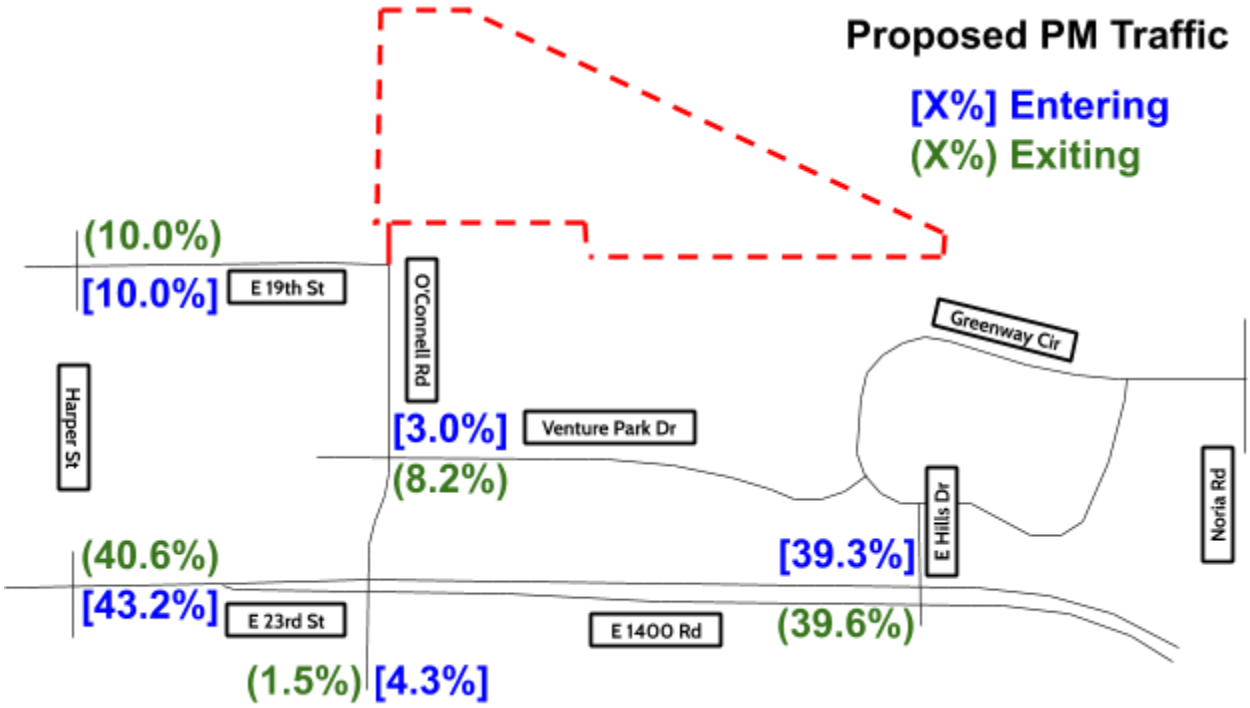
The method used to refine the probable trip distribution pattern along 19th Street was the catchment area method. By identifying a catchment area that would likely use 19th Street compared to O'Connell Road, a general percentage of expected vehicles was estimated. The catchment area was evaluated using a shortest travel time method which is not necessarily aligned with the shortest path. Beyond this estimated catchment boundary, trips to and from the MSO facility will be more likely to be routed to and from the site with a strong preference for arterials due to higher speed limits. This means that, outside the boundary, a collector street such as 19th Street would not have a high probability of becoming a main thoroughfare for MSO facility generated trips. With an approximate catchment area of 2.4 sq miles out of the total 34.26 square miles in the City of Lawrence, this could mean about 7% of new vehicle trips would be likely to use 19th Street. To be conservative in the estimation, it was assumed that 10% of all new trips generated by the MSO facility would utilize 19th Street compared to O'Connell Road.



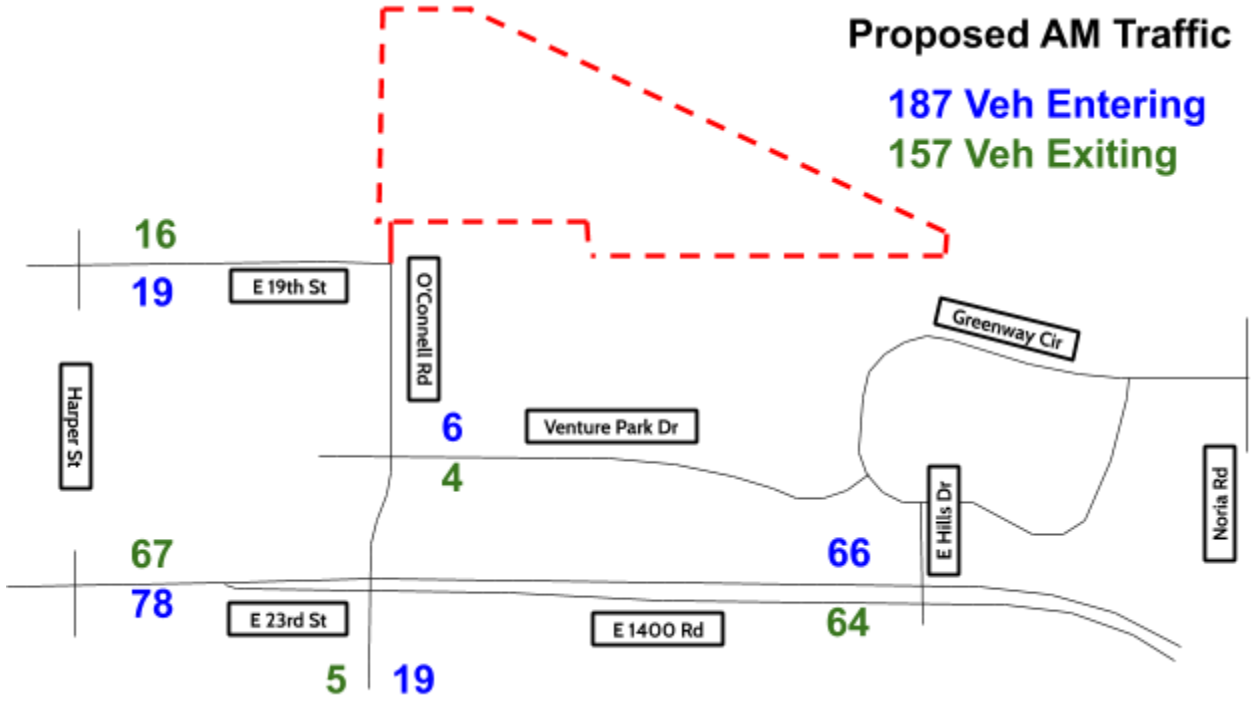
Estimated Catchment Area for Vehicles using 19th Street to Access the MSO Facility

Using the conservative estimate that 10% of the newly generated trips would utilize 19th Street, the trip distribution patterns were adjusted as follows:

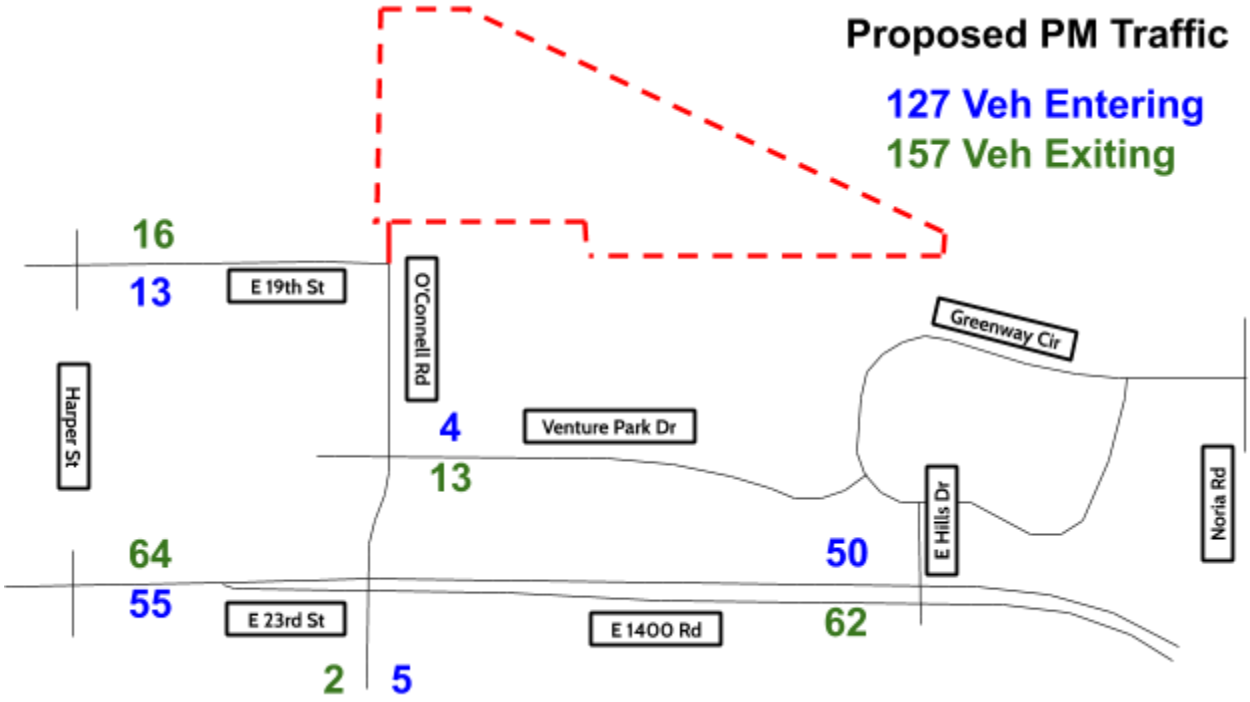




Using these trip distribution percentages, the number of vehicles during the peak hours were added to existing traffic volume patterns.



	AM Peak Hour, E 23rd Street & O'Connell Road Turning Movement Counts											
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Existing	30	593	45	9	552	0	92	15	54	3	3	41
Trip Generated	78					66		19		64	5	67
Total	108	593	45	9	552	66	92	34	54	67	8	108



	PM Peak Hour, E 23rd Street & O'Connell Road Turning Movement Counts											
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Existing	12	769	94	69	723	4	53	3	31	2	16	47
Trip Generated	55					50		5		62	2	64
Total	67	769	94	69	723	54	53	8	31	64	18	111

Determining the Growth Rate: The U.S. Census Bureau reported that the Lawrence population in 2000 was 80,098 while the population in 2015 was 94,104. This is an increase in growth of 17.5%. Based on the available census data, the average annual growth rate of Lawrence was calculated to be 1.08% which represented a constant linear growth derived from the following equation:

Constant % Growth (2000 to 2015) = (End Year vpd / Beginning Year vpd) ^ (1 / (End Year-Beginning Year)) - 1
= (94,104 / 80,098) ^ (1 / (2015-2000)) - 1
= 1.08% per year

Because the area is expected to grow slightly in traffic volume due to the proposed development and other possible developments, a 1.08% annual constant percent growth rate was used to project the increase in traffic volume twenty years into the future.

Growth Factor: The growth factor constant was determined as follows:

Growth Factor Constant = (1 + Constant % Growth Rate) ^ Projected Years
= (1 + 0.0108) ^ 20
= 1.24, for 20 years growth at 1.1%

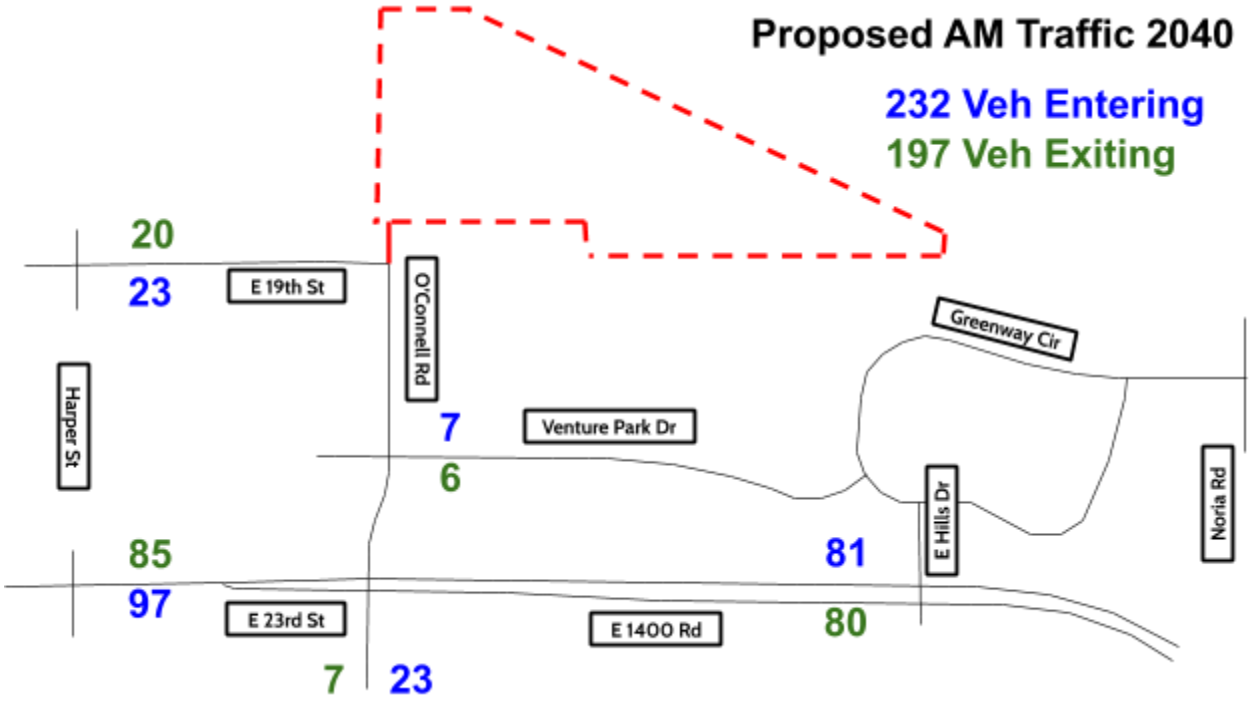
Projected Traffic Volumes: The 1.24 growth factor was applied to the existing traffic volumes but not the trips generated by the new development or existing developments. The number of trips attracted to the site will not increase or decrease with time, but would increase or decrease if the number of employees was altered.

In the case of the MSO facility, the campus will be constructed to accommodate a growth in city staff to align with the growth of Lawrence over the next 50 years; therefore, the increase of employees needs to be accounted for within the traffic volumes. Since traffic studies typically analyze traffic patterns projected by only two decades to remain relatively accurate, the number of employees at the facility at the 20 year mark post construction needs to be determined.

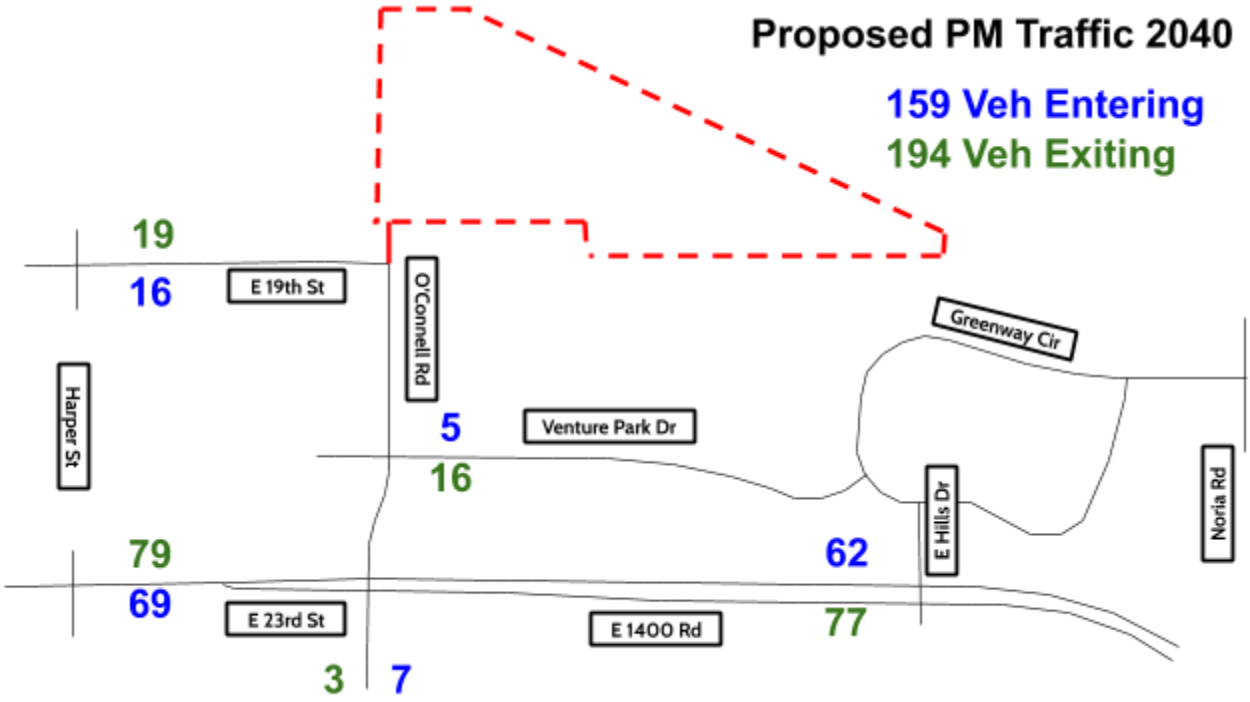
Based on data provided by city estimates, the future projected estimated staff includes 355 full-time and 21 part-time personnel at the 50 year mark. The increase in the number of employees at the 20 year mark would be about 40% of the expected increase in employees by the 50 year mark. Therefore, at the 20 year mark, there would be 276 full-time and 16 part-time personnel. Based on these new employee totals, the trip generation table has been updated for the future projected growth in 20 years.

Trip Generation Summary 2040								
	NUMBER OF EMPLOYEES (Full and Part Time)		**EXPECTED DAILY TRIPS PER STAFF SUBCATEGORY** (Veh / Day / Employee)	**ESTIMATED DAILY TRIPS** (Veh / Day)	**A.M. PEAK HOUR, 7-9am** (Veh / Hour)		**P.M. PEAK HOUR, 4-6pm** (Veh / Hour)	
					IN	OUT	IN	OUT
Office and Maintenance Combined Campus (Staff)	9	Employees	2	18	9			9
	147	Employees	6	882	147	147	147	147
	11	Employees	8	88	11	11	11	11
	20	Employees	2	40	20			20
Solid Waste Division (Staff)	69	Employees	2	138				
	29	Employees	2	58	29	29		
	1	Employee	2	2	1	1	1	1
Household Hazardous Waste (Staff)	6	Employees	2	12	6			6
Household Hazardous Waste (Public Drop Off)				35	9	9		
Total	**292**	**Employees**		**1273**	**232**	**197**	**159**	**194**

These trips were then distributed using the same distribution pattern.



	AM Peak Hour, E 23rd Street & O'Connell Road Turning Movement Counts											
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Existing	30	593	45	9	552	0	92	15	54	3	3	41
Trip Generated	78					66		19		64	5	67
Total	108	593	45	9	552	66	92	34	54	67	8	108
Future = Existing *1.24 Growth Factor	37	735	56	11	684	0	114	19	67	4	4	51
Future Trip Gen.	97					81		23		80	7	85
Future Total	134	735	56	11	684	81	114	42	67	84	11	136



	PM Peak Hour, E 23rd Street & O'Connell Road Turning Movement Counts											
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Existing	12	769	94	69	723	4	53	3	31	2	16	47
Trip Generated	55					50		5		62	2	64
Total	67	769	94	69	723	54	53	8	31	64	18	111
Future = Existing *1.24 Growth Factor	15	954	117	86	897	5	66	4	38	2	20	58
Future Trip Gen.	69					62		7		77	3	79
Future Total	84	954	117	86	897	67	66	11	38	79	23	137

Using these traffic volumes, a Synchro analysis was performed to identify any necessary changes to the intersection.

Section 9: Synchro Analysis of Performance Measures

Creating Synchro Scenarios: Using the traffic counts and the ITE trip generation volumes, six Synchro models were created for the traffic conditions surrounding the site.

- Scenario 1 - Existing street/pre-development conditions, Weekday AM Peak Traffic 2020
- Scenario 2 - Existing street/pre-development conditions, Weekday PM Peak Traffic 2020
- Scenario 3 - Proposed street/after-development conditions, Weekday AM Peak Traffic 2020
- Scenario 4 - Proposed street/after-development conditions, Weekday PM Peak Traffic 2020
- Scenario 5 - Proposed street/after-development conditions, Weekday AM Peak Traffic 2040
- Scenario 6 - Proposed street/after-development conditions, Weekday PM Peak Traffic 2040

Capacity and Level of Service Analysis: Three performance measures commonly used for Traffic Impact Studies are vehicle delay, level-of-service (LOS), and queue length. Vehicle delay is the average delay, in seconds, experienced by one vehicle passing through the intersection. The quality of traffic operation at an intersection is defined through level-of-service (LOS) which consists of assignments of 'A' for free-flowing conditions through 'F' for congested conditions. The procedures and methodology for determining the LOS are outlined in the Highway Capacity Manual (HCM 2010), produced by Transportation Research Broad. LOS 'A' through 'C' is considered acceptable. For intersections, no individual lane should be below LOS D. The 95th percentile queue length is the overall length of a string of stopped vehicles. Note that the queue is reported in the left\thru\right order. The results of the Synchro models are in the tables below.

Scenarios 1 & 2 Synchro Results (Existing)

Performance Measures	AM 2020	PM 2020
E 23rd Street & O'Connell Road		
Delay, s	21.7	26.3
LOS	C	C
NB Delay, s **L/T+R**	10.6 12.7/7.8	12.1 14.6/8.3
NB LOS **L/T+R**	B B/A	B B/A
NB Queue, ft	56/35	37/22
EB Delay, s **L/T/R**	22.0 34.3/23.0/0.1	32.1 34.8/35.8/1.5
EB LOS **L/T/R**	C C/C/A	C C/D/A
EB Queue, ft	40/194/0	22/291/13
SB Delay, s **L/T/R**	2.2 12.7/20.3/0.2	6.0 13.5/21.6/0.3
SB LOS **L/T/R**	A B/C/A	A B/C/A
SB Queue, ft	6/7/0	4/21/0
WB Delay, s **L/T/R**	26.2 33.0/26.1/0	23.1 45.8/21.0/0.0
WB LOS **L/T/R**	C C/C/A	C D/C/A
WB Queue, ft	19/182/0	85/243/0

Existing traffic conditions were evaluated for the intersection of E 23rd Street & O'Connell Road. For AM peak hour traffic, the delay at the intersection was 21.7 sec on average with an overall LOS C. Each of the approaches and turning movements have a LOS C or better. EB and WB left-turns experienced the most delay compared to the other movements; however, this is likely due to the left-turns active before the other movements meaning a left-turning vehicle arriving just after the green phase for left-turns has to wait out nearly a whole cycle length. For PM peak hour traffic, the delay at the intersection was 26.3 sec on average with an overall LOS C. Each of the approaches have a LOS C or better while only EBT and WBL turning movements are at LOS D. Overall, the traffic signal is operating well under current demand and capacity levels. Queue lengths did not exceed the turn lane capacity for any movement.

Scenarios 3 & 4 Synchro Results (Proposed street/after-development conditions 2020)

Performance Measures	AM 2020	PM 2020
E 23rd Street & O'Connell Road		
Delay, s	21.8	28.9
LOS	C	C
NB Delay, s **L/T+R**	13.6 15.3/11.8	13.0 14.8/10.6
NB LOS **L/T+R**	B B/B	B B/B
NB Queue, ft	57/47	37/26
EB Delay, s **L/T/R**	23.5 53.2/19.9/0.1	33.3 49.2/35.8/1.5
EB LOS **L/T/R**	C D/B/A	C D/D/A
EB Queue, ft	135/192/0	87/291/13
SB Delay, s **L/T/R**	6.7 14.8/21.2/0.6	7.4 15.0/21.7/0.7
SB LOS **L/T/R**	A B/C/A	A B/C/A
SB Queue, ft	44/14/0	42/22/0
WB Delay, s **L/T/R**	26.6 34.2/29.6/0.2	30.7 45.8/31.5/0.2
WB LOS **L/T/R**	C C/C/A	C D/C/A
WB Queue, ft	19/183/1	85/247/0

Existing traffic conditions plus trips generated by the new development were evaluated for the intersection of E 23rd Street & O'Connell Road. For AM peak hour traffic, the delay at the intersection was 21.8 sec on average with an overall LOS C. This is 0.1 sec more than the existing traffic conditions without the new development trips. Each of the approaches and turning movements have a LOS C or better except EB left-turns. EB left-turns experienced the most delay compared to the other movements since there will be an influx of city employees coming from the east to head to the facility. For PM peak hour traffic, the delay at the intersection was 28.9 sec on average with an overall LOS C. This is 2.6 sec more than the existing traffic conditions without the new development trips. Each of the approaches have a LOS C or better while only EBL, EBT, and WBL turning movements are at LOS D. Given the additional traffic volumes, the traffic signal is operating well under expected demand and capacity levels. Based on the number of turning vehicles in the AM and PM, dual left-turn lanes are not justified. Queue lengths did not exceed the turn lane capacity for any movement.

Scenarios 5 & 6 Synchro Results (Proposed street/after-development conditions 2040)

Performance Measures	AM 2040	PM 2040
E 23rd Street & O'Connell Road		
Delay, s	25.6	32.6
LOS	C	C
NB Delay, s **L/T+R**	14.6 16.9/12.2	14.8 17.3/11.4
NB LOS **L/T+R**	B B/B	B B/B
NB Queue, ft	69/55	49/32
EB Delay, s **L/T/R**	26.3 70.7/20.2/0.1	37.2 64.2/39.1/2.9
EB LOS **L/T/R**	C E/C/A	D E/D/A
EB Queue, ft	166/252/0	122/395/25
SB Delay, s **L/T/R**	7.6 15.9/21.7/1.4	9.3 17.7/24.1/2.0
SB LOS **L/T/R**	A B/C/A	A B/C/A
SB Queue, ft	53/17/5	57/29/12
WB Delay, s **L/T/R**	33.4 34.8/37.1/1.1	34.6 65.8/34.2/0.5
WB LOS **L/T/R**	C C/D/A	C E/C/A
WB Queue, ft	21/257/8	125/358/4

Future traffic conditions plus trips generated by the new development were evaluated for the intersection of E 23rd Street & O'Connell Road. For AM peak hour traffic, the delay at the intersection was 25.6 sec on average with an overall LOS C. This is 3.8 sec more than the existing 2020 traffic conditions with the new development trips. Each of the approaches and turning movements have a LOS C or better except EBL and WBT. For PM peak hour traffic, the delay at the intersection was 32.6 sec on average with an overall LOS C. This is 3.7 sec more than the existing 2020 traffic conditions with the new development trips. Each of the approaches have a LOS C or better except the eastbound approach with a LOS D. The only turning movements with a LOS C or worse are EBL at LOS E, EBT at LOS D, and WBL at LOS E. The traffic signal is operating well under expected demand and capacity levels. Based on the number of turning vehicles in the AM and PM, dual left-turn lanes are still not justified. Queue lengths did not exceed the turn lane capacity for any movement.

Section 10: Near-term Impact of Development

The roadways surrounding the planned MSO Facility have the capacity to handle the newly generated trips. The intersection of E 23rd Street & O'Connell Road does not require improvements to handle the new trips since the traffic volumes do not justify dual left-turn lanes and the queue lengths do not exceed the turn lane capacity for any movement.

Since 19th Street is planned to be connected to O'Connell Road in 2021, some city vehicles would utilize 19th Street with an estimate of up to 10% of newly generated trips by the MSO facility. This means an additional 16 westbound vehicles and 19 eastbound vehicles during the AM peak hour and an additional 16 westbound vehicles and 13 eastbound vehicles during the PM peak hour between Harper Street and O'Connell Road. Although the neighborhood association has raised concerns about thru traffic utilizing 19th Street, the MSO Facility land-uses would not cause a high enough volume to cause congestion or walkability issues along 19th Street and 19th Street will not be utilized as a truck route.

Section 11: Impact of Development with Existing Traffic Projected 20 Years

For the projected traffic volumes, no changes are required to handle traffic volumes as a result of the MSO Facility. For 2040 traffic volumes, the intersection of E 23rd Street & O'Connell Road does not require dual left-turn lanes or extended turn lane capacity for any movement.

Section 12: Summary and Recommendations

Summary: This traffic study covered the impact of the field operations campus in the City of Lawrence, Kansas. The 168 acre site will include several large buildings and will host a staff of 223 people. The total daily trips for the facility is expected to be 1,029 with 187 entering and 157 leaving during the AM peak hour and with 127 entering and 157 leaving during the PM peak hour. These traffic volumes account for the personnel making multiple site trips to and from the facility throughout the day.

New roadway connections will be constructed connecting to public streets with the major access point connecting to the intersection of E 19th Street & O'Connell Road. Although the current orientation of buildings within the campus is still under development, the site will be contained within a secure fence with only the Household Hazardous Waste located on the outside as a public drop off location. The intersection of E 19th Street & O'Connell Road will be reconfigured into a stop-controlled T-intersection with O'Connell Road extended to the north. The intersection of E 23rd Street & O'Connell Road does not require improvements to handle the new trips. If 19th Street is connected to O'Connell Road, an estimated 10% of newly generated trips might utilize 19th Street. Between Harper Street and O'Connell Road, trip distribution results included an additional 16 westbound vehicles and 19 eastbound vehicles during the AM peak hour and an additional 16 westbound vehicles and 13 eastbound vehicles during the PM peak hour. In general, O'Connell Road and the surrounding roadway network was constructed with the capacity to handle development in the area. The trips generated by the MSO facility do not justify additional roadway improvements besides the necessary changes needed for access to the site.

Recommendations:

- Construct the access roadways for the development and ensure trucks can maneuver through the circulating parking areas and fuel areas without issues.
- Ensure sight distance requirements are consistent with AASHTO requirements during finalization of the facility layout.
- If 19th Street is connected to O'Connell Road, reconsider the routing for transit buses through the area.
- Install a street light at the intersection of 19th Street & O'Connell Road to aid in nighttime visibility.

Government Office Complex
(733)

Vehicle Trip Ends vs: **Employees**
On a: **Weekday**

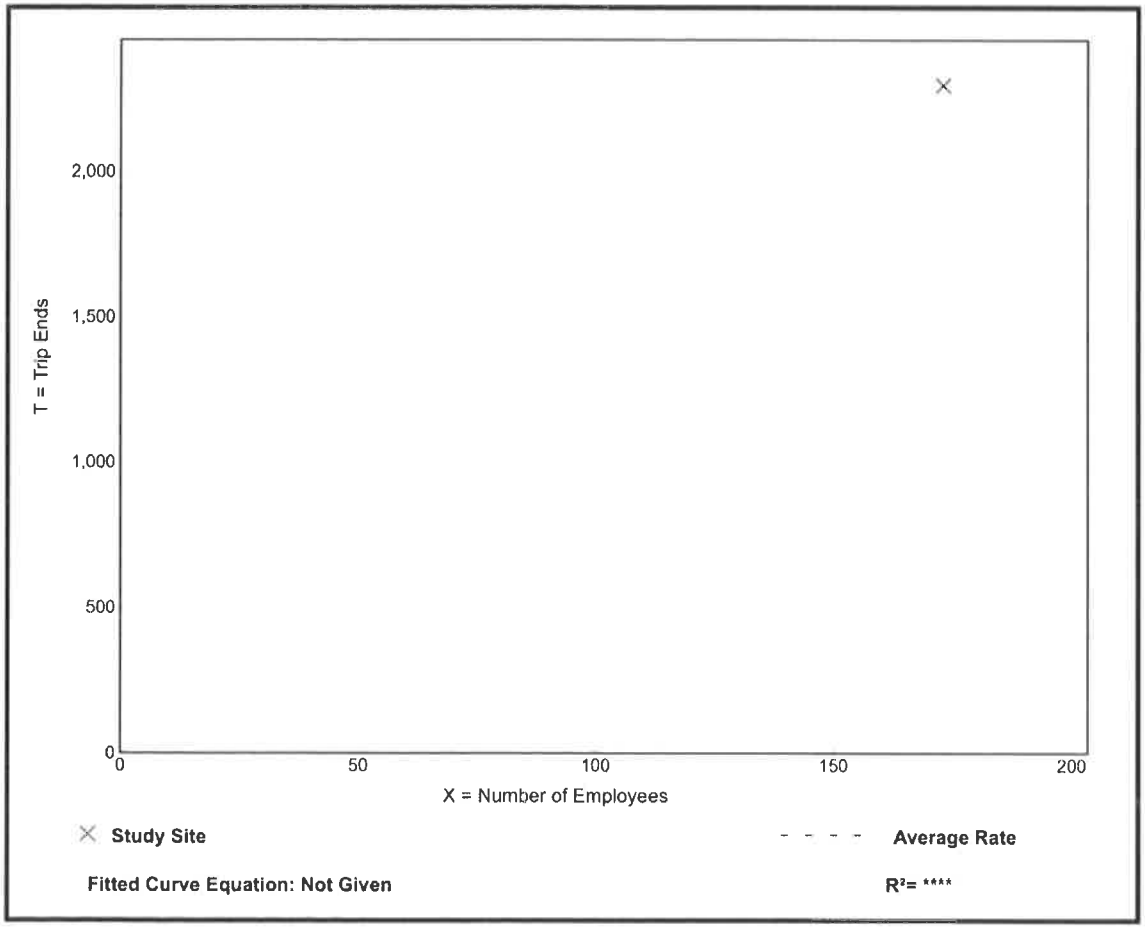
Setting/Location: **General Urban/Suburban**
Number of Studies: 1
Avg. Num. of Employees: 173
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
13.29	13.29 - 13.29	*

Data Plot and Equation

Caution – Small Sample Size



Fitted Curve Equation: Not Given

R^2= ****

Government Office Complex
(733)

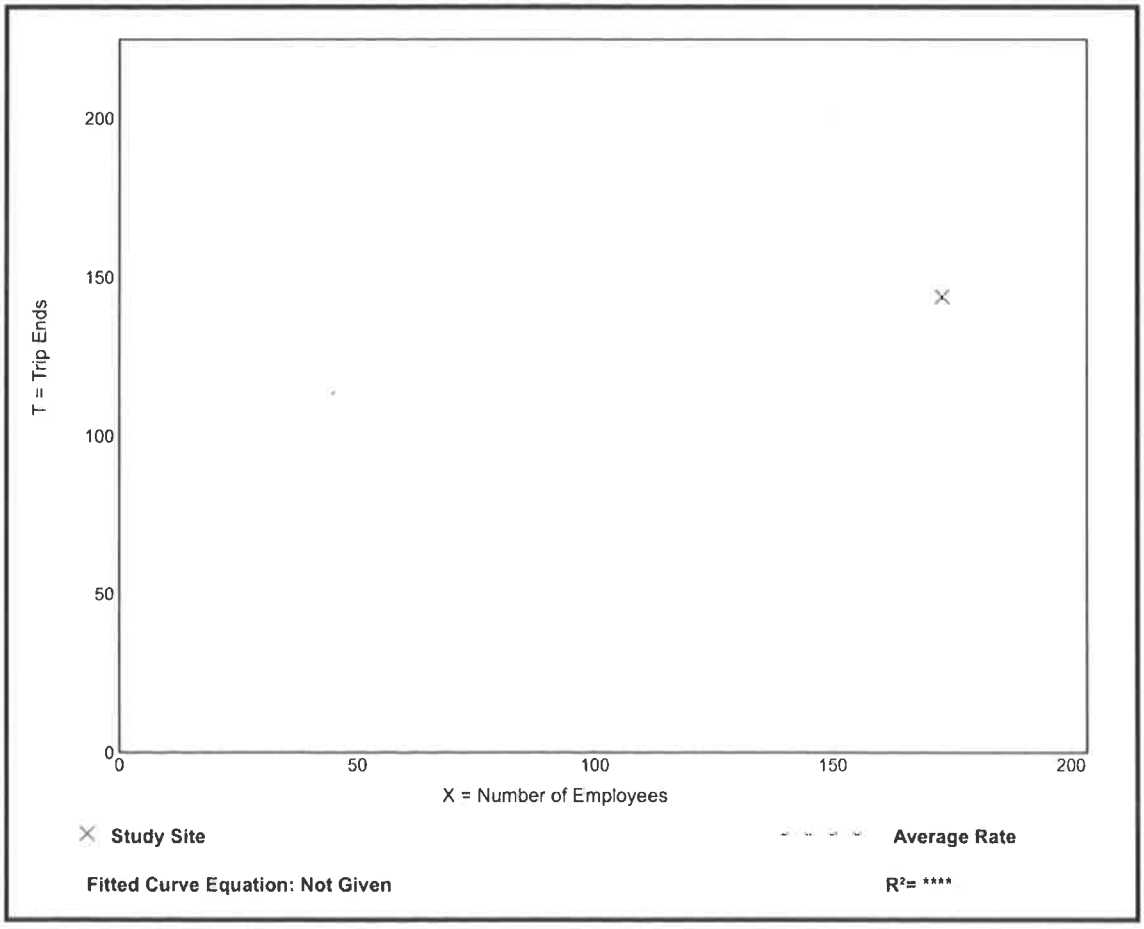
Vehicle Trip Ends vs: **Employees**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 1
Avg. Num. of Employees: 173
Directional Distribution: 89% entering, 11% exiting

Vehicle Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
0.83	0.83 - 0.83	*

Data Plot and Equation

Caution -- Small Sample Size



Fitted Curve Equation: Not Given

R^2= ****

Government Office Complex
(733)

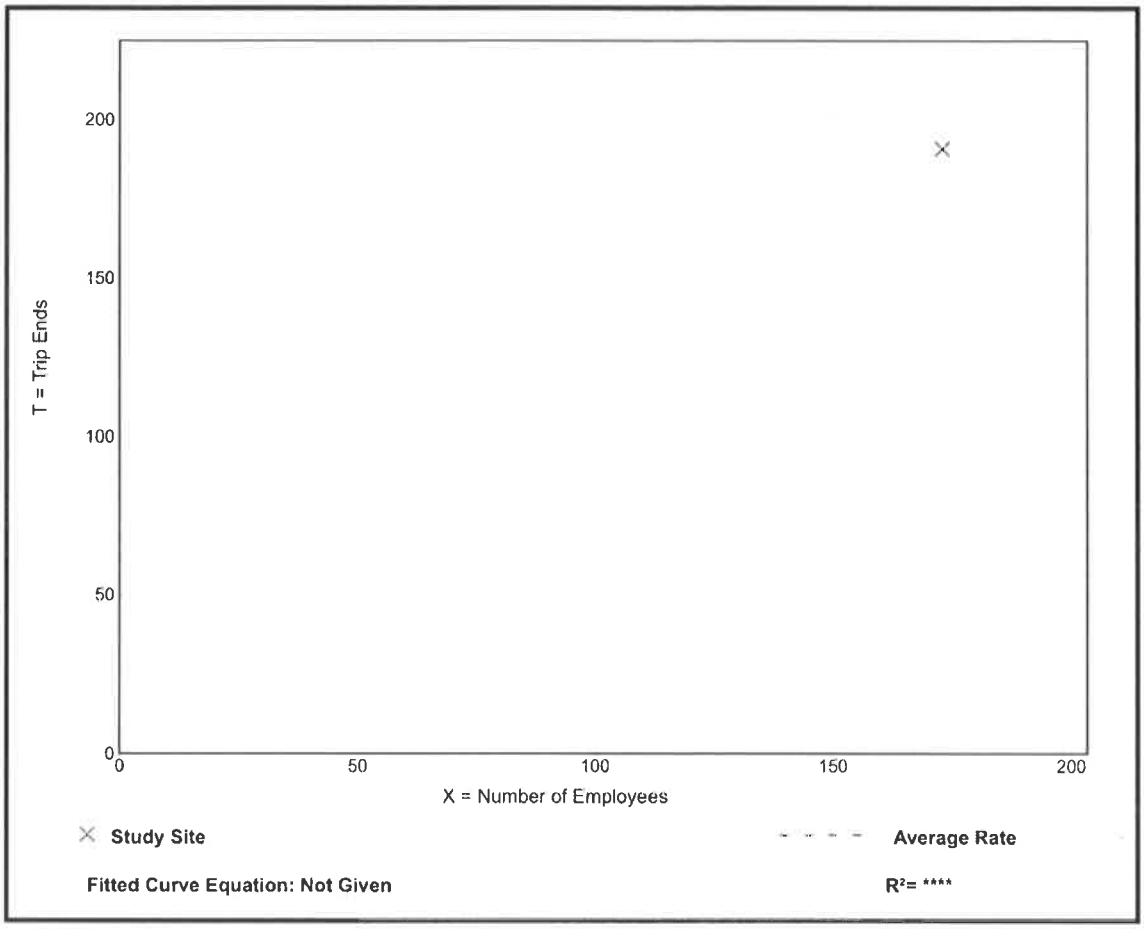
Vehicle Trip Ends vs: **Employees**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 1
Avg. Num. of Employees: 173
Directional Distribution: 31% entering, 69% exiting

Vehicle Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
1.10	1.10 - 1.10	*

Data Plot and Equation

Caution – Small Sample Size



Utility
(170)

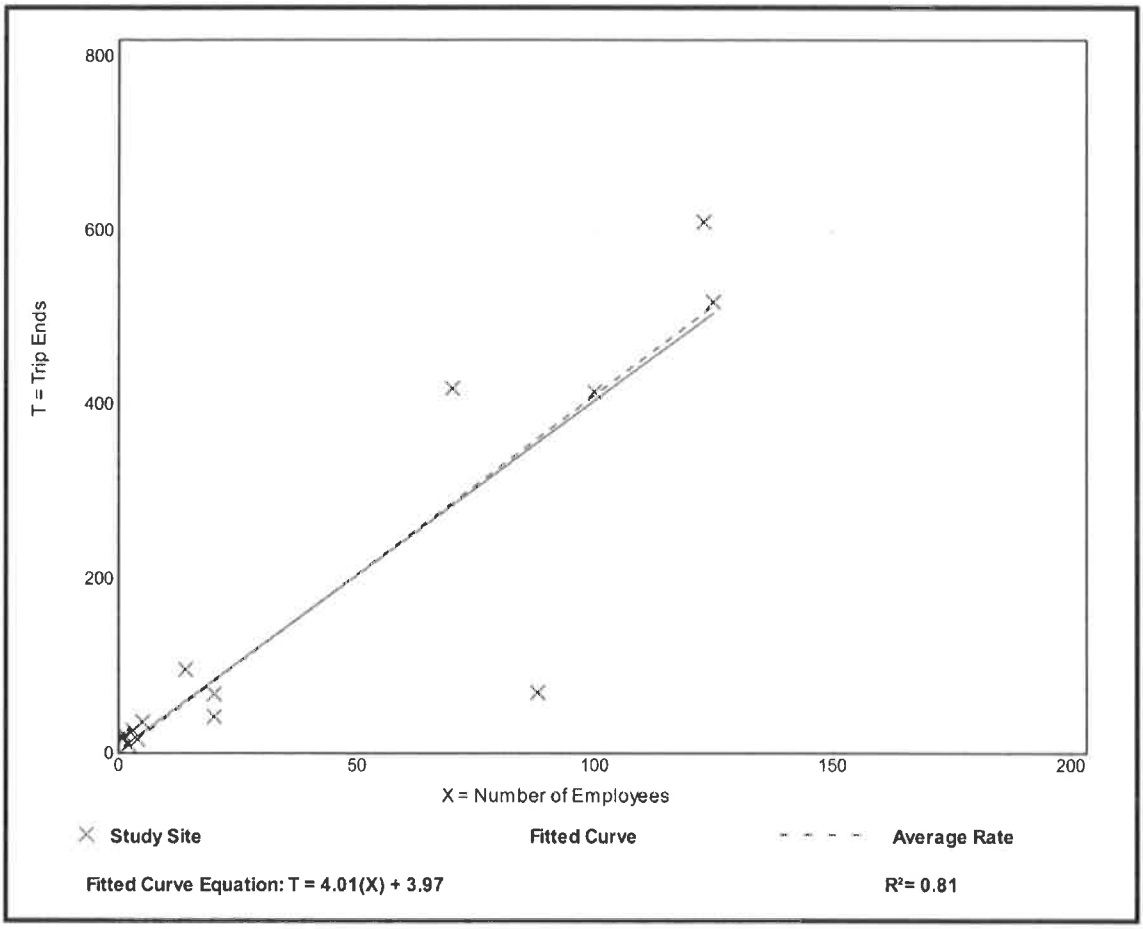
Vehicle Trip Ends vs: **Employees**
On a: **Weekday**

Setting/Location: **General Urban/Suburban**
Number of Studies: 14
Avg. Num. of Employees: 41
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
4.11	0.80 - 22.00	1.99

Data Plot and Equation



Fitted Curve Equation: T = 4.01(X) + 3.97

R^2= 0.81

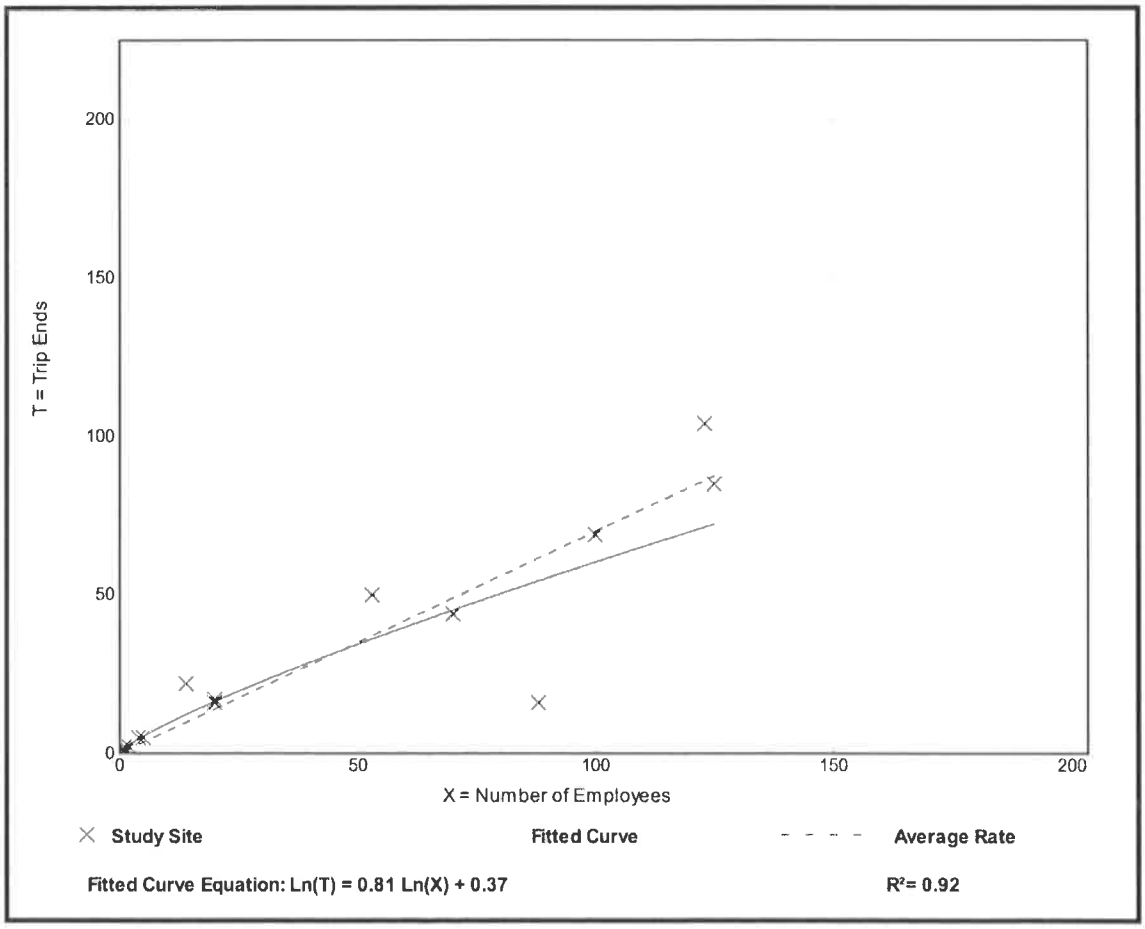
Utility
(170)

Vehicle Trip Ends vs: **Employees**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 14
Avg. Num. of Employees: 45
Directional Distribution: 81% entering, 19% exiting

Vehicle Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
0.70	0.18 - 2.00	0.28

Data Plot and Equation



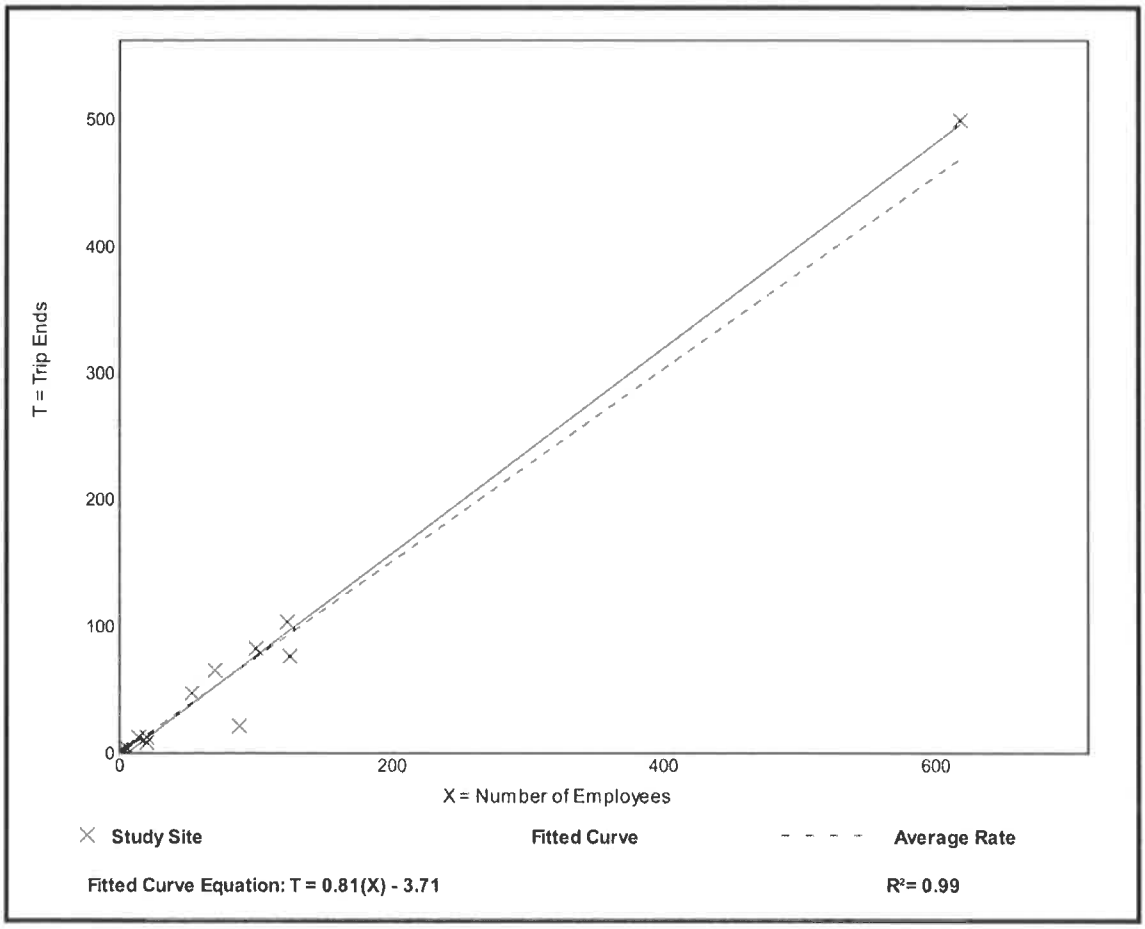
Utility
(170)

Vehicle Trip Ends vs:	**Employees**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 4 and 6 p.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	15
Avg. Num. of Employees:	83
Directional Distribution:	15% entering, 85% exiting

Vehicle Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
0.76	0.25 - 3.00	0.19

Data Plot and Equation



Fitted Curve Equation: T = 0.81(X) - 3.71

R^2= 0.99

E 23rd Street & E 1600 Road - TMC
Tue Dec 3, 2019
Full Length (12 AM-12 AM (+1))
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians, Bicycles on Crosswalk)
All Movements
ID: 731785, Location: 38.942698, -95.204907

Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg	1600 Rd						23rd St						1600 Rd						23rd St						
Direction	Southbound						Westbound						Northbound						Eastbound						
Time	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	Int
2019-12-03 12:00AM	4	3	0	0	**7**	0	0	29	1	0	**30**	0	1	0	0	0	**1**	0	2	15	0	0	**17**	0	**55**
12:15AM	1	0	0	0	**1**	0	0	25	1	0	**26**	0	0	0	2	0	**2**	0	2	21	1	0	**24**	0	**53**
12:30AM	7	0	0	0	**7**	0	0	37	0	0	**37**	0	0	1	0	0	**1**	0	1	7	0	1	**9**	0	**54**
12:45AM	5	0	0	0	**5**	0	0	32	0	0	**32**	0	0	0	1	0	**1**	0	1	6	0	0	**7**	0	**45**
Hourly Total	17	3	0	0	**20**	0	0	123	2	0	**125**	0	1	1	3	0	**5**	0	6	49	1	1	**57**	0	**207**
1:00AM	9	1	0	0	**10**	0	0	30	1	0	**31**	0	0	0	0	0	**0**	0	2	10	0	0	**12**	0	**53**
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1:30AM	1	0	0	0	**1**	0	0	12	0	0	**12**	0	0	0	1	0	**1**	0	0	2	1	1	**4**	0	**18**
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Hourly Total	14	2	0	0	**16**	0	0	68	1	0	**69**	0	1	0	1	0	**2**	0	3	31	2	1	**37**	0	**124**
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Hourly Total	2	0	0	0	**2**	0	0	20	0	0	**20**	0	3	1	0	0	**4**	0	0	35	0	0	**35**	0	**61**
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7:30AM	6	1	2	0	**9**	0	0	96	6	0	**102**	0	28	3	23	0	**54**	0	8	160	16	0	**184**	0	**349**
7:45AM	6	1	1	0	**8**	0	0	111	3	0	**114**	0	15	8	36	0	**59**	0	7	173	13	0	**193**	0	**374**
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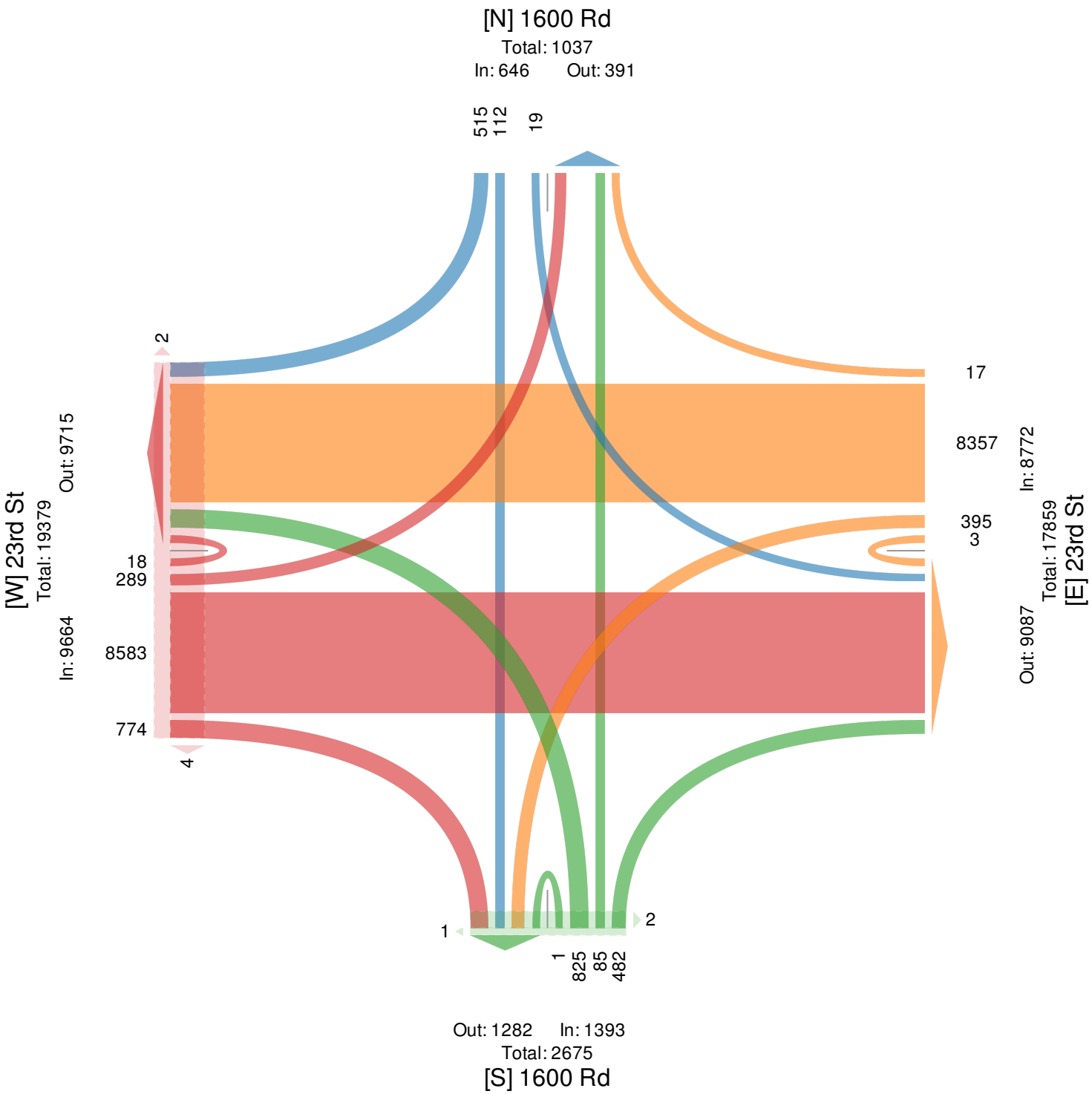
8:00AM	16	1	0	0	**17**	0	0	112	2	0	**114**	0	16	0	24	0	**40**	0	15	146	1	0	**162**	0	**333**
8:15AM	10	0	2	0	**12**	0	0	140	2	0	**142**	0	11	1	15	0	**27**	0	13	142	11	0	**166**	0	**347**
8:30AM	9	1	0	0	**10**	0	0	189	1	1	**191**	0	12	6	17	0	**35**	0	10	132	5	0	**147**	0	**383**
8:45AM	7	0	0	0	**7**	0	0	169	2	0	**171**	0	6	6	6	0	**18**	0	8	118	9	0	**135**	0	**331**
Hourly Total	42	2	2	0	**46**	0	0	610	7	1	**618**	0	45	13	62	0	**120**	0	46	538	26	0	**610**	0	**1394**
9:00AM	4	0	0	0	**4**	0	0	159	2	0	**161**	0	4	2	11	0	**17**	0	11	106	6	0	**123**	0	**305**
9:15AM	1	0	3	0	**4**	0	0	133	2	0	**135**	0	5	5	12	0	**22**	0	10	129	6	0	**145**	1	**306**
9:30AM	3	0	0	0	**3**	0	0	149	4	0	**153**	0	8	0	15	0	**23**	0	10	100	1	0	**111**	0	**290**
9:45AM	3	0	0	0	**3**	0	0	202	3	0	**205**	0	5	0	7	0	**12**	0	7	106	4	0	**117**	0	**337**
Hourly Total	11	0	3	0	**14**	0	0	643	11	0	**654**	0	22	7	45	0	**74**	0	38	441	17	0	**496**	1	**1238**
10:00AM	4	0	0	0	**4**	0	1	152	2	0	**155**	0	5	0	13	0	**18**	0	13	113	0	0	**126**	0	**303**
10:15AM	1	1	0	0	**2**	0	0	123	2	0	**125**	0	8	1	20	0	**29**	0	15	118	8	0	**141**	0	**297**
10:30AM	5	2	0	0	**7**	0	0	117	2	0	**119**	0	1	0	11	0	**12**	0	12	117	3	0	**132**	0	**270**
10:45AM	4	1	0	0	**5**	0	0	118	4	0	**122**	0	7	0	19	0	**26**	0	11	109	3	0	**123**	0	**276**
Hourly Total	14	4	0	0	**18**	0	1	510	10	0	**521**	0	21	1	63	0	**85**	0	51	457	14	0	**522**	0	**1146**
11:00AM	1	4	0	0	**5**	0	0	100	4	0	**104**	0	2	0	16	0	**18**	0	14	105	1	0	**120**	0	**247**
11:15AM	4	1	0	0	**5**	0	0	103	3	0	**106**	0	2	1	19	0	**22**	0	13	109	1	0	**123**	0	**256**
11:30AM	5	2	0	0	**7**	0	0	115	3	0	**118**	0	6	1	16	0	**23**	0	10	112	3	0	**125**	0	**273**
11:45AM	2	2	0	0	**4**	0	0	110	1	1	**112**	0	8	0	15	0	**23**	0	16	128	2	0	**146**	0	**285**
Hourly Total	12	9	0	0	**21**	0	0	428	11	1	**440**	0	18	2	66	0	**86**	0	53	454	7	0	**514**	0	**1061**
12:00PM	9	6	0	0	**15**	0	0	97	4	0	**101**	0	6	0	18	0	**24**	0	14	122	2	0	**138**	0	**278**
12:15PM	6	3	0	0	**9**	0	0	104	2	0	**106**	0	6	0	10	0	**16**	0	10	130	5	1	**146**	0	**277**
12:30PM	8	3	1	0	**12**	0	1	112	2	0	**115**	0	4	2	12	0	**18**	0	18	123	3	0	**144**	0	**289**
12:45PM	14	2	0	0	**16**	0	0	114	5	0	**119**	0	4	0	15	0	**19**	0	12	112	8	0	**132**	0	**286**
Hourly Total	37	14	1	0	**52**	0	1	427	13	0	**441**	0	20	2	55	0	**77**	0	54	487	18	1	**560**	0	**1130**
1:00PM	17	1	0	0	**18**	0	0	115	2	0	**117**	0	6	1	13	0	**20**	0	12	126	7	1	**146**	0	**301**
1:15PM	9	0	0	0	**9**	0	0	101	6	0	**107**	0	3	2	11	0	**16**	0	6	143	10	1	**160**	0	**292**
1:30PM	14	2	0	0	**16**	0	0	112	3	0	**115**	0	5	0	10	0	**15**	1	13	120	5	1	**139**	0	**285**
1:45PM	6	1	0	0	**7**	0	0	104	5	0	**109**	0	7	4	11	0	**22**	0	13	132	11	0	**156**	0	**294**
Hourly Total	46	4	0	0	**50**	0	0	432	16	0	**448**	0	21	7	45	0	**73**	1	44	521	33	3	**601**	0	**1172**
2:00PM	6	0	0	0	**6**	0	0	93	5	0	**98**	0	7	2	11	0	**20**	0	9	121	4	0	**134**	0	**258**
2:15PM	4	4	0	0	**8**	0	0	78	4	0	**82**	0	7	0	14	0	**21**	0	1	158	5	0	**164**	0	**275**
2:30PM	11	1	1	0	**13**	0	0	111	5	0	**116**	0	7	0	10	0	**17**	0	14	153	7	0	**174**	0	**320**

Leg	1600 Rd						23rd St						1600 Rd						23rd St						
Direction	Southbound						Westbound						Northbound						Eastbound						
Time	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	Int
2:45PM	3	1	0	0	**4**	0	0	95	4	0	**99**	0	7	2	15	0	**24**	1	15	154	9	0	**178**	1	**305**
Hourly Total	24	6	1	0	**31**	0	0	377	18	0	**395**	0	28	4	50	0	**82**	1	39	586	25	0	**650**	1	**1158**
3:00PM	11	3	0	0	**14**	0	0	87	5	0	**92**	0	6	1	12	0	**19**	0	17	136	5	0	**158**	0	**283**
3:15PM	3	1	0	0	**4**	0	0	108	6	0	**114**	0	4	2	12	0	**18**	0	14	138	9	0	**161**	0	**297**
3:30PM	8	13	0	0	**21**	0	1	134	11	0	**146**	0	9	2	16	0	**27**	0	21	129	3	0	**153**	0	**347**
3:45PM	4	0	0	0	**4**	0	0	110	16	0	**126**	0	3	3	13	0	**19**	0	17	157	7	1	**182**	0	**331**
Hourly Total	26	17	0	0	**43**	0	1	439	38	0	**478**	0	22	8	53	0	**83**	0	69	560	24	1	**654**	0	**1258**
4:00PM	14	5	0	0	**19**	0	0	121	15	0	**136**	0	3	2	15	0	**20**	0	19	162	8	1	**190**	0	**365**
4:15PM	5	0	1	0	**6**	0	0	118	17	0	**135**	0	7	0	10	0	**17**	0	15	203	5	1	**224**	0	**382**
4:30PM	31	8	1	0	**40**	0	0	181	21	0	**202**	0	5	0	16	0	**21**	0	12	162	1	0	**175**	0	**438**
4:45PM	12	2	1	0	**15**	0	1	175	13	0	**189**	0	8	0	12	0	**20**	0	25	182	3	0	**210**	0	**434**
Hourly Total	62	15	3	0	**80**	0	1	595	66	0	**662**	0	23	2	53	0	**78**	0	71	709	17	2	**799**	0	**1619**
5:00PM	9	10	1	0	**20**	0	2	157	20	0	**179**	0	9	2	16	0	**27**	0	24	182	3	1	**210**	0	**436**
5:15PM	9	2	0	0	**11**	0	1	158	17	0	**176**	0	6	1	11	0	**18**	0	28	243	2	0	**273**	0	**478**
5:30PM	17	2	0	0	**19**	0	0	233	19	0	**252**	0	8	0	14	0	**22**	0	17	162	3	0	**182**	0	**475**
5:45PM	11	4	0	0	**15**	0	2	194	12	0	**208**	0	7	0	17	1	**25**	0	19	137	3	0	**159**	0	**407**
Hourly Total	46	18	1	0	**65**	0	5	742	68	0	**815**	0	30	3	58	1	**92**	0	88	724	11	1	**824**	0	**1796**
6:00PM	24	2	0	0	**26**	0	0	188	12	0	**200**	0	4	1	21	0	**26**	1	6	141	1	0	**148**	1	**400**
6:15PM	12	1	1	0	**14**	0	1	186	11	0	**198**	0	5	0	16	0	**21**	0	18	114	4	0	**136**	1	**369**
6:30PM	8	1	0	0	**9**	0	0	192	4	0	**196**	0	7	2	11	0	**20**	0	15	111	4	0	**130**	0	**355**
6:45PM	5	0	0	0	**5**	0	0	181	7	0	**188**	0	4	1	13	0	**18**	0	6	110	2	1	**119**	0	**330**
Hourly Total	49	4	1	0	**54**	0	1	747	34	0	**782**	0	20	4	61	0	**85**	1	45	476	11	1	**533**	2	**1454**
7:00PM	14	0	0	0	**14**	0	1	185	7	0	**193**	0	4	0	14	0	**18**	0	15	67	4	0	**86**	0	**311**
7:15PM	6	0	0	0	**6**	0	2	177	6	0	**185**	0	2	0	4	0	**6**	0	18	107	4	0	**129**	0	**326**
7:30PM	8	4	1	0	**13**	0	0	159	5	0	**164**	0	1	0	6	0	**7**	0	8	80	2	1	**91**	0	**275**
7:45PM	4	0	1	0	**5**	0	0	106	4	0	**110**	0	0	0	7	0	**7**	0	14	78	3	0	**95**	0	**217**
Hourly Total	32	4	2	0	**38**	0	3	627	22	0	**652**	0	7	0	31	0	**38**	0	55	332	13	1	**401**	0	**1129**
8:00PM	14	1	0	0	**15**	0	0	101	4	0	**105**	0	6	0	5	0	**11**	0	11	69	1	0	**81**	2	**212**
8:15PM	7	0	0	0	**7**	0	0	93	8	0	**101**	0	3	2	6	0	**11**	0	14	70	2	0	**86**	0	**205**
8:30PM	7	0	0	0	**7**	0	0	85	2	0	**87**	0	1	0	7	0	**8**	0	10	74	2	0	**86**	0	**188**
8:45PM	2	1	0	0	**3**	0	0	73	6	0	**79**	0	0	0	1	0	**1**	0	8	53	1	2	**64**	0	**147**
Hourly Total	30	2	0	0	**32**	0	0	352	20	0	**372**	0	10	2	19	0	**31**	0	43	266	6	2	**317**	2	**752**
9:00PM	2	0	0	0	**2**	0	0	79	6	0	**85**	0	0	0	5	0	**5**	0	5	63	1	0	**69**	0	**161**
9:15PM	3	0	0	0	**3**	0	0	70	7	0	**77**	0	1	0	5	0	**6**	0	3	56	1	0	**60**	0	**146**
9:30PM	6	0	0	0	**6**	0	2	81	4	1	**88**	0	2	0	3	0	**5**	0	5	39	2	1	**47**	0	**146**
9:45PM	0	0	0	0	**0**	0	0	54	6	0	**60**	0	1	2	4	0	**7**	0	4	30	2	0	**36**	0	**103**
Hourly Total	11	0	0	0	**11**	0	2	284	23	1	**310**	0	4	2	17	0	**23**	0	17	188	6	1	**212**	0	**556**
10:00PM	2	0	0	0	**2**	0	0	71	3	0	**74**	0	0	0	1	0	**1**	0	4	43	0	1	**48**	0	**125**
10:15PM	0	0	0	0	**0**	0	1	60	3	0	**64**	0	0	1	1	0	**2**	0	4	24	0	0	**28**	0	**94**
10:30PM	3	0	0	0	**3**	0	0	52	0	0	**52**	0	1	1	1	0	**3**	0	2	29	0	0	**31**	0	**89**
10:45PM	0	0	0	0	**0**	0	0	59	2	0	**61**	0	1	0	0	0	**1**	0	3	19	0	0	**22**	0	**84**
Hourly Total	5	0	0	0	**5**	0	1	242	8	0	**251**	0	2	2	3	0	**7**	0	13	115	0	1	**129**	0	**392**
11:00PM	0	0	0	0	**0**	0	0	47	1	0	**48**	0	1	0	1	0	**2**	0	1	19	2	1	**23**	0	**73**
11:15PM	0	0	0	0	**0**	0	0	39	1	0	**40**	0	0	1	0	0	**1**	0	1	15	1	0	**17**	0	**58**
11:30PM	3	1	0	0	**4**	0	0	33	0	0	**33**	0	0	0	2	0	**2**	0	1	23	1	0	**25**	0	**64**
11:45PM	0	0	0	0	**0**	0	0	38	1	0	**39**	0	0	1	2	0	**3**	0	2	20	1	1	**24**	0	**66**
Hourly Total	3	1	0	0	**4**	0	0	157	3	0	**160**	0	1	2	5	0	**8**	0	5	77	5	2	**89**	0	**261**
Total	515	112	19	0	**646**	0	17	8357	395	3	**8772**	0	482	85	825	1	**1393**	3	774	8583	289	18	**9664**	6	**20475**
% Approach	79.7%	17.3%	2.9%	0%	**-**	-	0.2%	95.3%	4.5%	0%	**-**	-	34.6%	6.1%	59.2%	0.1%	**-**	-	8.0%	88.8%	3.0%	0.2%	**-**	-	-
% Total	2.5%	0.5%	0.1%	0%	**3.2%**	-	0.1%	40.8%	1.9%	0%	**42.8%**	-	2.4%	0.4%	4.0%	0%	**6.8%**	-	3.8%	41.9%	1.4%	0.1%	**47.2%**	-	-
Lights	450	105	17	0	**572**	-	17	8126	389	3	**8535**	-	470	84	710	1	**1265**	-	724	8293	224	18	**9259**	-	19631
% Lights	87.4%	93.8%	89.5%	0%	**88.5%**	-	100%	97.2%	98.5%	100%	**97.3%**	-	97.5%	98.8%	86.1%	100%	**90.8%**	-	93.5%	96.6%	77.5%	100%	**95.8%**	-	95.9%
Articulated Trucks	9	2	1	0	**12**	-	0	68	2	0	**70**	-	6	0	2	0	**8**	-	3	90	15	0	**108**	-	198
% Articulated Trucks	1.7%	1.8%	5.3%	0%	**1.9%**	-	0%	0.8%	0.5%	0%	**0.8%**	-	1.2%	0%	0.2%	0%	**0.6%**	-	0.4%	1.0%	5.2%	0%	**1.1%**	-	1.0%
Buses and Single-Unit Trucks	56	5	1	0	**62**	-	0	163	4	0	**167**	-	6	1	113	0	**120**	-	47	200	50	0	**297**	-	646
% Buses and Single-Unit Trucks	10.9%	4.5%	5.3%	0%	**9.6%**	-	0%	2.0%	1.0%	0%	**1.9%**	-	1.2%	1.2%	13.7%	0%	**8.6%**	-	6.1%	2.3%	17.3%	0%	**3.1%**	-	3.2%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	3	-	-	-	-	-	5	
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	83.3%	-
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	1	
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0%	-	-	-	-	-	16.7%	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

E 23rd Street & E 1600 Road - TMC
Tue Dec 3, 2019
Full Length (12 AM-12 AM (+1))
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians, Bicycles on Crosswalk)
All Movements
ID: 731785, Location: 38.942698, -95.204907

Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



E 23rd Street & E 1600 Road - TMC
Tue Dec 3, 2019
AM Peak (Dec 03 2019 7:45AM - 8:45 AM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians, Bicycles on Crosswalk)
All Movements
ID: 731785, Location: 38.942698, -95.204907

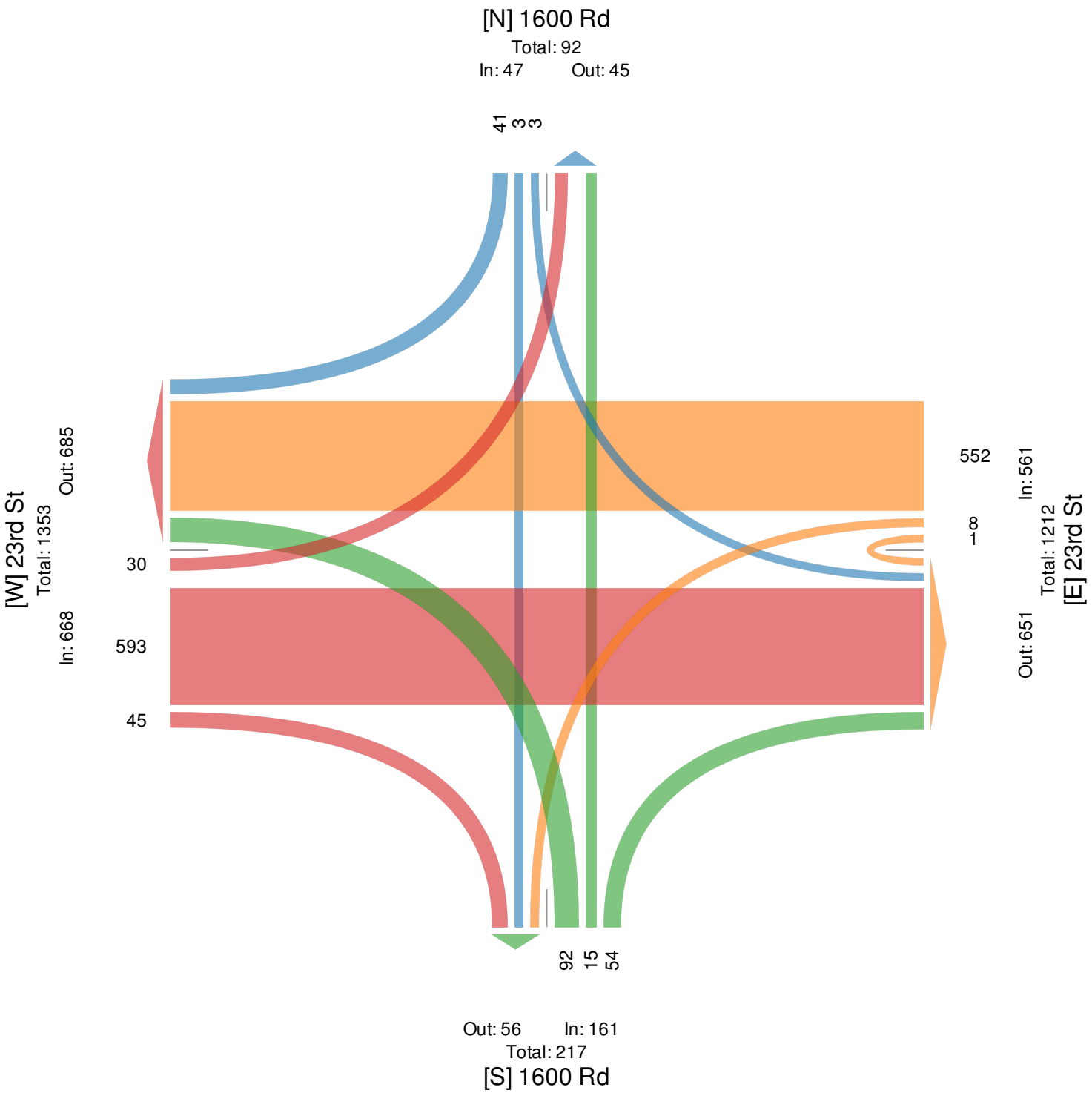
GHA GEWALT HAMILTON ASSOCIATES, INC.
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg	1600 Rd						23rd St						1600 Rd						23rd St						
Direction	Southbound						Westbound						Northbound						Eastbound						
Time	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	Int
2019-12-03 7:45AM	6	1	1	0	**8**	0	0	111	3	0	**114**	0	15	8	36	0	**59**	0	7	173	13	0	**193**	0	**374**
8:00AM	16	1	0	0	**17**	0	0	112	2	0	**114**	0	16	0	24	0	**40**	0	15	146	1	0	**162**	0	**333**
8:15AM	10	0	2	0	**12**	0	0	140	2	0	**142**	0	11	1	15	0	**27**	0	13	142	11	0	**166**	0	**347**
8:30AM	9	1	0	0	**10**	0	0	189	1	1	**191**	0	12	6	17	0	**35**	0	10	132	5	0	**147**	0	**383**
Total	41	3	3	0	**47**	0	0	552	8	1	**561**	0	54	15	92	0	**161**	0	45	593	30	0	**668**	0	**1437**
% Approach	87.2%	6.4%	6.4%	0%	**-**	-	0%	98.4%	1.4%	0.2%	**-**	-	33.5%	9.3%	57.1%	0%	**-**	-	6.7%	88.8%	4.5%	0%	**-**	-	-
% Total	2.9%	0.2%	0.2%	0%	**3.3%**	-	0%	38.4%	0.6%	0.1%	**39.0%**	-	3.8%	1.0%	6.4%	0%	**11.2%**	-	3.1%	41.3%	2.1%	0%	**46.5%**	-	-
PHF	0.641	0.750	0.375	-	**0.691**	-	-	0.730	0.667	0.250	**0.734**	-	0.844	0.469	0.639	-	**0.682**	-	0.750	0.857	0.577	-	**0.865**	-	0.938
Lights	35	2	3	0	**40**	-	0	533	7	1	**541**	-	53	15	75	0	**143**	-	36	579	27	0	**642**	-	1366
% Lights	85.4%	66.7%	100%	0%	**85.1%**	-	0%	96.6%	87.5%	100%	**96.4%**	-	98.1%	100%	81.5%	0%	**88.8%**	-	80.0%	97.6%	90.0%	0%	**96.1%**	-	95.1%
Articulated Trucks	0	0	0	0	**0**	-	0	4	0	0	**4**	-	0	0	0	0	**0**	-	0	5	0	0	**5**	-	9
% Articulated Trucks	0%	0%	0%	0%	**0%**	-	0%	0.7%	0%	0%	**0.7%**	-	0%	0%	0%	0%	**0%**	-	0%	0.8%	0%	0%	**0.7%**	-	0.6%
Buses and Single-Unit Trucks	6	1	0	0	**7**	-	0	15	1	0	**16**	-	1	0	17	0	**18**	-	9	9	3	0	**21**	-	62
% Buses and Single-Unit Trucks	14.6%	33.3%	0%	0%	**14.9%**	-	0%	2.7%	12.5%	0%	**2.9%**	-	1.9%	0%	18.5%	0%	**11.2%**	-	20.0%	1.5%	10.0%	0%	**3.1%**	-	4.3%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

E 23rd Street & E 1600 Road - TMC
Tue Dec 3, 2019
AM Peak (Dec 03 2019 7:45AM - 8:45 AM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians, Bicycles on Crosswalk)
All Movements
ID: 731785, Location: 38.942698, -95.204907

GEWALT HAMILTON ASSOCIATES, INC.
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



E 23rd Street & E 1600 Road - TMC
Tue Dec 3, 2019
Midday Peak (Dec 03 2019 12PM - 1 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians, Bicycles on Crosswalk)
All Movements
ID: 731785, Location: 38.942698, -95.204907

Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg	1600 Rd						23rd St						1600 Rd						23rd St						
Direction	Southbound						Westbound						Northbound						Eastbound						
Time	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	Int
2019-12-03 12:00PM	9	6	0	0	**15**	0	0	97	4	0	**101**	0	6	0	18	0	**24**	0	14	122	2	0	**138**	0	**278**
12:15PM	6	3	0	0	**9**	0	0	104	2	0	**106**	0	6	0	10	0	**16**	0	10	130	5	1	**146**	0	**277**
12:30PM	8	3	1	0	**12**	0	1	112	2	0	**115**	0	4	2	12	0	**18**	0	18	123	3	0	**144**	0	**289**
12:45PM	14	2	0	0	**16**	0	0	114	5	0	**119**	0	4	0	15	0	**19**	0	12	112	8	0	**132**	0	**286**
Total	37	14	1	0	**52**	0	1	427	13	0	**441**	0	20	2	55	0	**77**	0	54	487	18	1	**560**	0	**1130**
% Approach	71.2%	26.9%	1.9%	0%	**-**	-	0.2%	96.8%	2.9%	0%	**-**	-	26.0%	2.6%	71.4%	0%	**-**	-	9.6%	87.0%	3.2%	0.2%	**-**	-	-
% Total	3.3%	1.2%	0.1%	0%	**4.6%**	-	0.1%	37.8%	1.2%	0%	**39.0%**	-	1.8%	0.2%	4.9%	0%	**6.8%**	-	4.8%	43.1%	1.6%	0.1%	**49.6%**	-	-
PHF	0.661	0.583	0.250	-	**0.813**	-	0.250	0.936	0.650	-	**0.926**	-	0.833	0.250	0.764	-	**0.802**	-	0.750	0.937	0.563	0.250	**0.959**	-	0.978
Lights	32	12	1	0	**45**	-	1	400	13	0	**414**	-	19	2	45	0	**66**	-	52	462	14	1	**529**	-	1054
% Lights	86.5%	85.7%	100%	0%	**86.5%**	-	100%	93.7%	100%	0%	**93.9%**	-	95.0%	100%	81.8%	0%	**85.7%**	-	96.3%	94.9%	77.8%	100%	**94.5%**	-	93.3%
Articulated Trucks	0	1	0	0	**1**	-	0	6	0	0	**6**	-	0	0	1	0	**1**	-	0	7	0	0	**7**	-	15
% Articulated Trucks	0%	7.1%	0%	0%	**1.9%**	-	0%	1.4%	0%	0%	**1.4%**	-	0%	0%	1.8%	0%	**1.3%**	-	0%	1.4%	0%	0%	**1.3%**	-	1.3%
Buses and Single-Unit Trucks	5	1	0	0	**6**	-	0	21	0	0	**21**	-	1	0	9	0	**10**	-	2	18	4	0	**24**	-	61
% Buses and Single-Unit Trucks	13.5%	7.1%	0%	0%	**11.5%**	-	0%	4.9%	0%	0%	**4.8%**	-	5.0%	0%	16.4%	0%	**13.0%**	-	3.7%	3.7%	22.2%	0%	**4.3%**	-	5.4%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

E 23rd Street & E 1600 Road - TMC
Tue Dec 3, 2019
Midday Peak (Dec 03 2019 12PM - 1 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians, Bicycles on Crosswalk)
All Movements
ID: 731785, Location: 38.942698, -95.204907

GEWALT HAMILTON ASSOCIATES, INC.
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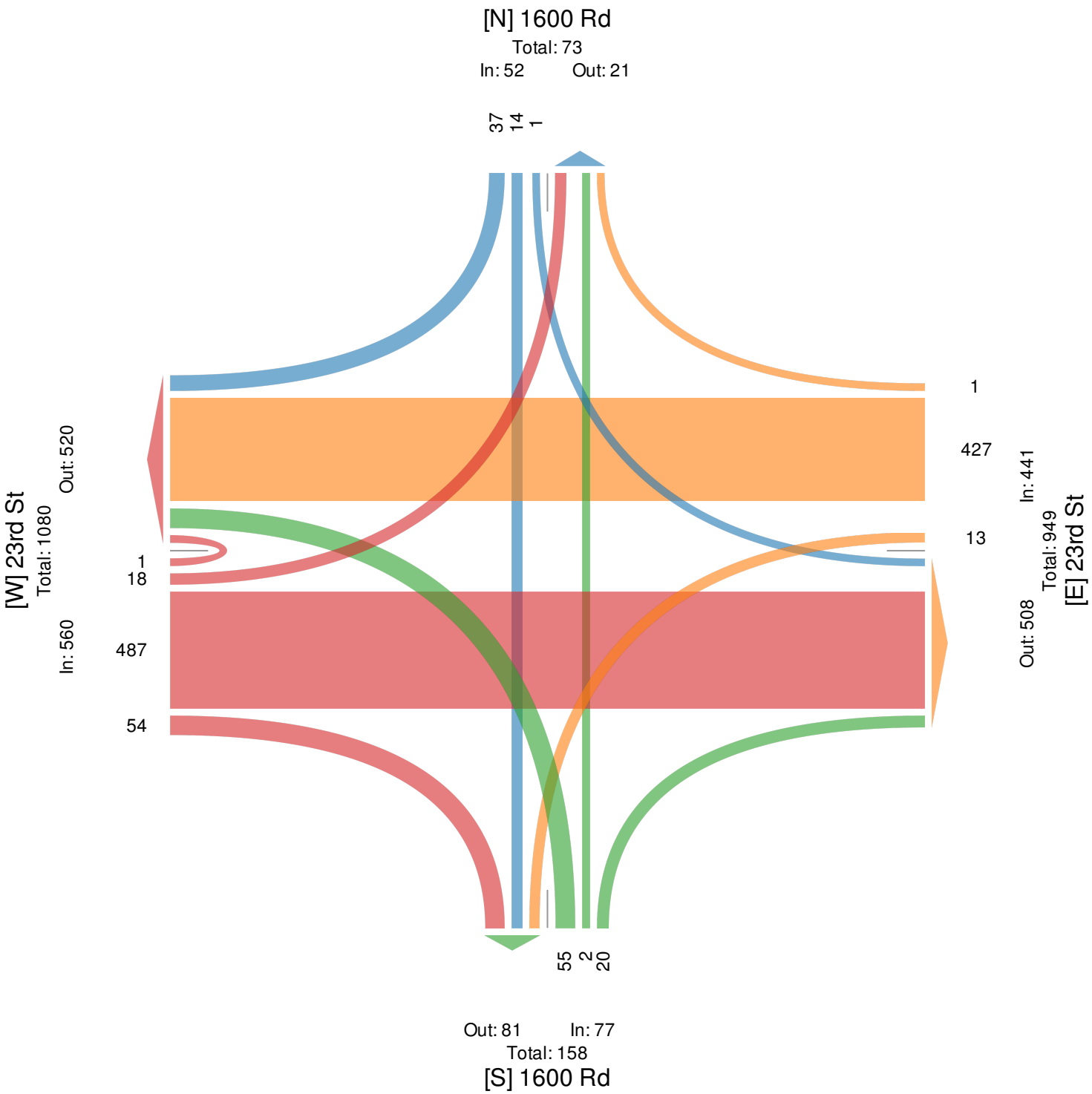
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



E 23rd Street & E 1600 Road - TMC
Tue Dec 3, 2019
PM Peak (Dec 03 2019 4:45PM - 5:45 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians, Bicycles on Crosswalk)
All Movements
ID: 731785, Location: 38.942698, -95.204907

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625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg	1600 Rd						23rd St						1600 Rd						23rd St						
Direction	Southbound						Westbound						Northbound						Eastbound						
Time	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	Int
2019-12-03 4:45PM	12	2	1	0	**15**	0	1	175	13	0	**189**	0	8	0	12	0	**20**	0	25	182	3	0	**210**	0	**434**
5:00PM	9	10	1	0	**20**	0	2	157	20	0	**179**	0	9	2	16	0	**27**	0	24	182	3	1	**210**	0	**436**
5:15PM	9	2	0	0	**11**	0	1	158	17	0	**176**	0	6	1	11	0	**18**	0	28	243	2	0	**273**	0	**478**
5:30PM	17	2	0	0	**19**	0	0	233	19	0	**252**	0	8	0	14	0	**22**	0	17	162	3	0	**182**	0	**475**
Total	47	16	2	0	**65**	0	4	723	69	0	**796**	0	31	3	53	0	**87**	0	94	769	11	1	**875**	0	**1823**
% Approach	72.3%	24.6%	3.1%	0%	**-**	-	0.5%	90.8%	8.7%	0%	**-**	-	35.6%	3.4%	60.9%	0%	**-**	-	10.7%	87.9%	1.3%	0.1%	**-**	-	-
% Total	2.6%	0.9%	0.1%	0%	**3.6%**	-	0.2%	39.7%	3.8%	0%	**43.7%**	-	1.7%	0.2%	2.9%	0%	**4.8%**	-	5.2%	42.2%	0.6%	0.1%	**48.0%**	-	-
PHF	0.691	0.400	0.500	-	**0.813**	-	0.500	0.776	0.863	-	**0.790**	-	0.861	0.375	0.828	-	**0.806**	-	0.839	0.791	0.917	0.250	**0.801**	-	0.953
Lights	43	16	2	0	**61**	-	4	709	69	0	**782**	-	29	2	49	0	**80**	-	93	758	6	1	**858**	-	1781
% Lights	91.5%	100%	100%	0%	**93.8%**	-	100%	98.1%	100%	0%	**98.2%**	-	93.5%	66.7%	92.5%	0%	**92.0%**	-	98.9%	98.6%	54.5%	100%	**98.1%**	-	97.7%
Articulated Trucks	2	0	0	0	**2**	-	0	4	0	0	**4**	-	1	0	0	0	**1**	-	1	3	2	0	**6**	-	13
% Articulated Trucks	4.3%	0%	0%	0%	**3.1%**	-	0%	0.6%	0%	0%	**0.5%**	-	3.2%	0%	0%	0%	**1.1%**	-	1.1%	0.4%	18.2%	0%	**0.7%**	-	0.7%
Buses and Single-Unit Trucks	2	0	0	0	**2**	-	0	10	0	0	**10**	-	1	1	4	0	**6**	-	0	8	3	0	**11**	-	29
% Buses and Single-Unit Trucks	4.3%	0%	0%	0%	**3.1%**	-	0%	1.4%	0%	0%	**1.3%**	-	3.2%	33.3%	7.5%	0%	**6.9%**	-	0%	1.0%	27.3%	0%	**1.3%**	-	1.6%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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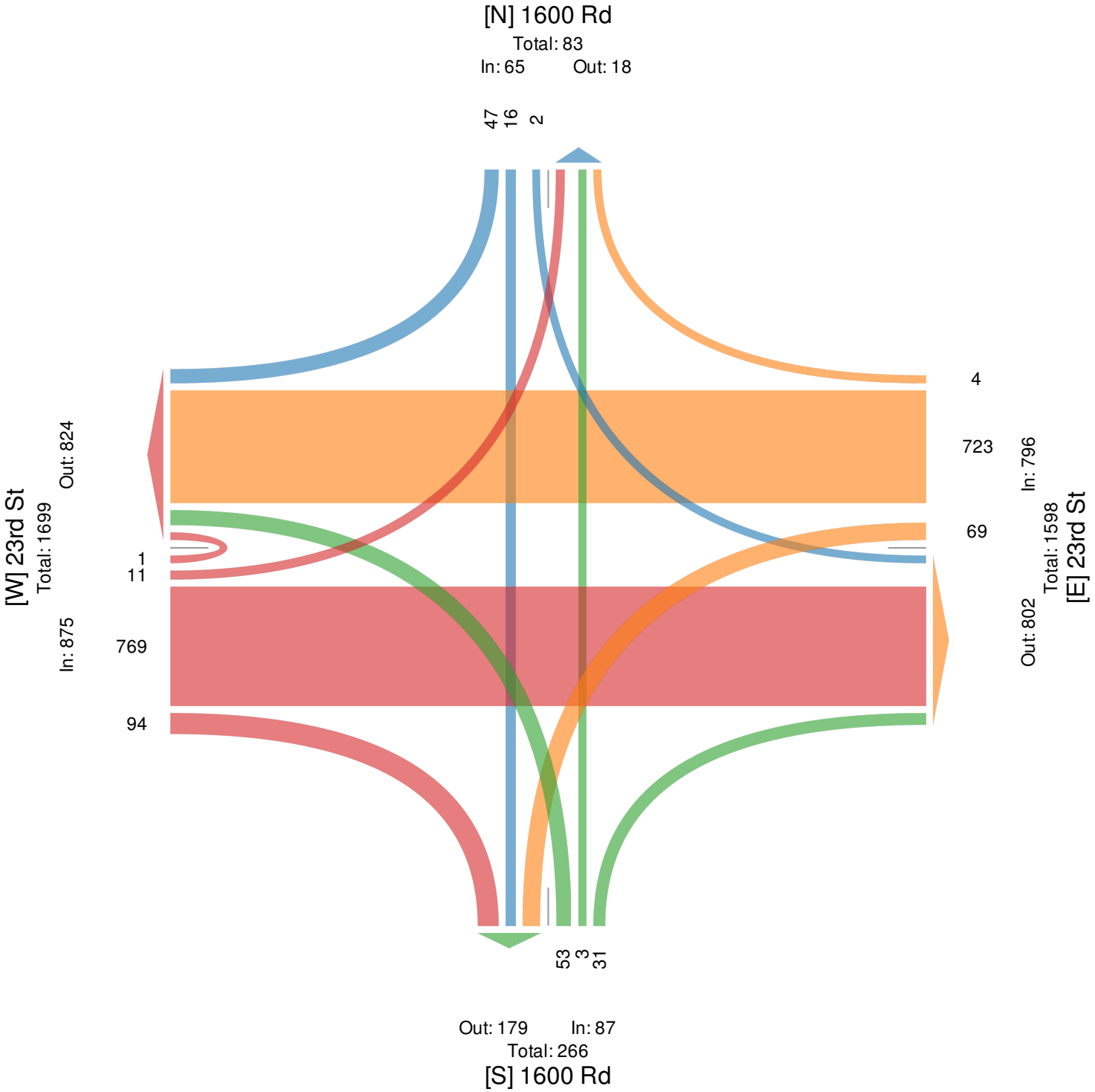


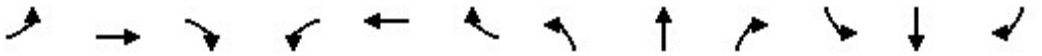
Accident_K	Date	On_Road	Dist	UOM	Dir	Accident_C	CWOV	Fixed_ Obje	Accident_L	F__of_ Vehs	Total_ Accs	Fatal_ Accs	Injury_ Acc	PDO_ Accs	F__of_ Deat	F__of_ Inju	Time	Weather_Co	Light_Cond	KDOT_Latit	KDOT_Longi
20140101562	1/27/2014	K010	1	F	N	COLL W FIXED OBJECT			INTRSECTION-RELATED-ON ROADWAY	1	1	0	0	1	0	0	1203	NO ADVERSE CONDITIONS	DAYLIGHT	38.94266	-95.20481
20140107615	4/17/2014	K010	0			COLL W OTHER MOTOR VEHICLE	ANGLE - SIDE IMPACT		INTERSECTION-ON ROADWAY	2	1	0	1	0	0	3	2256	NO ADVERSE CONDITIONS	DARK--STREET LIGHTS ON	38.94266	-95.20481
20140108155	5/2/2014	K010	0			COLL W OTHER MOTOR VEHICLE	REAR END		INTERSECTION-ON ROADWAY	2	1	0	0	1	0	0	2240	NO ADVERSE CONDITIONS	DARK--STREET LIGHTS ON	38.94266	-95.20481
20140108161	4/30/2014	K010	20	F	W	COLL W OTHER MOTOR VEHICLE	SIDESWIPE: SAME DIRECTION		INTRSECTION-RELATED-ON ROADWAY	3	1	0	0	1	0	0	1605	NO ADVERSE CONDITIONS	DAYLIGHT	38.94266	-95.20489
20140108248	5/2/2014	K010	30	F	E	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	2	1	0	1	0	0	1	2230	NO ADVERSE CONDITIONS	DARK--STREET LIGHTS ON	38.94266	-95.2047
20140109535	5/13/2014	K010	0			COLL W OTHER MOTOR VEHICLE	REAR END		INTERSECTION-ON ROADWAY	2	1	0	1	0	0	1	1405	NO ADVERSE CONDITIONS	DAYLIGHT	38.94266	-95.20481
20140111174	6/11/2014	K010	300	F	W	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	2	1	0	0	1	0	0	1805	NO ADVERSE CONDITIONS	DAYLIGHT	38.94267	-95.20587
20140111696	6/18/2014	K010	100	F	W	COLL W OTHER MOTOR VEHICLE	REAR END		NON-INTERSECTION-ON ROADWAY	2	1	0	0	1	0	0	843	NO ADVERSE CONDITIONS	DAYLIGHT	38.94266	-95.20516
20140113218	7/10/2014	K010	50	F	W	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	2	1	0	0	1	0	0	1819	NO ADVERSE CONDITIONS	DAYLIGHT	38.94266	-95.20498
20140116797	8/23/2014	K010	20	F	W	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	2	1	0	1	0	0	1	1210	NO ADVERSE CONDITIONS	DAYLIGHT	38.94266	-95.20496
20140124649	11/14/2014	K010	0.1	M	W	COLL W OTHER MOTOR VEHICLE	REAR END		NON-INTERSECTION-ON ROADWAY	2	1	0	1	0	0	1	1555	NO ADVERSE CONDITIONS	DAYLIGHT	38.94267	-95.20674
20140124894	11/17/2014	K010	10	F	E	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	3	1	0	0	1	0	0	1920	NO ADVERSE CONDITIONS	DARK--NO STREET LIGHTS	38.94266	-95.20485
20140125445	11/22/2014	K010	600	F	W	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	3	1	0	0	1	0	0	1510	NO ADVERSE CONDITIONS	DAYLIGHT	38.94268	-95.207
20140128003	12/16/2014	K010	10	F	W	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	2	1	0	0	1	0	0	1520	NO ADVERSE CONDITIONS	DAYLIGHT	38.94266	-95.20492

Accident_K	Date	On_Road	Dist	UOM	Dir	Accident_C	CWOV	Fixed_ Obje	Accident_L	F__of_ Vehs	Total_ Accs	Fatal_ Accs	Injury_ Acc	PDO_ Accs	F__of_ Deat	F__of_ Inju	Time	Weather_Co	Light_Cond	KDOT_Latit	KDOT_Longi
20150102664	2/11/2015	K010	15	F	W	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	2	1	0	0	1	0	0	1440	NO ADVERSE CONDITIONS	DAYLIGHT	38.94266	-95.20494
20150103290	2/21/2015	K010	15	F	W	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	2	1	0	0	1	0	0	725	FOG	DAYLIGHT	38.94266	-95.20494
20150103887	2/27/2015	K010	15	F	E	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	2	1	0	0	1	0	0	1400	NO ADVERSE CONDITIONS	DAYLIGHT	38.94265	-95.20353
20150106047	3/24/2015	K010	45	F	E	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	2	1	0	0	1	0	0	1625	NO ADVERSE CONDITIONS	DAYLIGHT	38.94266	-95.20472
20150106665	4/3/2015	K010	75	F	W	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	2	1	0	0	1	0	0	1547	NO ADVERSE CONDITIONS	DAYLIGHT	38.94266	-95.20515
20150106830	4/7/2015	K010	80	F	W	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	2	1	0	0	1	0	0	1123	NO ADVERSE CONDITIONS	DAYLIGHT	38.94266	-95.20516
20150108338	4/24/2015	K010	0			COLL W OTHER MOTOR VEHICLE	REAR END		INTERSECTION-ON ROADWAY	2	1	0	0	1	0	0	1150	NO ADVERSE CONDITIONS	DAYLIGHT	38.94266	-95.20489
20150108815	5/2/2015	K010	25	F	E	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	2	1	0	0	1	0	0	1040	NO ADVERSE CONDITIONS	DAYLIGHT	38.94266	-95.20479
20150109132	5/4/2015	K010	200	F	W	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	2	1	0	0	1	0	0	710	RAIN, MIST OR DRIZZLE	DAYLIGHT	38.94266	-95.20559
20150109447	5/10/2015	K010	145	F	W	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	2	1	0	0	1	0	0	1200	RAIN, MIST OR DRIZZLE	DAYLIGHT	38.94266	-95.20539
20150109470	4/30/2015	K010	0.1	M	W	COLL W OTHER MOTOR VEHICLE	ANGLE - SIDE IMPACT		NON-INTERSECTION-ON ROADWAY	2	1	0	0	1	0	0	900	NO ADVERSE CONDITIONS	DAYLIGHT	38.94267	-95.20674
20150111882	5/28/2015	K010	100	F	W	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	2	1	0	0	1	0	0	550	RAIN, MIST OR DRIZZLE	DAWN	38.94266	-95.20524
20150113339	6/22/2015	K010	239	F	W	COLL W OTHER MOTOR VEHICLE	SIDESWIPE: SAME DIRECTION		INTRSECTION-RELATED-ON ROADWAY	2	1	0	0	1	0	0	1159	NO ADVERSE CONDITIONS	DAYLIGHT	38.94267	-95.20572
20150114881	7/8/2015	K010	100	F	W	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	2	1	0	0	1	0	0	810	RAIN, MIST OR DRIZZLE	DAYLIGHT	38.94266	-95.20524
20150116216	7/24/2015	K010	0			COLL W OTHER MOTOR VEHICLE	ANGLE - SIDE IMPACT		INTERSECTION-ON ROADWAY	2	1	0	1	0	0	2	1514	NO ADVERSE CONDITIONS	DAYLIGHT	38.94266	-95.20488
20150116988	8/3/2015	K010	200	F	W	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	2	1	0	0	1	0	0	753	NO ADVERSE CONDITIONS	DAYLIGHT	38.94266	-95.20559
20150117066	8/4/2015	K010	264	F	E	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	2	1	0	0	1	0	0	1640	RAIN, MIST OR DRIZZLE	DAYLIGHT	38.94265	-95.20395
20150118184	8/18/2015	K010	100	F	W	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	3	1	0	0	1	0	0	1644	NO ADVERSE CONDITIONS	DAYLIGHT	38.94266	-95.20524
20150118551	8/15/2015	K010	600	F	E	COLL W FIXED OBJECT			MEDIAN-OFF ROADWAY	2	1	0	0	1	0	0	338	NO ADVERSE CONDITIONS	DARK--STREET LIGHTS ON	38.94264	-95.20277
20150120255	9/3/2015	K010	263	F	W	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	2	1	0	0	1	0	0	1548	NO ADVERSE CONDITIONS	DAYLIGHT	38.94267	-95.20581
20150122772	10/1/2015	K010	200	F	W	COLL W OTHER MOTOR VEHICLE	SIDESWIPE: SAME DIRECTION		NON-INTERSECTION-ON ROADWAY	2	1	0	0	1	0	0	940	NO ADVERSE CONDITIONS	DAYLIGHT	38.94266	-95.20559
20150124600	10/27/2015	K010	120	F	W	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	3	1	0	0	1	0	0	654	RAIN, MIST OR DRIZZLE	DAWN	38.94266	-95.20531
20150125513	10/15/2015	K010	5	F	W	COLL W FIXED OBJECT			MEDIAN-OFF ROADWAY	1	1	0	0	1	0	0	215	NO ADVERSE CONDITIONS	DARK--STREET LIGHTS ON	38.94266	-95.2049
20150125735	10/27/2015	K010	400	F	W	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	2	1	0	0	1	0	0	1650	RAIN, MIST OR DRIZZLE	DAYLIGHT	38.94267	-95.20629
20150126876	11/18/2015	K010	600	F	E	COLL W OTHER MOTOR VEHICLE	SIDESWIPE: SAME DIRECTION		NON-INTERSECTION-ON ROADWAY	2	1	0	0	1	0	0	1703	NO ADVERSE CONDITIONS	DAYLIGHT	38.94264	-95.20277
20150127431	11/27/2015	K010	587	F	W	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	3	1	0	1	0	0	1	1435	FREEZING RAIN	DAYLIGHT	38.94268	-95.20694
20150128325	12/1/2015	K010	40	F	W	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	2	1	0	0	1	0	0	1550	NO ADVERSE CONDITIONS	DAYLIGHT	38.94266	-95.20503
20150128809	12/9/2015	K010	20	F	E	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	2	1	0	1	0	0	1	2035	NO ADVERSE CONDITIONS	DARK--STREET LIGHTS ON	38.94266	-95.20481
20150129924	12/21/2015	K010	200	F	E	COLL W ANIMAL			NON-INTERSECTION-ON ROADWAY	1	1	0	0	1	0	0	840	NO ADVERSE CONDITIONS	DAYLIGHT	38.94265	-95.20418
20150130261	12/22/2015	K010	520	F	W	COLL W OTHER MOTOR VEHICLE	REAR END		NON-INTERSECTION-ON ROADWAY	4	1	0	0	1	0	0	1725	NO ADVERSE CONDITIONS	DARK--STREET LIGHTS ON	38.94267	-95.2067
20150131523	1/6/2015	K010	50	F	E	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	3	1	0	0	1	0	0	1640	NO ADVERSE CONDITIONS	DAYLIGHT	38.94266	-95.20472
20150132140	12/18/2015	K010	600	F	E	COLL W OTHER MOTOR VEHICLE	REAR END		NON-INTERSECTION-ON ROADWAY	2	1	0	0	1	0	0	1705	NO ADVERSE CONDITIONS	DUSK	38.94264	-95.20277
20150132624	3/21/2015	K010	300	F	W	COLL W OTHER MOTOR VEHICLE	ANGLE - SIDE IMPACT		NON-INTERSECTION-ON ROADWAY	2	1	0	0	1	0	0	1157	NO ADVERSE CONDITIONS	DAYLIGHT	38.94267	-95.20594

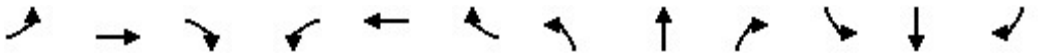
Accident_K	Date	On_Road	Dist	UOM	Dir	Accident_C	CWOV	Fixed_Obje	Accident_L	F__of_ Vehs	Total_ Accs	Fatal_ Accs	Injury_ Acc	PDO_ Accs	F__of_ Deat	F__of_ Inju	Time	Weather_Co	Light_Cond	KDOT_Latit	KDOT_Longi
20160033260	1/6/2016	K010	50	F	E	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	3	1	0	0	1	0	0	1640	NO ADVERSE CONDITIONS	DAYLIGHT	38.94266	-95.20472
20160101811	1/30/2016	K010	1	F	W	COLL W FIXED OBJECT		CURB	ROADSIDE-NO SHLDR-OFF RDWY	1	1	0	0	1	0	0	1248	NO ADVERSE CONDITIONS	DAYLIGHT	38.94266	-95.2049
20160102739	2/13/2016	K010	5	F	W	COLL W FIXED OBJECT		OTHER POST-POLE	ROADSIDE-NO SHLDR-OFF RDWY	1	1	0	0	1	0	0		NO ADVERSE CONDITIONS	DARK--STREET LIGHTS ON	38.94266	-95.2049
20160102820	2/11/2016	K010	500	F	E	COLL W OTHER MOTOR VEHICLE	REAR END		NON-INTERSECTION-ON ROADWAY	3	1	0	1	0	0	1	800	NO ADVERSE CONDITIONS	DAYLIGHT	38.94264	-95.20312
20160103755	2/27/2016	K010	300	F	W	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	2	1	0	0	1	0	0	1304	NO ADVERSE CONDITIONS	DAYLIGHT	38.94267	-95.20594
20160104193	3/3/2016	K010	0			COLL W OTHER MOTOR VEHICLE	ANGLE - SIDE IMPACT		INTERSECTION-ON ROADWAY	2	1	0	0	1	0	0	1115	NO ADVERSE CONDITIONS	DAYLIGHT	38.94266	-95.20488
20160104206	2/26/2016	K010	286	F	W	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	2	1	0	0	1	0	0	1701	NO ADVERSE CONDITIONS	DAYLIGHT	38.94267	-95.20589
20160104706	3/3/2016	K010	20	F	E	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	2	1	0	0	1	0	0	755	NO ADVERSE CONDITIONS	DAYLIGHT	38.94266	-95.20481
20160107779	4/10/2016	K010	200	F	E	COLL W ANIMAL			NON-INTERSECTION-ON ROADWAY	1	1	0	0	1	0	0	38	NO ADVERSE CONDITIONS	DARK--STREET LIGHTS ON	38.94265	-95.20418
20160108048	4/10/2016	K010	100	F	W	COLL W OTHER MOTOR VEHICLE	REAR END		NON-INTERSECTION-ON ROADWAY	3	1	0	0	1	0	0	1018	NO ADVERSE CONDITIONS	DAYLIGHT	38.94266	-95.20524
20160108541	4/18/2016	K010	35	F	W	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	2	1	0	0	1	0	0	720	RAIN, MIST OR DRIZZLE	DAYLIGHT	38.94266	-95.20488
20160109186	4/29/2016	K010	25	F	E	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	2	1	0	1	0	0	1	1609	RAIN, MIST OR DRIZZLE	DAYLIGHT	38.94266	-95.20479
20160110216	5/13/2016	K010	300	F	W	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	2	1	0	0	1	0	0	1722	RAIN, MIST OR DRIZZLE	DAYLIGHT	38.94267	-95.20594
20160110217	5/13/2016	K010	16	F	W	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	2	1	0	0	1	0	0	1712	RAIN, MIST OR DRIZZLE	DAYLIGHT	38.94266	-95.20494
20160111386	5/16/2016	K010	12	F	W	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	2	1	0	0	1	0	0	1243	RAIN, MIST OR DRIZZLE	DAYLIGHT	38.94266	-95.20492
20160112225	6/3/2016	K010	15	F	E	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	2	1	0	1	0	0	2	1955	NO ADVERSE CONDITIONS	DAYLIGHT	38.94266	-95.20483
20160113092	6/14/2016	K010	500	F	W	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	2	1	0	0	1	0	0	700	NO ADVERSE CONDITIONS	DAYLIGHT	38.94267	-95.20665
20160113289	6/18/2016	K010	0			COLL W OTHER MOTOR VEHICLE	REAR END		INTERSECTION-ON ROADWAY	2	1	0	0	1	0	0	600	NO ADVERSE CONDITIONS	DAYLIGHT	38.94266	-95.20488
20160114790	6/29/2016	K010	300	F	W	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	3	1	0	0	1	0	0	1555	NO ADVERSE CONDITIONS	DAYLIGHT	38.94267	-95.20594
20160117241	7/30/2016	K010	285	F	E	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	3	1	0	0	1	0	0	1630	NO ADVERSE CONDITIONS	DAYLIGHT	38.94265	-95.20388
20160117273	8/2/2016	K010	20	F	E	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	2	1	0	0	1	0	0	645	NO ADVERSE CONDITIONS	DAYLIGHT	38.94266	-95.20481
20160117529	7/15/2016	K010	15	F	E	COLL W OTHER MOTOR VEHICLE	SIDESWIPE: SAME DIRECTION		NON-INTERSECTION-ON ROADWAY	3	1	0	1	0	0	2	2213	NO ADVERSE CONDITIONS	DARK--STREET LIGHTS ON	38.94266	-95.20483
20160118807	8/16/2016	K010	45	F	E	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	3	1	0	0	1	0	0	1700	NO ADVERSE CONDITIONS	DAYLIGHT	38.94266	-95.20472
20160119237	8/22/2016	K010	100	F	W	COLL W OTHER MOTOR VEHICLE	ANGLE - SIDE IMPACT		INTRSECTION-RELATED-ON ROADWAY	2	1	0	0	1	0	0	719	NO ADVERSE CONDITIONS	DAYLIGHT	38.94266	-95.20524
20160120083	9/4/2016	K010	426	F	E	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	3	1	0	0	1	0	0	1515	NO ADVERSE CONDITIONS	DAYLIGHT	38.94264	-95.20338
20160120600	9/12/2016	K010	0.01	M	W	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	2	1	0	0	1	0	0	1618	NO ADVERSE CONDITIONS	DAYLIGHT	38.94266	-95.20507
20160120609	9/12/2016	K010	0.1	M	E	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	3	1	0	1	0	0	1	1530	NO ADVERSE CONDITIONS	DAYLIGHT	38.94264	-95.20303
20160122979	10/7/2016	K010	350	F	W	COLL W OTHER MOTOR VEHICLE	REAR END		NON-INTERSECTION-ON ROADWAY	2	1	0	0	1	0	0	1640	NO ADVERSE CONDITIONS	DAYLIGHT	38.94267	-95.20611
20160124464	10/21/2016	K010	30	F	W	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	2	1	0	1	0	0	1	643	NO ADVERSE CONDITIONS	DAWN	38.94266	-95.20499
20160124977	10/27/2016	K010	25	F	E	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	2	1	0	1	0	0	1	1549	NO ADVERSE CONDITIONS	DAYLIGHT	38.94266	-95.20479
20160125521	10/25/2016	K010	220	F	W	COLL W OTHER MOTOR VEHICLE	REAR END		NON-INTERSECTION-ON ROADWAY	2	1	0	1	0	0	2	1636	NO ADVERSE CONDITIONS	DAYLIGHT	38.94266	-95.20566
20160126611	11/3/2016	K010	35	F	W	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	2	1	0	0	1	0	0	1520	NO ADVERSE CONDITIONS	DAYLIGHT	38.94266	-95.20501
20160101774	2/2/2016	23RD	150	F	W	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	2	1	0	1	0	0	1	1733	NO ADVERSE CONDITIONS	DUSK	0	0
20160131860	12/17/2016	23RD	15	F	W	COLL W OTHER MOTOR VEHICLE	REAR END		NON-INTERSECTION-ON ROADWAY	2	1	0	0	1	0	0	640	NO ADVERSE CONDITIONS	DARK--STREET LIGHTS ON	0	0

Accident_K	Date	On_Road	Dist	UOM	Dir	Accident_C	CWOV	Fixed_ Obje	Accident_L	F__of_ Vehs	Total_ Accs	Fatal_ Accs	Injury_ Acc	PDO_ Accs	F__of_ Deat	F__of_ Inju	Time	Weather_Co	Light_Cond	KDOT_Latit	KDOT_Longi
20170100115	1/3/2017	23RD	145	F	W	COLL W OTHER MOTOR VEHICLE	REAR END		NON-INTERSECTION-ON ROADWAY	2	1	0	0	1	0	0	2307	NO ADVERSE CONDITIONS	DARK--STREET LIGHTS ON	0	0
20170100620	1/12/2017	23RD	158	F	W	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	2	1	0	0	1	0	0	1555	NO ADVERSE CONDITIONS	DAYLIGHT	0	0
20170104381	3/2/2017	23RD	0.1	M	W	COLL W OTHER MOTOR VEHICLE	REAR END		NON-INTERSECTION-ON ROADWAY	2	1	0	0	1	0	0	1731	NO ADVERSE CONDITIONS	DAYLIGHT	0	0
20170104931	3/10/2017	23RD	100	F	W	COLL W OTHER MOTOR VEHICLE	REAR END		NON-INTERSECTION-ON ROADWAY	3	1	0	0	1	0	0	1710	NO ADVERSE CONDITIONS	DAYLIGHT	0	0
20170109106	4/27/2017	23RD	40	F	E	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	2	1	0	0	1	0	0	1630	NO ADVERSE CONDITIONS	DAYLIGHT	0	0
20170111523	5/15/2017	23RD	100	F	E	COLL W OTHER MOTOR VEHICLE	REAR END		INTRSECTION-RELATED-ON ROADWAY	2	1	0	0	1	0	0	1545	NO ADVERSE CONDITIONS	DAYLIGHT	0	0
20170113397	6/13/2017	23RD	300	F	E	COLL W ANIMAL			NON-INTERSECTION-ON ROADWAY	1	1	0	1	0	0	1	1915	NO ADVERSE CONDITIONS	DAYLIGHT	0	0
20170113446	6/16/2017	23RD	50	F	E	COLL W OTHER MOTOR VEHICLE	REAR END		NON-INTERSECTION-ON ROADWAY	2	1	0	0	1	0	0	1744	NO ADVERSE CONDITIONS	DAYLIGHT	0	0
20170116983	8/10/2017	23RD	150	F	W	COLL W OTHER MOTOR VEHICLE	REAR END		NON-INTERSECTION-ON ROADWAY	2	1	0	0	1	0	0	736	FOG	DAYLIGHT	0	0
20170117595	8/16/2017	23RD	200	F	E	COLL W OTHER MOTOR VEHICLE	ANGLE - SIDE IMPACT		INTRSECTION-RELATED-ON ROADWAY	2	1	0	1	0	0	1	1141	RAIN, MIST OR DRIZZLE	DAYLIGHT	0	0
20170120486	9/27/2017	23RD	300	F	E	COLL W OTHER MOTOR VEHICLE	REAR END		NON-INTERSECTION-ON ROADWAY	2	1	0	0	1	0	0	744	NO ADVERSE CONDITIONS	DAYLIGHT	0	0
20170121411	10/5/2017	23RD	30	F	W	COLL W FIXED OBJECT			NON-INTERSECTION-ON ROADWAY	1	1	0	0	1	0	0	1000	NO ADVERSE CONDITIONS	DAYLIGHT	0	0
20170126597	11/4/2017	23RD	30	F	E	COLL W OTHER MOTOR VEHICLE	REAR END		NON-INTERSECTION-ON ROADWAY	2	1	0	0	1	0	0	815	NO ADVERSE CONDITIONS	DAWN	0	0
20170126617	10/27/2017	23RD	0			COLL W OTHER MOTOR VEHICLE	HEAD ON		INTERSECTION-ON ROADWAY	2	1	0	0	1	0	0	1700	NO ADVERSE CONDITIONS	DAYLIGHT	0	0
20170127098	11/5/2017	VENTUREPARK	0.5	M	E	COLL W PEDESTRIAN			NON-INTERSECTION-ON ROADWAY	1	1	0	1	0	0	1	2346	NO ADVERSE CONDITIONS	DARK--NO STREET LIGHTS	0	0
20170128611	11/21/2017	23RD	200	F	W	COLL W OTHER MOTOR VEHICLE	REAR END		NON-INTERSECTION-ON ROADWAY	2	1	0	0	1	0	0	1734	NO ADVERSE CONDITIONS	DARK--STREET LIGHTS ON	0	0
20170118065	8/25/2017	VENTURE PARK	0			COLL W FIXED OBJECT			INTERSECTION-ON ROADWAY	1	1	0	0	1	0	0	145	NO ADVERSE CONDITIONS	DARK--STREET LIGHTS ON	38.945577	-95.204202
20170127098	11/5/2017	VENTUREPARK	0.5	M	E	COLL W PEDESTRIAN			NON-INTERSECTION-ON ROADWAY	1	1	0	1	0	0	1	2346	NO ADVERSE CONDITIONS	DARK--NO STREET LIGHTS	0	0

Accident Key	Date	On Road	Dist	UOM	Dir	Accident Class	CWOV	Fixed Object	Accident Location	# of Vehs	Total Accs	Fatal Accs	Injury Accs	PDO Accs	# of Deaths	# of Injuries	Time	Weather	Light Conditions	DOT Latitude	DOT Longitude
20180101182	1/22/2018	23RD	<Null>			Other Motor Vehicle	Angle - Side Impact		Intersection	2	1	0	0	1	0	0	1135	Rain, mist, or drizzle	Daylight	38.942791	-95.204919
20180121662	9/15/2018	23RD	<Null>			Other Motor Vehicle	Rear End		Intersection	4	1	0	1	0	0	1	1917	No adverse conditions	Dusk	38.942791	-95.204919
20180103846	2/21/2018	23RD	15	F	E	Other Motor Vehicle	Rear End		Intersection-related	2	1	0	0	1	0	0	1831	No adverse conditions	Dark: Street Lights On	38.942791	-95.204866
20180120363	8/28/2018	23RD	20	F	E	Other Motor Vehicle	Rear End		Intersection-related	2	1	0	1	0	0	2	632	No adverse conditions	Daylight	38.94279	-95.204848
20180104620	2/7/2018	23RD	30	F	E	Other Motor Vehicle	Rear End		Intersection-related	2	1	0	0	1	0	0	1237	No adverse conditions	Daylight	38.94279	-95.204813
20180117730	7/30/2018	23RD	80	F	W	Other Motor Vehicle	Rear End		Non-Intersection	2	1	0	0	1	0	0	925	No adverse conditions	Daylight	38.942792	-95.2052
20180100509	1/14/2018	23RD	100	F	W	Other Motor Vehicle	Rear End		Intersection-related	2	1	0	0	1	0	0	1050	Snow	Daylight	38.942792	-95.20527
20180101251	1/23/2018	23RD	200	F	W	Other Motor Vehicle	Rear End		Intersection-related	2	1	0	0	1	0	0	1756	No adverse conditions	Dark: Street Lights On	38.942794	-95.205622
20180100995	1/20/2018	23RD	500	F	W	Other Motor Vehicle	Rear End		Intersection-related	3	1	0	1	0	0	2	1947	No adverse conditions	Dark: Street Lights On	38.942797	-95.206677
20180117736	7/31/2018	O'CONNELL	30	F	S	Other Motor Vehicle	Rear End		Intersection-related	2	1	0	0	1	0	0	740	No adverse conditions	Daylight	38.942709	-95.204916
20180115999	7/9/2018	O'CONNELL	30	F	S	Other Motor Vehicle	Angle - Side Impact		Intersection-related	2	1	0	1	0	0	1	1300	No adverse conditions	Daylight	38.942709	-95.204916
20180131350	12/5/2018	O'CONNELL	50	F	S	Other Motor Vehicle	Angle - Side Impact		Non-Intersection	2	1	0	0	1	0	0	1227	No adverse conditions	Daylight	38.942654	-95.204914
20180116491	5/24/2018	VENTUREPARK	500	F	E	Fixed Object		Curb	Non-Intersection	1	1	0	0	1	0	0	304	No adverse conditions	Dark: Street Lights On	38.945562	-95.202444



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	593	45	9	552	0	92	15	54	3	3	41
Future Volume (vph)	30	593	45	9	552	0	92	15	54	3	3	41
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	750		550	700		1000	145		0	270		0
Storage Lanes	1		1	1		1	1		0	1		1
Taper Length (ft)	220			220			25			65		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850					0.883				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	1770	3539	1863	1770	1645	0	1770	1863	1583
Flt Permitted	0.950			0.950			0.664			0.709		
Satd. Flow (perm)	1770	3539	1583	1770	3539	1863	1237	1645	0	1321	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			145					57				240
Link Speed (mph)		45			55			35			35	
Link Distance (ft)		1944			5046			911			1100	
Travel Time (s)		29.5			62.6			17.7			21.4	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	32	631	48	10	587	0	98	16	57	3	3	44
Shared Lane Traffic (%)												
Lane Group Flow (vph)	32	631	48	10	587	0	98	73	0	3	3	44
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		30			36			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane								Yes				
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2		1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100		20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	pt+ov	Prot	NA	pt+ov	pm+pt	NA		pm+pt	NA	Prot
Protected Phases	7	4	4 5	3	8	8 1	5	2		1	6	6
Permitted Phases							2			6		

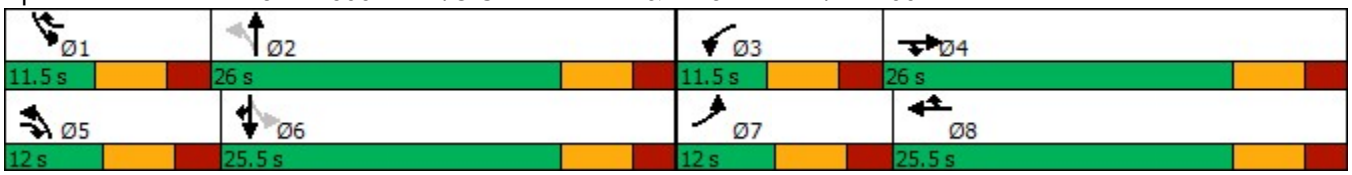


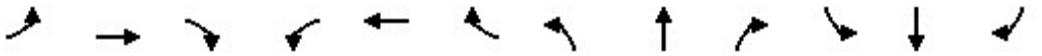
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	7	4	4 5	3	8	8 1	5	2		1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0
Minimum Split (s)	11.5	25.0		11.5	25.0		11.5	25.0		11.5	25.0	25.0
Total Split (s)	12.0	26.0		11.5	25.5		12.0	26.0		11.5	25.5	25.5
Total Split (%)	16.0%	34.7%		15.3%	34.0%		16.0%	34.7%		15.3%	34.0%	34.0%
Maximum Green (s)	5.5	19.5		5.0	19.0		5.5	19.5		5.0	19.0	19.0
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	2.5	2.5		2.5	2.5		2.5	2.5		2.5	2.5	2.5
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5		6.5	6.5		6.5	6.5		6.5	6.5	6.5
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None		None	Max		None	Max	Max
Walk Time (s)		7.0			7.0			7.0			7.0	7.0
Flash Dont Walk (s)		11.0			11.0			11.0			11.0	11.0
Pedestrian Calls (#/hr)		0			0			0			0	0
Act Effct Green (s)	5.7	17.9	30.4	5.2	15.8		28.0	27.1		23.8	20.0	20.0
Actuated g/C Ratio	0.09	0.29	0.49	0.08	0.25		0.45	0.43		0.38	0.32	0.32
v/c Ratio	0.20	0.62	0.06	0.07	0.66		0.16	0.10		0.01	0.01	0.07
Control Delay	34.3	23.0	0.1	33.0	26.1		12.7	7.8		12.7	20.3	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	34.3	23.0	0.1	33.0	26.1		12.7	7.8		12.7	20.3	0.2
LOS	C	C	A	C	C		B	A		B	C	A
Approach Delay		22.0			26.2			10.6			2.2	
Approach LOS		C			C			B			A	
90th %ile Green (s)	5.5	19.5		5.0	19.0		5.5	19.5		5.0	19.0	19.0
90th %ile Term Code	Max	Max		Max	Max		Max	MaxR		Max	MaxR	MaxR
70th %ile Green (s)	5.5	31.0		0.0	19.0		5.5	31.0		0.0	19.0	19.0
70th %ile Term Code	Max	Hold		Skip	Max		Max	Hold		Skip	MaxR	MaxR
50th %ile Green (s)	0.0	16.5		0.0	16.5		5.5	31.0		0.0	19.0	19.0
50th %ile Term Code	Skip	Gap		Skip	Hold		Max	Hold		Skip	MaxR	MaxR
30th %ile Green (s)	0.0	14.8		0.0	14.8		5.5	31.0		0.0	19.0	19.0
30th %ile Term Code	Skip	Gap		Skip	Hold		Max	Hold		Skip	MaxR	MaxR
10th %ile Green (s)	0.0	10.0		0.0	10.0		0.0	19.5		0.0	19.5	19.5
10th %ile Term Code	Skip	Gap		Skip	Hold		Skip	MaxR		Skip	Hold	Hold
Stops (vph)	31	470	0	12	459		52	19		3	4	0
Fuel Used(gal)	1	16	1	1	29		1	1		0	0	0
CO Emissions (g/hr)	68	1126	40	40	2034		86	49		4	5	23
NOx Emissions (g/hr)	13	219	8	8	396		17	10		1	1	4
VOC Emissions (g/hr)	16	261	9	9	471		20	11		1	1	5
Dilemma Vehicles (#)	0	40	0	0	40		0	4		0	0	0
Queue Length 50th (ft)	11	106	0	4	97		17	3		1	1	0
Queue Length 95th (ft)	40	194	0	19	182		56	35		6	7	0
Internal Link Dist (ft)		1864			4966			831			1020	
Turn Bay Length (ft)	750		550	700			145			270		
Base Capacity (vph)	162	1264	820	148	1126		604	746		540	596	670
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	0
Reduced v/c Ratio	0.20	0.50	0.06	0.07	0.52		0.16	0.10		0.01	0.01	0.07

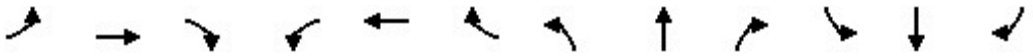
Intersection Summary			
Area Type:	Other		
Cycle Length: 75			
Actuated Cycle Length: 62.4			
Natural Cycle: 75			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.66			
Intersection Signal Delay: 21.7		Intersection LOS: C	
Intersection Capacity Utilization 47.5%		ICU Level of Service A	
Analysis Period (min) 15			
90th %ile Actuated Cycle: 75			
70th %ile Actuated Cycle: 75			
50th %ile Actuated Cycle: 60.5			
30th %ile Actuated Cycle: 58.8			
10th %ile Actuated Cycle: 42.5			

Splits and Phases: 3: E 1600 Road/O'Connell Road & E 23rd Street/N 1400 Road





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	12	769	94	69	723	4	53	3	31	2	16	47
Future Volume (vph)	12	769	94	69	723	4	53	3	31	2	16	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	750		550	700		1000	145		0	270		0
Storage Lanes	1		1	1		1	1		0	1		1
Taper Length (ft)	220			220			25			65		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850		0.862				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1606	0	1770	1863	1583
Flt Permitted	0.950			0.950			0.666			0.734		
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	1241	1606	0	1367	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			145			145		33				240
Link Speed (mph)		45			55			35			35	
Link Distance (ft)		1944			5046			911			1100	
Travel Time (s)		29.5			62.6			17.7			21.4	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	13	809	99	73	761	4	56	3	33	2	17	49
Shared Lane Traffic (%)												
Lane Group Flow (vph)	13	809	99	73	761	4	56	36	0	2	17	49
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		30			36			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane								Yes				
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2		1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100		20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	pt+ov	Prot	NA	pt+ov	pm+pt	NA		pm+pt	NA	Prot
Protected Phases	7	4	4 5	3	8	8 1	5	2		1	6	6
Permitted Phases							2			6		

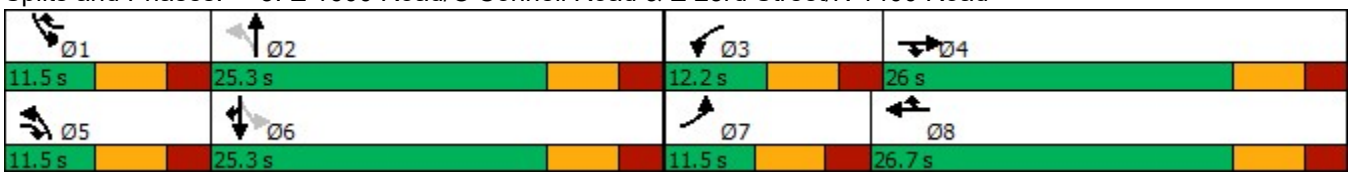


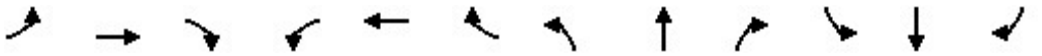
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	7	4	4 5	3	8	8 1	5	2		1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0
Minimum Split (s)	11.5	25.0		11.5	25.0		11.5	25.0		11.5	25.0	25.0
Total Split (s)	11.5	26.0		12.2	26.7		11.5	25.3		11.5	25.3	25.3
Total Split (%)	15.3%	34.7%		16.3%	35.6%		15.3%	33.7%		15.3%	33.7%	33.7%
Maximum Green (s)	5.0	19.5		5.7	20.2		5.0	18.8		5.0	18.8	18.8
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	2.5	2.5		2.5	2.5		2.5	2.5		2.5	2.5	2.5
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5		6.5	6.5		6.5	6.5		6.5	6.5	6.5
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None		None	Max		None	Max	Max
Walk Time (s)		7.0			7.0			7.0			7.0	7.0
Flash Dont Walk (s)		11.0			11.0			11.0			11.0	11.0
Pedestrian Calls (#/hr)		0			0			0			0	0
Act Effct Green (s)	5.2	18.6	30.6	5.9	25.5	37.5	26.8	25.9		23.2	19.6	19.6
Actuated g/C Ratio	0.08	0.27	0.44	0.09	0.37	0.54	0.39	0.37		0.34	0.28	0.28
v/c Ratio	0.10	0.85	0.13	0.49	0.58	0.00	0.11	0.06		0.00	0.03	0.08
Control Delay	34.8	35.8	1.5	45.8	21.0	0.0	14.6	8.3		13.5	21.6	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	34.8	35.8	1.5	45.8	21.0	0.0	14.6	8.3		13.5	21.6	0.3
LOS	C	D	A	D	C	A	B	A		B	C	A
Approach Delay		32.1			23.1			12.1			6.0	
Approach LOS		C			C			B			A	
90th %ile Green (s)	5.0	19.5		5.7	20.2		5.0	18.8		5.0	18.8	18.8
90th %ile Term Code	Max	Max		Max	Max		Max	MaxR		Max	MaxR	MaxR
70th %ile Green (s)	0.0	19.5		5.7	31.7		5.0	30.3		0.0	18.8	18.8
70th %ile Term Code	Skip	Max		Max	Hold		Max	Hold		Skip	MaxR	MaxR
50th %ile Green (s)	0.0	19.5		5.7	31.7		5.0	30.3		0.0	18.8	18.8
50th %ile Term Code	Skip	Max		Max	Hold		Max	Hold		Skip	MaxR	MaxR
30th %ile Green (s)	0.0	19.5		5.7	31.7		5.0	30.3		0.0	18.8	18.8
30th %ile Term Code	Skip	Max		Max	Hold		Max	Hold		Skip	MaxR	MaxR
10th %ile Green (s)	0.0	14.0		0.0	14.0		0.0	18.8		0.0	18.8	18.8
10th %ile Term Code	Skip	Gap		Skip	Hold		Skip	MaxR		Skip	MaxR	MaxR
Stops (vph)	14	660	5	64	532	0	33	10		3	14	0
Fuel Used(gal)	0	24	1	4	36	0	1	0		0	0	0
CO Emissions (g/hr)	29	1644	89	282	2523	9	53	25		3	21	26
NOx Emissions (g/hr)	6	320	17	55	491	2	10	5		1	4	5
VOC Emissions (g/hr)	7	381	21	65	585	2	12	6		1	5	6
Dilemma Vehicles (#)	0	51	0	0	46	0	0	2		0	1	0
Queue Length 50th (ft)	6	190	0	34	132	0	16	1		1	6	0
Queue Length 95th (ft)	22	#291	13	#85	#243	0	37	22		4	21	0
Internal Link Dist (ft)		1864			4966			831			1020	
Turn Bay Length (ft)	750		550	700		1000	145			270		
Base Capacity (vph)	133	1037	774	151	1400	921	521	622		489	526	619
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.10	0.78	0.13	0.48	0.54	0.00	0.11	0.06		0.00	0.03	0.08

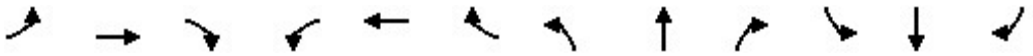
Intersection Summary			
Area Type:	Other		
Cycle Length: 75			
Actuated Cycle Length: 69.2			
Natural Cycle: 75			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.85			
Intersection Signal Delay: 26.3		Intersection LOS: C	
Intersection Capacity Utilization 51.3%		ICU Level of Service A	
Analysis Period (min) 15			
90th %ile Actuated Cycle: 75			
70th %ile Actuated Cycle: 75			
50th %ile Actuated Cycle: 75			
30th %ile Actuated Cycle: 75			
10th %ile Actuated Cycle: 45.8			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 3: E 1600 Road/O'Connell Road & E 23rd Street/N 1400 Road





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	108	593	45	9	552	66	92	34	54	67	8	108
Future Volume (vph)	108	593	45	9	552	66	92	34	54	67	8	108
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	750		550	700		1000	145		0	270		0
Storage Lanes	1		1	1		1	1		0	1		1
Taper Length (ft)	220			220			25			65		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850		0.908				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1691	0	1770	1863	1583
Flt Permitted	0.950			0.950			0.752			0.697		
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	1401	1691	0	1298	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			145			145		57				240
Link Speed (mph)		45			55			35			35	
Link Distance (ft)		1944			5046			911			1100	
Travel Time (s)		29.5			62.6			17.7			21.4	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	115	631	48	10	587	70	98	36	57	71	9	115
Shared Lane Traffic (%)												
Lane Group Flow (vph)	115	631	48	10	587	70	98	93	0	71	9	115
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		30			36			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane								Yes				
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2		1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100		20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	pt+ov	Prot	NA	pt+ov	pm+pt	NA		pm+pt	NA	Prot
Protected Phases	7	4	4 5	3	8	8 1	5	2		1	6	6
Permitted Phases							2			6		

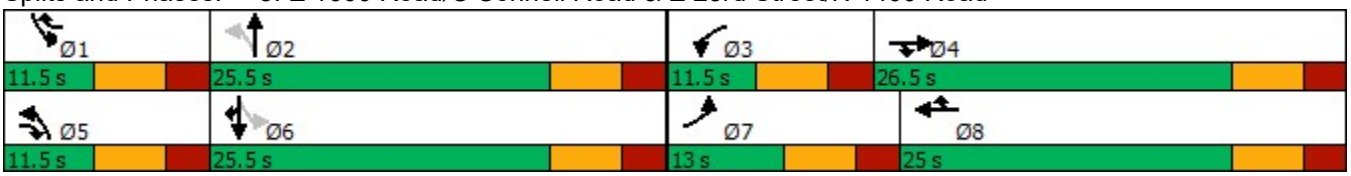


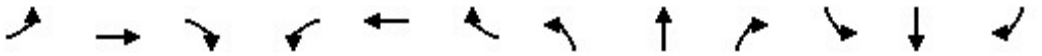
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	7	4	4 5	3	8	8 1	5	2		1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0
Minimum Split (s)	11.5	25.0		11.5	25.0		11.5	25.0		11.5	25.0	25.0
Total Split (s)	13.0	26.5		11.5	25.0		11.5	25.5		11.5	25.5	25.5
Total Split (%)	17.3%	35.3%		15.3%	33.3%		15.3%	34.0%		15.3%	34.0%	34.0%
Maximum Green (s)	6.5	20.0		5.0	18.5		5.0	19.0		5.0	19.0	19.0
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	2.5	2.5		2.5	2.5		2.5	2.5		2.5	2.5	2.5
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5		6.5	6.5		6.5	6.5		6.5	6.5	6.5
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None		None	Max		None	Max	Max
Walk Time (s)		7.0			7.0			7.0			7.0	7.0
Flash Dont Walk (s)		11.0			11.0			11.0			11.0	11.0
Pedestrian Calls (#/hr)		0			0			0			0	0
Act Effct Green (s)	6.8	23.8	35.9	5.2	16.3	28.4	23.6	19.9		23.6	19.9	19.9
Actuated g/C Ratio	0.10	0.35	0.53	0.08	0.24	0.42	0.35	0.29		0.35	0.29	0.29
v/c Ratio	0.65	0.51	0.05	0.07	0.69	0.09	0.19	0.17		0.15	0.02	0.18
Control Delay	53.2	19.9	0.1	34.2	29.6	0.2	15.3	11.8		14.8	21.2	0.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	53.2	19.9	0.1	34.2	29.6	0.2	15.3	11.8		14.8	21.2	0.6
LOS	D	B	A	C	C	A	B	B		B	C	A
Approach Delay		23.5			26.6			13.6			6.7	
Approach LOS		C			C			B			A	
90th %ile Green (s)	6.5	20.0		5.0	18.5		5.0	19.0		5.0	19.0	19.0
90th %ile Term Code	Max	Max		Max	Max		Max	MaxR		Max	MaxR	MaxR
70th %ile Green (s)	6.5	31.5		0.0	18.5		5.0	19.0		5.0	19.0	19.0
70th %ile Term Code	Max	Hold		Skip	Max		Max	MaxR		Max	MaxR	MaxR
50th %ile Green (s)	6.5	31.2		0.0	18.2		5.0	19.0		5.0	19.0	19.0
50th %ile Term Code	Max	Hold		Skip	Gap		Max	MaxR		Max	MaxR	MaxR
30th %ile Green (s)	6.5	28.1		0.0	15.1		5.0	19.0		5.0	19.0	19.0
30th %ile Term Code	Max	Hold		Skip	Gap		Max	MaxR		Max	MaxR	MaxR
10th %ile Green (s)	0.0	11.0		0.0	11.0		0.0	19.0		0.0	19.0	19.0
10th %ile Term Code	Skip	Hold		Skip	Gap		Skip	MaxR		Skip	MaxR	MaxR
Stops (vph)	88	432	0	12	472	0	59	33		43	8	0
Fuel Used(gal)	4	15	1	1	30	2	1	1		1	0	1
CO Emissions (g/hr)	253	1066	40	40	2079	148	93	72		74	11	61
NOx Emissions (g/hr)	49	207	8	8	404	29	18	14		14	2	12
VOC Emissions (g/hr)	59	247	9	9	482	34	22	17		17	3	14
Dilemma Vehicles (#)	0	37	0	0	37	0	0	6		0	0	0
Queue Length 50th (ft)	53	105	0	5	130	0	28	13		20	3	0
Queue Length 95th (ft)	#135	192	0	19	183	1	57	47		44	14	0
Internal Link Dist (ft)		1864			4966			831			1020	
Turn Bay Length (ft)	750		550	700		1000	145			270		
Base Capacity (vph)	177	1388	904	136	1011	710	515	536		487	546	634
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.65	0.45	0.05	0.07	0.58	0.10	0.19	0.17		0.15	0.02	0.18

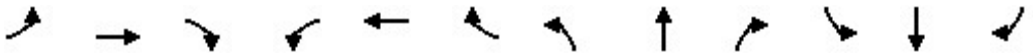
Intersection Summary			
Area Type:	Other		
Cycle Length: 75			
Actuated Cycle Length: 67.9			
Natural Cycle: 75			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.69			
Intersection Signal Delay: 21.8		Intersection LOS: C	
Intersection Capacity Utilization 49.3%		ICU Level of Service A	
Analysis Period (min) 15			
90th %ile Actuated Cycle: 75			
70th %ile Actuated Cycle: 75			
50th %ile Actuated Cycle: 74.7			
30th %ile Actuated Cycle: 71.6			
10th %ile Actuated Cycle: 43			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 3: E 1600 Road/O'Connell Road & E 23rd Street/N 1400 Road





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	67	769	94	69	723	54	53	8	31	64	18	111
Future Volume (vph)	67	769	94	69	723	54	53	8	31	64	18	111
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	750		550	700		1000	145		0	270		0
Storage Lanes	1		1	1		1	1		0	1		1
Taper Length (ft)	220			220			25			65		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850		0.879				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1637	0	1770	1863	1583
Flt Permitted	0.950			0.950			0.745			0.730		
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	1388	1637	0	1360	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			145			145		33				240
Link Speed (mph)		45			55			35			35	
Link Distance (ft)		1944			5046			911			1100	
Travel Time (s)		29.5			62.6			17.7			21.4	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	71	809	99	73	761	57	56	8	33	67	19	117
Shared Lane Traffic (%)												
Lane Group Flow (vph)	71	809	99	73	761	57	56	41	0	67	19	117
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		30			36			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane								Yes				
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2		1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100		20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	pt+ov	Prot	NA	pt+ov	pm+pt	NA		pm+pt	NA	Prot
Protected Phases	7	4	4 5	3	8	8 1	5	2		1	6	6
Permitted Phases							2			6		

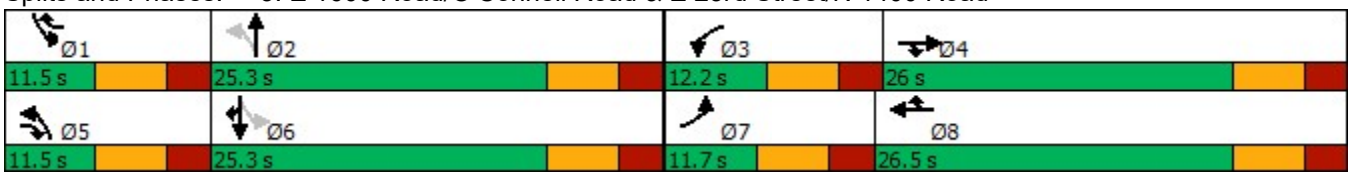


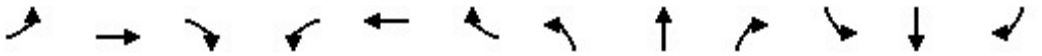
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	7	4	4 5	3	8	8 1	5	2		1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0
Minimum Split (s)	11.5	25.0		11.5	25.0		11.5	25.0		11.5	25.0	25.0
Total Split (s)	11.7	26.0		12.2	26.5		11.5	25.3		11.5	25.3	25.3
Total Split (%)	15.6%	34.7%		16.3%	35.3%		15.3%	33.7%		15.3%	33.7%	33.7%
Maximum Green (s)	5.2	19.5		5.7	20.0		5.0	18.8		5.0	18.8	18.8
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	2.5	2.5		2.5	2.5		2.5	2.5		2.5	2.5	2.5
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5		6.5	6.5		6.5	6.5		6.5	6.5	6.5
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None		None	Max		None	Max	Max
Walk Time (s)		7.0			7.0			7.0			7.0	7.0
Flash Dont Walk (s)		11.0			11.0			11.0			11.0	11.0
Pedestrian Calls (#/hr)		0			0			0			0	0
Act Effct Green (s)	5.4	18.6	30.6	5.9	19.0	31.0	23.2	19.6		23.2	19.6	19.6
Actuated g/C Ratio	0.08	0.27	0.44	0.09	0.27	0.45	0.34	0.28		0.34	0.28	0.28
v/c Ratio	0.51	0.85	0.13	0.49	0.78	0.07	0.11	0.08		0.14	0.04	0.19
Control Delay	49.2	35.8	1.5	45.8	31.5	0.2	14.8	10.6		15.0	21.7	0.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	49.2	35.8	1.5	45.8	31.5	0.2	14.8	10.6		15.0	21.7	0.7
LOS	D	D	A	D	C	A	B	B		B	C	A
Approach Delay		33.3			30.7			13.0			7.4	
Approach LOS		C			C			B			A	
90th %ile Green (s)	5.2	19.5		5.7	20.0		5.0	18.8		5.0	18.8	18.8
90th %ile Term Code	Max	Max		Max	Max		Max	MaxR		Max	MaxR	MaxR
70th %ile Green (s)	5.2	19.5		5.7	20.0		5.0	18.8		5.0	18.8	18.8
70th %ile Term Code	Max	Max		Max	Max		Max	MaxR		Max	MaxR	MaxR
50th %ile Green (s)	5.2	19.5		5.7	20.0		5.0	18.8		5.0	18.8	18.8
50th %ile Term Code	Max	Max		Max	Max		Max	MaxR		Max	MaxR	MaxR
30th %ile Green (s)	5.2	19.5		5.7	20.0		5.0	18.8		5.0	18.8	18.8
30th %ile Term Code	Max	Max		Max	Max		Max	MaxR		Max	MaxR	MaxR
10th %ile Green (s)	0.0	14.0		0.0	14.0		0.0	18.8		0.0	18.8	18.8
10th %ile Term Code	Skip	Gap		Skip	Hold		Skip	MaxR		Skip	MaxR	MaxR
Stops (vph)	59	660	5	64	619	0	36	15		41	16	0
Fuel Used(gal)	2	24	1	4	39	2	1	0		1	0	1
CO Emissions (g/hr)	157	1644	89	282	2744	121	54	32		71	24	63
NOx Emissions (g/hr)	31	320	17	55	534	24	11	6		14	5	12
VOC Emissions (g/hr)	36	381	21	65	636	28	13	7		16	6	15
Dilemma Vehicles (#)	0	51	0	0	50	0	0	3		0	1	0
Queue Length 50th (ft)	33	190	0	34	173	0	16	3		19	7	0
Queue Length 95th (ft)	#87	#291	13	#85	#247	0	37	26		42	22	0
Internal Link Dist (ft)		1864			4966			831			1020	
Turn Bay Length (ft)	750		550	700		1000	145			270		
Base Capacity (vph)	138	1037	774	151	1063	784	494	486		487	526	619
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.51	0.78	0.13	0.48	0.72	0.07	0.11	0.08		0.14	0.04	0.19

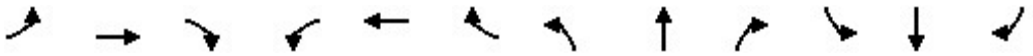
Intersection Summary			
Area Type:	Other		
Cycle Length: 75			
Actuated Cycle Length: 69.2			
Natural Cycle: 75			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.85			
Intersection Signal Delay: 28.9		Intersection LOS: C	
Intersection Capacity Utilization 51.9%		ICU Level of Service A	
Analysis Period (min) 15			
90th %ile Actuated Cycle: 75			
70th %ile Actuated Cycle: 75			
50th %ile Actuated Cycle: 75			
30th %ile Actuated Cycle: 75			
10th %ile Actuated Cycle: 45.8			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 3: E 1600 Road/O'Connell Road & E 23rd Street/N 1400 Road





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	134	735	56	11	684	81	114	42	67	84	11	136
Future Volume (vph)	134	735	56	11	684	81	114	42	67	84	11	136
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	750		550	700		1000	145		0	270		0
Storage Lanes	1		1	1		1	1		0	1		1
Taper Length (ft)	220			220			25			65		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850		0.908				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1691	0	1770	1863	1583
Flt Permitted	0.950			0.950			0.750			0.682		
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	1397	1691	0	1270	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			145			145		71				240
Link Speed (mph)		45			55			35			35	
Link Distance (ft)		1944			5046			911			1100	
Travel Time (s)		29.5			62.6			17.7			21.4	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	143	782	60	12	728	86	121	45	71	89	12	145
Shared Lane Traffic (%)												
Lane Group Flow (vph)	143	782	60	12	728	86	121	116	0	89	12	145
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		30			36			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane								Yes				
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2		1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100		20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	pt+ov	Prot	NA	pt+ov	pm+pt	NA		pm+pt	NA	Prot
Protected Phases	7	4	4 5	3	8	8 1	5	2		1	6	6
Permitted Phases							2			6		

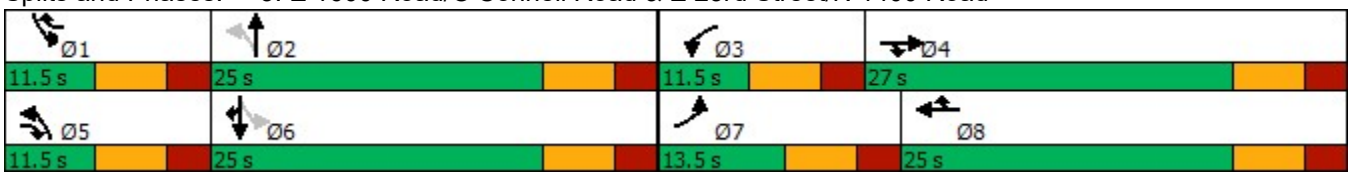


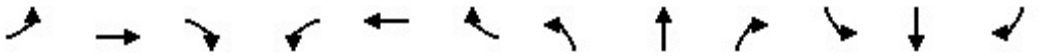
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	7	4	4 5	3	8	8 1	5	2		1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0
Minimum Split (s)	11.5	25.0		11.5	25.0		11.5	25.0		11.5	25.0	25.0
Total Split (s)	13.5	27.0		11.5	25.0		11.5	25.0		11.5	25.0	25.0
Total Split (%)	18.0%	36.0%		15.3%	33.3%		15.3%	33.3%		15.3%	33.3%	33.3%
Maximum Green (s)	7.0	20.5		5.0	18.5		5.0	18.5		5.0	18.5	18.5
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	2.5	2.5		2.5	2.5		2.5	2.5		2.5	2.5	2.5
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5		6.5	6.5		6.5	6.5		6.5	6.5	6.5
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None		None	Max		None	Max	Max
Walk Time (s)		7.0			7.0			7.0			7.0	7.0
Flash Dont Walk (s)		11.0			11.0			11.0			11.0	11.0
Pedestrian Calls (#/hr)		0			0			0			0	0
Act Effct Green (s)	7.1	28.9	40.5	5.0	17.5	29.1	22.5	18.7		22.5	18.7	18.7
Actuated g/C Ratio	0.10	0.40	0.56	0.07	0.24	0.41	0.31	0.26		0.31	0.26	0.26
v/c Ratio	0.82	0.55	0.06	0.10	0.84	0.12	0.26	0.24		0.21	0.02	0.25
Control Delay	70.7	20.2	0.1	34.8	37.1	1.1	16.9	12.2		15.9	21.7	1.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	70.7	20.2	0.1	34.8	37.1	1.1	16.9	12.2		15.9	21.7	1.4
LOS	E	C	A	C	D	A	B	B		B	C	A
Approach Delay		26.3			33.4			14.6			7.6	
Approach LOS		C			C			B			A	
90th %ile Green (s)	7.0	20.5		5.0	18.5		5.0	18.5		5.0	18.5	18.5
90th %ile Term Code	Max	Max		Max	Max		Max	MaxR		Max	MaxR	MaxR
70th %ile Green (s)	7.0	32.0		0.0	18.5		5.0	18.5		5.0	18.5	18.5
70th %ile Term Code	Max	Hold		Skip	Max		Max	MaxR		Max	MaxR	MaxR
50th %ile Green (s)	7.0	32.0		0.0	18.5		5.0	18.5		5.0	18.5	18.5
50th %ile Term Code	Max	Hold		Skip	Max		Max	MaxR		Max	MaxR	MaxR
30th %ile Green (s)	7.0	32.0		0.0	18.5		5.0	18.5		5.0	18.5	18.5
30th %ile Term Code	Max	Hold		Skip	Max		Max	MaxR		Max	MaxR	MaxR
10th %ile Green (s)	7.0	27.1		0.0	13.6		0.0	18.5		0.0	18.5	18.5
10th %ile Term Code	Max	Hold		Skip	Gap		Skip	MaxR		Skip	MaxR	MaxR
Stops (vph)	109	530	0	14	602	3	78	40		54	11	2
Fuel Used(gal)	5	19	1	1	38	3	2	1		1	0	1
CO Emissions (g/hr)	348	1320	50	48	2672	186	121	90		94	15	79
NOx Emissions (g/hr)	68	257	10	9	520	36	24	18		18	3	15
VOC Emissions (g/hr)	81	306	11	11	619	43	28	21		22	4	18
Dilemma Vehicles (#)	0	42	0	0	45	0	0	7		0	1	0
Queue Length 50th (ft)	67	135	0	5	169	0	35	16		25	4	0
Queue Length 95th (ft)	#166	#252	0	21	#257	8	69	55		53	17	5
Internal Link Dist (ft)		1864			4966			831			1020	
Turn Bay Length (ft)	750		550	700		1000	145			270		
Base Capacity (vph)	174	1426	957	125	921	720	464	492		433	485	589
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.82	0.55	0.06	0.10	0.79	0.12	0.26	0.24		0.21	0.02	0.25

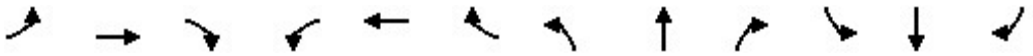
Intersection Summary			
Area Type:	Other		
Cycle Length: 75			
Actuated Cycle Length: 71.7			
Natural Cycle: 75			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.84			
Intersection Signal Delay: 25.6		Intersection LOS: C	
Intersection Capacity Utilization 55.6%		ICU Level of Service B	
Analysis Period (min) 15			
90th %ile Actuated Cycle: 75			
70th %ile Actuated Cycle: 75			
50th %ile Actuated Cycle: 75			
30th %ile Actuated Cycle: 75			
10th %ile Actuated Cycle: 58.6			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 3: E 1600 Road/O'Connell Road & E 23rd Street/N 1400 Road





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	84	954	117	86	897	67	66	11	38	79	23	137
Future Volume (vph)	84	954	117	86	897	67	66	11	38	79	23	137
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	750		550	700		1000	145		0	270		0
Storage Lanes	1		1	1		1	1		0	1		1
Taper Length (ft)	220			220			25			65		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850		0.884				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1647	0	1770	1863	1583
Flt Permitted	0.950			0.950			0.741			0.722		
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	1380	1647	0	1345	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			136			136		41				225
Link Speed (mph)		45			55			35			35	
Link Distance (ft)		1944			5046			911			1100	
Travel Time (s)		29.5			62.6			17.7			21.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	91	1037	127	93	975	73	72	12	41	86	25	149
Shared Lane Traffic (%)												
Lane Group Flow (vph)	91	1037	127	93	975	73	72	53	0	86	25	149
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		30			36			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane								Yes				
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2		1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100		20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	pt+ov	Prot	NA	pt+ov	pm+pt	NA		pm+pt	NA	Prot
Protected Phases	7	4	4 5	3	8	8 1	5	2		1	6	6
Permitted Phases							2			6		

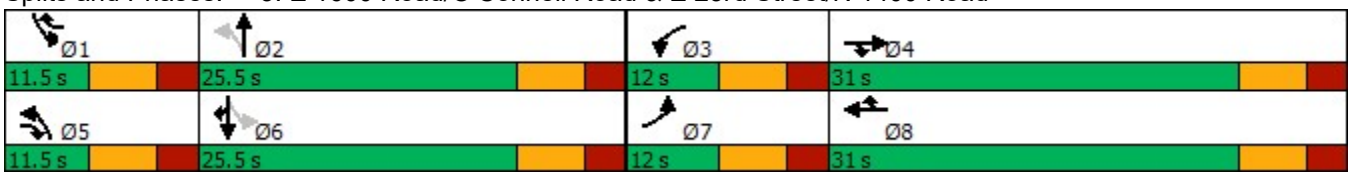


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	7	4	4 5	3	8	8 1	5	2		1	6	6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0
Minimum Split (s)	11.5	25.0		11.5	25.0		11.5	25.0		11.5	25.0	25.0
Total Split (s)	12.0	31.0		12.0	31.0		11.5	25.5		11.5	25.5	25.5
Total Split (%)	15.0%	38.8%		15.0%	38.8%		14.4%	31.9%		14.4%	31.9%	31.9%
Maximum Green (s)	5.5	24.5		5.5	24.5		5.0	19.0		5.0	19.0	19.0
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	2.5	2.5		2.5	2.5		2.5	2.5		2.5	2.5	2.5
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5		6.5	6.5		6.5	6.5		6.5	6.5	6.5
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None		None	Max		None	Max	Max
Walk Time (s)		7.0			7.0			7.0			7.0	7.0
Flash Dont Walk (s)		11.0			11.0			11.0			11.0	11.0
Pedestrian Calls (#/hr)		0			0			0			0	0
Act Effct Green (s)	5.7	24.1	35.9	5.7	24.1	35.9	23.3	19.5		23.3	19.5	19.5
Actuated g/C Ratio	0.08	0.32	0.48	0.08	0.32	0.48	0.31	0.26		0.31	0.26	0.26
v/c Ratio	0.68	0.91	0.15	0.69	0.85	0.09	0.16	0.11		0.19	0.05	0.26
Control Delay	64.2	39.1	2.9	65.8	34.2	0.5	17.3	11.4		17.7	24.1	2.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	64.2	39.1	2.9	65.8	34.2	0.5	17.3	11.4		17.7	24.1	2.0
LOS	E	D	A	E	C	A	B	B		B	C	A
Approach Delay		37.2			34.6			14.8			9.3	
Approach LOS		D			C			B			A	
90th %ile Green (s)	5.5	24.5		5.5	24.5		5.0	19.0		5.0	19.0	19.0
90th %ile Term Code	Max	Max		Max	Max		Max	MaxR		Max	MaxR	MaxR
70th %ile Green (s)	5.5	24.5		5.5	24.5		5.0	19.0		5.0	19.0	19.0
70th %ile Term Code	Max	Max		Max	Max		Max	MaxR		Max	MaxR	MaxR
50th %ile Green (s)	5.5	24.5		5.5	24.5		5.0	19.0		5.0	19.0	19.0
50th %ile Term Code	Max	Max		Max	Max		Max	MaxR		Max	MaxR	MaxR
30th %ile Green (s)	5.5	24.5		5.5	24.5		5.0	19.0		5.0	19.0	19.0
30th %ile Term Code	Max	Max		Max	Max		Max	MaxR		Max	MaxR	MaxR
10th %ile Green (s)	0.0	20.5		0.0	20.5		0.0	19.0		0.0	19.0	19.0
10th %ile Term Code	Skip	Gap		Skip	Hold		Skip	MaxR		Skip	MaxR	MaxR
Stops (vph)	69	802	12	70	763	1	44	18		52	19	4
Fuel Used(gal)	3	30	2	5	49	2	1	1		1	0	1
CO Emissions (g/hr)	211	2069	118	364	3432	152	70	40		91	31	82
NOx Emissions (g/hr)	41	403	23	71	668	29	14	8		18	6	16
VOC Emissions (g/hr)	49	480	27	84	795	35	16	9		21	7	19
Dilemma Vehicles (#)	0	58	0	0	57	0	0	3		0	1	0
Queue Length 50th (ft)	46	265	0	47	243	0	23	5		27	10	0
Queue Length 95th (ft)	#122	#395	25	#125	#358	4	49	32		57	29	12
Internal Link Dist (ft)		1864			4966			831			1020	
Turn Bay Length (ft)	750		550	700		1000	145			270		
Base Capacity (vph)	134	1197	819	134	1197	819	458	462		449	488	581
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.68	0.87	0.16	0.69	0.81	0.09	0.16	0.11		0.19	0.05	0.26

Intersection Summary			
Area Type:	Other		
Cycle Length: 80			
Actuated Cycle Length: 74.5			
Natural Cycle: 80			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.91			
Intersection Signal Delay: 32.6		Intersection LOS: C	
Intersection Capacity Utilization 58.4%		ICU Level of Service B	
Analysis Period (min) 15			
90th %ile Actuated Cycle: 80			
70th %ile Actuated Cycle: 80			
50th %ile Actuated Cycle: 80			
30th %ile Actuated Cycle: 80			
10th %ile Actuated Cycle: 52.5			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 3: E 1600 Road/O'Connell Road & E 23rd Street/N 1400 Road



BULK MATERIAL BINS

BULK MATERIAL BINS

BULK MATERIAL BINS

FUEL

HHW

FORMER WATER TANK LOCATION

BH-1

BH-2

BH-3

BH-4

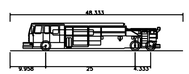
BH-5

BH-6

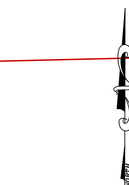
SB

IPS

TRAC
FORMER FARML
ZONE



Lawrence 49 Pumper Fire Truck	
Overall Length	48.333ft
Overall Width	8.000ft
Overall Body Height	7.715ft
Min Body Ground Clearance	0.627ft
Track Width	8.000ft
Lock-to-lock time	5.00s
Max Wheel Angle	45.00°



80' 0 40' 80' 160'

1 Inch = 80 ft.

CFS ENGINEERS
cfse.com

Mark	Description	Date

Designed by: RLW
Drawn by: RLW
Ckd by: AJC
Submitted by: AJC
Date: 06-08-20
Reviewed by: AJC
Plot scale: 1"=70'
File name: 19106-Turning-Fire Truck.dwg
Plot date: 07/01/20

VEHICLE TURNING MOVEMENTS

49' LAWRENCE FIRE TRUCK

FIELD OPERATION FACILITY
LAWRENCE, KANSAS

Sheet reference number:
1
Sheet 1 of 2

GEOTECHNICAL ENGINEERING REPORT

Lawrence MSO Field Operations Facility

E 19th Street and O'Connell Road
Lawrence, Kansas
CFS Project No. 19-1196

Prepared For

The City of Lawrence
6 East 6th Street
Lawrence, Kansas 66044

Dake Wells Architecture
1828 Walnut Street, 3rd Floor
Kansas City, Missouri 64108

October 1, 2020

Prepared by:
Cook, Flatt & Strobel Engineers, P.A.
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Topeka, Kansas 66608
785.670.6447

One Vision. One Team. One Call.

CFS ENGINEERS

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Kansas City, Missouri
Springfield, Missouri
Jefferson City, Missouri

October 1, 2020

Mr. Dan Maginn, AIA
Dake Wells Architecture
1828 Walnut Street, 3rd Floor
Kansas City, Missouri 64108

Subject: Geotechnical Engineering Report
Lawrence MSO Field Operations Facility
E. 19th Street & O'Connell Road
Lawrence, Kansas
Project No. 19-1196

Dear Mr. Maginn:

We have completed the subsurface exploration and geotechnical engineering evaluation for the above referenced project. The purpose of the exploration was to obtain information on the subsurface conditions at the proposed building site and, based on this information to provide geotechnical recommendations for design and construction of the proposed buildings and pavement areas.

In summary, the borings encountered undocumented fill and naturally deposited clay soils underlain by interbedded layers of shale, sandstone and limestone bedrock that continued to the depths explored. The following report summarizes the information obtained from the borings and laboratory test results, describes the subsurface conditions that were observed, and presents an assessment of the subsurface and geologic conditions that will likely have an impact on the construction of the proposed buildings and parking lots.

This report completes our current scope of services for this project. We appreciate the opportunity to be of service to you on this project and are prepared to provide the recommended construction services.

Respectfully submitted,

Cook, Flatt & Strobel Engineers, P.A.

John J. Zey, P.E.
Senior Geotechnical Engineer

Cc: The City of Lawrence, Kansas

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GEOTECHNICAL ENGINEERING REPORT
LAWRENCE MSO FIELD OPERATIONS FACILITY
E. 19TH STREET AND O'CONNELL ROAD
LAWRENCE, KANSAS

Project No. 19-1196
October 1, 2020

INTRODUCTION

CFS Engineers has completed the subsurface exploration and geotechnical engineering evaluation of the site for the proposed Lawrence MSO Field Operations Facility, which will be located northeast of E. 19th Street and O'Connell Road in Lawrence, Kansas. The subsurface exploration and geotechnical engineering services for this project were performed in general accordance with the scope of work in our December 12, 2019 contract for professional services with Dake Wells Architecture.

PROJECT DESCRIPTION

The Architectural Concept Plans that were provided to CFS Engineers indicated that the proposed Lawrence Field Operations Facility will include: the MSO Building Complex, the Central Maintenance Garage, the Solid Waste Building, the Facilities Building, the Forestry and Horticulture Building and the Household Hazardous Waste Building, along with associated parking lots, drives and appurtenant structures.

The MSO Building Complex will consist of three administration buildings that will contain the Traffic, Water, Wastewater, Streets, Stormwater and Inspection Divisions, and a Conditioned Vehicle Storage structure that will be adjacent to the administration buildings. The administration buildings will be two story, steel frame structures, with grade supported lower level floor slabs. These buildings will be stepped down the west side of the site to follow the existing grade and minimize the amount of site grading work that will be required. Based on the building type and anticipated column spacing, maximum foundation loads for the administration buildings are anticipated to be less than 75 kips for isolated interior columns and 3 kips per lineal foot for load bearing walls. The finished floor elevations of these buildings had not been determined at the time our report

was prepared. For the purpose of our analysis, we have assumed that the upper level floor elevation of the south building will be set at about elevation 886 ± feet, with the upper level floors of the middle and north buildings at about 876 ± feet and 866 ± feet, respectively. At these proposed floor elevations, it is anticipated that less than 10 feet of cut and/or new fill will be required to develop finished grades in each of the individual administration building areas.

The Conditioned Vehicle Storage structure will be located adjacent to the west side of the Administration Buildings of the MSO Complex. It is our understanding that this building will be a high wall, single story, steel frame structure, with a grade supported floor slab. The overall plan dimensions of this structure will be about 196 by 910 feet. Foundation loads for the Conditioned Vehicle Storage structure were not known at the time our report was prepared. Based on the Architectural Concept Drawings, the maximum column spacing for this structure is anticipated to be on the order of 25 by 98 feet, with maximum interior column loads estimated to be on the order of 250 kips or less. The floor slab of the Conditioned Vehicle Storage structure will be sloped downward from the south to the north end of the structure to approximately match the natural site grade.

It is our understanding that the Central Maintenance Garage Building will be a one story, high wall, steel frame structure, with a grade supported floor slab. An upper level mezzanine will be located in the southwest portion of the building to provide office space. The building will have overall plan dimensions of about 220 by 340 feet, with maximum interior column spacing estimated to be about 25 by 50 feet. Foundation loads for this structure were not known at the time our report was prepared. We have assumed that maximum foundation loads will be less than 125 kips for isolated interior columns and 3 kips per lineal foot for load bearing walls. The finished floor elevation of this building had not been determined at the time our report was prepared. For the purpose of our analysis, we have assumed that the floor elevation of the building will be set at about elevation 886 ± feet. At this floor elevation, up to 6 feet of cut will be required to develop finished grades in the proposed building area.

The Solid Waste Building will be a single story, steel frame structure, with a grade supported floor slab. The west end of the building will contain the administration area, with a large shop in the middle of the building, and maintenance and wash bays at the eastern end. This building will have overall plan dimensions of about 190 by 350 feet, and maximum interior column spacing estimated to be about 25 by 50 feet. Foundation loads for this structure were not known at the time our report was prepared. We have assumed that maximum foundation

loads will be less than 125 kips for isolated interior columns and 3 kips per lineal foot for load bearing walls. The finished floor elevation of this building had not been determined at the time our report was prepared. For the purpose of our analysis, we have assumed that the floor elevation of the building will be set at about elevation 886 ± feet. At this floor elevation, up to 6 feet of cut will be required to develop finished grades in the proposed building area.

We understand that the Facilities Building will be a single story, steel frame structure, with a grade supported floor slab. The building will contain offices, conference, storage and warehouse areas, with a large conditioned vehicle storage area and a loading dock next to the warehouse areas. This building will have overall plan dimensions of about 130 by 250 feet, and maximum interior column spacing estimated to be about 25 by 50 feet. Foundation loads for this structure were not known at the time our report was prepared. We have assumed that maximum foundation loads will be less than 125 kips for isolated interior columns and 3 kips per lineal foot for load bearing walls. The finished floor elevation of this building had not been determined at the time our report was prepared. For the purpose of our analysis, we have assumed that the floor elevation of the building will be set at about elevation 845 ± feet. At this floor elevation, less than 2 feet of cut and/or new fill will be required to develop finished grades in the proposed building area.

The Forestry and Horticulture Building will be a single story, steel frame structure, with a grade supported floor slab. The building will contain offices, conference, storage and interior greenhouse areas, with a large conditioned vehicle storage area. This building will have overall plan dimensions of about 140 by 310 feet, and maximum interior column spacing estimated to be about 25 by 50 feet. Foundation loads for this structure were not known at the time our report was prepared. We have assumed that maximum foundation loads will be less than 125 kips for isolated interior columns and 3 kips per lineal foot for load bearing walls. The finished floor elevation of this building had not been determined at the time our report was prepared. For the purpose of our analysis, we have assumed that the floor elevation of the building will be set at about elevation 850 ± feet. At this floor elevation, less than 2 feet of cut and/or new fill will be required to develop finished grades in the proposed building area.

The Household Hazardous Waste Building will be a single story, steel frame structure, with a grade supported floor slab. The building will contain offices, storage areas and a testing lab. This building will have overall plan

dimensions of about 65 by 140 feet. Foundation loads for this structure were not known at the time our report was prepared. We have assumed that maximum foundation loads will be less than 50 kips for isolated interior columns and 3 kips per lineal foot for load bearing walls. The finished floor elevation of this building had not been determined at the time our report was prepared. For the purpose of our analysis, we have assumed that the floor elevation of the building will be set at about elevation 892 ± feet. At this floor elevation, up to 3 feet of cut and new fill will be required to develop finished grades in the proposed building area.

In addition, light duty parking lots, drives and other appurtenant structures are planned at the site. The parking lots will provide space for automobiles and other light personnel vehicles, with occasional semi-trailer delivery and garbage trucks.

The scope of the exploration and engineering evaluation for this study, as well as the conclusions and recommendations in this report, were based on our understanding of the project as described above. If pertinent details of the project have changed or otherwise differ from our descriptions, we should be notified and engaged to review the changes and modify our recommendations, if needed.

DRILLING AND SAMPLING PROCEDURES

The field work for this project was performed between August 17 and 27, 2020. A total of 60 exploratory test borings were drilled in the proposed building and pavement areas. Figure 1 in the Appendix shows the approximate locations of the borings with reference to the existing site features. The boring locations were staked by CFS Engineers, prior to the start of the field work. Borings B-14, B-17, B-32 and B-35 were offset from their originally staked locations due to power lines and other site obstructions. The coordinates and ground surface elevations shown on the boring logs were determined by CFS Engineers following completion of the borings.

The borings were performed with a truck-mounted rotary drill rig, using 6-inch diameter flight augers equipped with carbide cutting teeth to advance the boreholes. Representative samples of the overburden soils and weathered bedrock units were obtained at selected intervals using the split-barrel sampling procedure as outlined in ASTM Specification D-1586. The split-barrel sampling procedure utilizes a standard 2-inch O.D.

split-barrel sampler that is driven into the bottom of the borings with an automatic hammer. The number of blows required to advance the sampler the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Resistance Value (N). These "N" values are indicated on the boring logs at their depth of occurrence and provide an indication of the consistency of cohesive and moderately cohesive soils, the relative density of sands and the relative hardness of weathered bedrock units. A higher efficiency is achieved with the automatic hammer compared to the safety hammer, which is operated with a cathead and rope. This higher efficiency has an appreciable effect on the Standard Penetration Resistance Values (N). The effect of the automatic hammer's efficiency has been considered in the interpretation and analysis of the subsurface information for this report.

Boring logs are included in the Appendix of this report and present such data as soil and bedrock descriptions, consistency, relative density and relative hardness evaluations, depths, sampling intervals and observed groundwater conditions. Conditions encountered in each of the borings were monitored and recorded by the drill crew. Field logs were prepared by the drill crew that included visual classification of the materials encountered during drilling, as well as drilling characteristics. Our final boring logs represent the geotechnical engineer's interpretation of the field logs combined with laboratory observation and testing of the samples. Stratification boundaries indicated on the boring logs were based on observations during our field work, an extrapolation of information obtained by examining samples from the borings and comparisons of soils and/or bedrock types with similar engineering characteristics. Locations of these boundaries are approximate, and the transitions between soil and bedrock types may be more gradational in nature rather than clearly defined.

LABORATORY TESTING PROGRAM

Laboratory tests were performed on representative samples of the onsite soil and weathered bedrock units to evaluate pertinent engineering properties of these materials. Laboratory tests were performed in general accordance with ASTM and other applicable standards. The split-barrel samples were tested to determine the moisture contents of the onsite soils and weathered bedrock units. A calibrated hand penetrometer was used to determine the approximate unconfined compressive strength of the cohesive and moderately cohesive soil samples. The hand penetrometer has been correlated with unconfined compression tests, and provides a better

estimate of the consistency and strength than visual observation alone. The results of the laboratory tests are indicated on the respective boring logs in the Appendix of this report.

In addition, Atterberg Limits tests were conducted on representative samples of the onsite soils and weathered bedrock. These tests provide information on the plasticity of these materials, which is a basis for classification and for estimating the potential of subgrade materials to change volume with variations in moisture content. The results of the Atterberg Limits tests are also shown on the respective boring logs.

As part of the testing program, the soil samples were classified by a geotechnical engineer using visual and manual procedures outlined in ASTM D-2487 and D-2488. The descriptions of the soils indicated on the boring logs are in accordance with the enclosed General Notes and the Unified Soil Classification System. Estimated group symbols according to the Unified Soil Classification System are shown on the boring logs. A brief description of this classification system is included in the Appendix of this report.

The bedrock units encountered in the borings were described in accordance with the enclosed General Notes for Bedrock on the basis of visual classification of disturbed auger cuttings and drilling characteristics. Core samples may reveal other rock types.

PREVIOUS SUBSURFACE INFORMATION

CFS Engineers reviewed the "Preliminary Geotechnical Report", prepared by GeoSource in March of 2012 and "Geotechnical Exploration" reports prepared by CFS Engineers in August of 2012 and September of 2014 that were all conducted at the former Farmland Industries site. The subsurface information from these previous site investigations were used in our evaluation of the site geology and subsurface conditions and in the formulation of the geotechnical engineering recommendations that are presented in the following sections of this report.

SITE AND SUBSURFACE CONDITIONS

The proposed Lawrence MSO Field Operations Facility will be located northeast of the intersection of E 19th Street and O'Connell Road in Lawrence, Kansas. The site is bounded on the north by the BNSF Railroad, on the

east by the East Hills Business Park, on the west by a residential subdivision and the southern boundary of the site extends to East 19th Street. The site was previously occupied by the former Farmland Industrial Plant, which manufactured fertilizer and other related products for agricultural use. At the time the borings were performed, most of the former structures had been removed, although some water storage tanks, old structure foundations and paved areas remain in some areas. The existing pavements, tanks and old foundations will be removed prior to and/or during the site preparation work for the new buildings and pavements. There were also two existing buildings at the site, the Bag Warehouse and Bulk Warehouse shown on Figure 1 are to remain.

The following presents a general summary of the major strata encountered during our subsurface exploration and includes a discussion of the results of field and laboratory tests conducted. Specific subsurface conditions encountered at the boring locations are presented on the individual boring logs in the Appendix of this report. Figures 2, 3 and 4 in the Appendix show Generalized Subsurface Profiles, based on the information obtained from the borings. The stratification lines shown on the boring logs and profiles represent the approximate boundaries between soil and bedrock types; in-situ, the transition between materials may be more gradational in nature rather than clearly defined.

Most of the borings encountered a thin layer of topsoil or gravel at the surface. The topsoil and gravel layers ranged from about 4 to 14 inches in thickness at the boring locations. Beneath the topsoil and gravel layers, the borings encountered undocumented fill and naturally deposited soils and/or weathered bedrock that continued to the depths explored. Undocumented fill was encountered in about two-thirds of the 60 borings that were performed. The fill was generally composed of moderate to high plasticity clays, with variable amounts of gravel, rock fragments, sand, silt, cinders and miscellaneous construction debris. The thickness of the undocumented fill varied from about 1 to 12 feet at the boring locations. At Borings B-11, B-28 and B-52, the undocumented fill was most likely building backfill. At Boring B-28, the upper 2 feet of the fill section was comprised of crushed limestone aggregate. At Boring B-11, about 2 feet of buried topsoil was encountered below the fill and at Boring B-52 a layer fine to medium grained sand was encountered within the fill section. Standard Penetration Tests performed in the undocumented fill yielded “N” values that ranged from 2 to 24 blows for one foot of penetration. Atterberg Limits performed on selected samples of the fill indicated Liquid Limits in the range of 26 to 58, with Plasticity Indices of 6 to 35.

The topsoil and undocumented fill layers were underlain by naturally deposited glacial till and residual clay soils. These soils were visually described as lean clays, silty lean clays and shaly clays (CL), lean to fat clays (CL/CH), fat clays (CH), and clayey silts (CL/ML). In general, the consistency of the soils varied from medium stiff to very stiff, with moisture contents in the range of 18.4 to 40.8 percent. A layer of very soft, saturated clayey silt (ML) was encountered in Boring B-32 below a depth of 3 feet. Standard Penetration Tests performed in these soils yielded "N" values that ranged from 4 to 20 blows for one foot of penetration. Atterberg Limits performed on selected samples of the naturally deposited soils indicated Liquid Limits in the range of 30 to 82, with Plasticity Indices of 15 to 53.

The composition of the glacial till deposits is often erratic due to the random nature of its deposition. Glacial deposits frequently contain isolated pockets of water bearing sands and gravel, as well as erratics that range from small cobbles to large boulders.

The undocumented fill and overburden soils were underlain by interbedded layers of shale, limestone and sandstone bedrock units that are part of the Pennsylvanian Age Douglas Group. The weathered top of the bedrock was encountered at depths ranging from about 1 to more than 15 feet below the existing ground surface at the boring locations. The uppermost bedrock unit encountered in the borings is thought to be the Haskell Limestone. This limestone unit is quite variable in thickness in the Lawrence area, ranging from a few inches to as much as 10 feet thick in areas where the limestone is unweathered. Some of the borings encountered auger refusal on apparent limestone bedrock that may be an old buried foundation from the former Farmland Facility instead of limestone bedrock that was indicted on the boring logs.

Beneath the Haskell Limestone, the borings encountered the Stranger Formation, which was comprised of shale and sandstone bedrock, with one or more minor coal seams. The upper 5 to 10 feet of the shale bedrock units are typically weathered. The weathered shale was described as soft to moderately hard and yellowish tan to gray brown in color. The unweathered shale is typically hard and gray in color. The Stranger Formation also contains the Tonganoxie Sandstone Member. This sandstone unit was described as a light brown to tan, silty to shaly, fine grained sandstone that is poorly cemented to cemented, with interbedded shale seams. Standard Penetration Tests performed in the shale and sandstone bedrock units yielded "N" values in the range of 28 to 96 blows for 1 to 12 inches of penetration.

GROUNDWATER OBSERVATIONS

Groundwater observations were made both during drilling and upon completion of the borings. Groundwater was encountered in 16 of the 60 borings that were performed for this project. The depth to water in the boreholes ranged from about 2 to 18.5 feet below the existing ground at the time that the exploration work was performed. The observed groundwater levels are shown on the individual boring logs in the Appendix and are also indicated on the Generalized Subsurface Profiles using the usual inverted delta symbol. Most of the borings remained dry and no visible groundwater was observed. The soils and bedrock units encountered in the borings have relatively low permeabilities and observations over an extended period of time through use of cased borings or piezometers would be required to better define current groundwater conditions.

Perched groundwater is commonly observed near the soil mantle/bedrock contact. A perched groundwater condition occurs when surface water percolates downward through the relatively permeable soil deposits to the less permeable bedrock. This sometimes creates a zone of saturated soils above the bedrock that have relatively low strength and high compressibility. Groundwater quantities, where perched conditions exist, are normally small and any dewatering can generally be accomplished with conventional sump pumps and/or area French drains.

The composition of the glacial soils is often erratic due to the random nature of its deposition. Glacial deposits frequently contain isolated pockets of water bearing sands and gravel, as well as cobbles and large boulder size materials. Water bearing lenses within natural glacial deposits are generally limited in extent. Excavations encountering such lenses typically experience a sudden influx of groundwater, due to the high permeability of the materials within the lens. Foundation and other excavations that encounter trapped water within the glacial soils can normally be dewatered using conventional sump pumps.

Fluctuations of groundwater levels can occur due to seasonal variations in the amount of rainfall, runoff, and other factors not evident at the time the borings were performed. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of our evaluation, it is our professional opinion that the proposed project site can be developed for the proposed buildings using conventional grading and foundation construction techniques. We have recommended that lightly loaded buildings be supported on shallow spread footings that bear in stiff, naturally deposited clay soils, controlled structural fill and/or weathered bedrock. We have recommended that buildings with higher foundation loads be supported on drilled pier foundations that are socketed into the bedrock units that underlie the site. Drilled piers and/or rock bearing footings should also be considered for building areas that require more than 15 feet of new fill to reduce the potential for differential settlement.

The primary geotechnical concerns are related to the presence of undocumented fill and expansive clay soils at this site. The existing fill at this site was apparently placed without any testing or supervision. Because of this, there is no way of knowing whether the fill was properly compacted and whether unsuitable materials have been incorporated in the fill section. The borings that were recently performed indicated that the fill was generally comprised of inorganic soils, with some gravel and rock fragments. However, the fill at some of the borings contained a significant amount of organic material, rubble or other unsuitable materials. Also, it is certainly possible that buried foundations, walls, and slabs from the former industrial buildings and other structures may be present beneath portions of the site. Because of this, we have recommended that the undocumented fill be completely removed from the proposed building areas and replaced with controlled structural fill. It is anticipated that much of the undocumented fill can be reused as structural fill, provided that the fill is not obtained from onsite areas that have need designated as contaminated and provided that the fill is moisture conditioned and properly recompacted. Rotating screens or other similar equipment may be required to remove oversized rubble and debris from the undocumented fill so that it can be reused as structural fill.

Another concern, from a geotechnical engineering standpoint, is the presence of soils having moderate to high shrink-swell potential. To reduce the potential for subgrade volume change and floor slab movement, we have recommended that a minimum of 24 inches of select, low volume change material be placed below building floor slabs. Depending on the finished floor elevations of the buildings, it may be necessary to undercut the proposed building areas to allow placement of the recommended select fill layer.

In areas where more than 15 feet of new fill will be required in building areas, it is recommended that the fill be placed as early as possible to allow time for the underlying soils consolidate under the weight of the new fill, thereby reducing the long-term settlement of the completed buildings. With early placement of the fill section and pre-consolidation of the soils, the proposed buildings could be founded on conventional spread footings. The long-term performance of the foundations will depend to a large degree on the thoroughness of the site preparation work and the sequencing of fill placement with the construction of the buildings, pavements and other structures.

As an alternative to removal and replacement of undocumented fill or using drilled pier foundations, buildings with higher foundation loads could be supported on a *Geopier*® reinforced subgrade, which are also as known rammed aggregate piers. Rammed aggregate piers may be a viable option and may potentially provide an economic benefit to this project. Based on our experience, it is anticipated that rammed aggregate piers could be used to increase the net allowable soil bearing pressure at this site while limiting foundation settlement. Additional information for using a *Geopier*® reinforced subgrade is presented in a later section of this report.

Thorough site preparation will be required to correct areas that were disturbed during the previous site grading work and construction activity at the proposed building site. The recommendations presented in the following sections outline procedures for site preparation and/or treatment of the onsite soils that are intended to produce structural fill sections and subgrades that are suitable for support of building foundations, floor slabs and pavements.

These recommendations are based, in part, upon the data obtained from our subsurface exploration and from the previous exploration work that was conducted at the site. The nature and extent of subsurface variations that may exist at the proposed project site will not become evident until construction. If variations appear evident, then the recommendations presented in this report should be evaluated. In the event that any changes in the nature, design, locations or floor elevations of the proposed buildings are planned, the conclusions and recommendations contained in this report will not be considered valid unless the changes are reviewed by the geotechnical engineer and our recommendations modified in writing.

SITE PREPARATION

Initial site preparation for the proposed project should commence with demolition of the existing structures within proposed construction areas. Demolition should include complete removal of all grade supported slabs, sidewalks, pavements and shallow spread footings. All broken concrete, asphalt and other debris from demolition of these structures should be removed from the site. Areas disturbed during demolition of the existing structures should be thoroughly evaluated by the geotechnical engineer prior to placement of structural fill. All disturbed soils should be undercut prior to placement of structural fill.

In areas where vegetation and topsoil are present, the vegetation and topsoil should be removed from planned building and pavement areas. Based on the borings, an average stripping depth of approximately 6 to 14 inches would be anticipated for most areas. The stripping depths required will likely vary and should be adjusted to remove all vegetation and root systems. A representative of CFS Engineers should observe the stripping operations to evaluate that all unsuitable materials have been removed. Soils removed during site stripping operations could be used for final site grading outside the building and pavement areas. Care should be exercised to separate these materials to avoid incorporation of the organic matter in structural fill sections.

Any required tree removal should also be accomplished at this time. Care should be taken to thoroughly remove all root systems from the planned building and pavement areas. Materials disturbed during removal of stumps should be undercut and replaced with structural fill. A zone of desiccated soils may exist in the vicinity of the trees. The desiccated soils have a higher swell potential and should also be undercut and replaced with structural fill.

Relocation of any existing utility lines within the zone of influence of proposed construction areas should also be completed as part of the site preparation. The lines should be relocated to areas outside of the proposed construction. Excavations created during the removal of the existing lines should be cut wide enough to allow for use of heavy construction equipment to recompact the fill. In addition, the base of the excavations should be thoroughly evaluated by a geotechnical engineer or engineering technician prior to placement of fill. All fill should be placed in accordance with the recommendations presented in the Structural Fill section of this report.

Following stripping, it is recommended that the proposed building areas be undercut to a level that will allow placement of a minimum of 24 inches of select, low volume change fill and/or stabilized soil below the building floor slabs and leveling course. Additional undercutting will be required in building areas underlain by undocumented fill. In areas underlain by undocumented fill, the undercut should extend to stable natural soils and/or to weathered bedrock. The undercut should extend a minimum of 10 feet beyond the proposed building lines. The purpose of the select, low volume change fill and/or stabilized section is to surcharge and to limit moisture changes in the underlying moderate to high plasticity clay soils; thereby reducing the potential for volume changes resulting from moisture changes in these soils. For the purposes of this report, low volume change materials are defined as soils having a Liquid Limit of 50 or less.

Following undercutting and prior to placement of structural fill, it is recommended that the exposed grade be scarified to a minimum depth of 8 inches and be moisture conditioned to bring the moisture content of the soils into the range recommended for structural fill. Moisture conditioning is the process of adjusting the moisture content of the scarified materials to a moisture content that is within a range of 0 to 4 percent above the optimum moisture content as determined by the Standard Proctor (ASTM D-698) compaction procedure. Following moisture conditioning, the scarified materials should be recompacted to a minimum of 95 percent of Standard Proctor (ASTM D-698) maximum dry density. Soft or unstable areas that hamper compaction of the subgrade should be undercut and replaced with controlled structural fill. Suitable structural fill should then be placed to design grades as soon as practical after reworking the subgrade to avoid moisture changes in the underlying soils.

Following moisture conditioning, it is recommended that the exposed grade be proofrolled. Proofrolling of the subgrade provides a more stable base for placement of structural fill and aids in identifying soft or disturbed areas. Unsuitable areas identified by the proofrolling operation should be undercut and replaced with structural fill. Proofrolling can be accomplished through use of a fully-loaded, tandem-axle dump truck or similar equipment providing an equivalent subgrade loading.

If soft or unstable conditions are encountered during the proofrolling operation, stabilization of the soils may be required. Clean crushed rock having a particle diameter of 3 to 6 inches could be used to stabilize the subgrade

prior to placement of structural fill. After initial undercutting, the large rock would be spread over the unstable subgrade and worked into the soft soils by close tracking with a bulldozer or other suitable construction equipment. Additional rock would be added until the subgrade becomes firm enough to support construction equipment. The use of a geotextile fabric, in conjunction with crushed rock, could also be considered as a means of stabilizing the exposed grade.

Where fill is being placed on a slope steeper than 5 (H) to 1 (V), the existing slope should be benched as fill placement progresses. These benches should be vertically stepped no more than 2 to 3 feet. This procedure would better key the fill into the original slope and will facilitate compaction of the fill.

Subgrade preparation for pavement areas will not need to be as extensive as recommended for the building areas. After the pavement areas have been stripped, it is recommended that they be undercut to a level that will allow placement of a minimum of 9 inches of low volume change fill and/or stabilized soil below the pavement section. Prior to placement of select fill or stabilized soil, the exposed subgrade soils should be thoroughly proofrolled. Any soft or unstable areas observed during proofrolling should be undercut and brought up to planned grade with controlled structural fill.

It is recommended that the site grading work be performed well ahead of the start of construction of the proposed buildings. Major fill sections, (15 feet or more), should be completed at least 3 to 4 months in advance of construction, in order to allow time for consolidation of the underlying soils to occur. Surcharging of critical areas could be considered to reduce the time required for settlement to occur and also to reduce net settlement of the completed structure. If surcharging of the site is performed, the surcharge should have a minimum height of 5 feet above design grades and extend a minimum of 10 feet beyond the outside perimeter of the structure. Instrumentation should be installed to monitor the amount and rate of settlement.

CLIMATIC CONDITIONS

Weather conditions will influence the site preparation required. In spring and late fall, following periods of rainfall, the moisture content of the near surface soils may be significantly above the optimum moisture content. Additionally, it is common to encounter wet, unstable soils upon removal of the site pavements or

flatwork as a result of moisture becoming trapped beneath relatively impervious pavements. Perched ground water may also develop above dense cemented soils or impervious bedrock units (such as shale) saturating near surface materials. These conditions could seriously impede grading by causing an unstable subgrade condition. Typical remedial measures include aerating the wet subgrade, removal of the wet materials and replacing them with dry materials or treating the wet material with fly ash.

If site grading commences during summer months, the moisture contents of the onsite clay soils may be abnormally low, which can significantly increase the swell potential of these materials. Typically, discing and moisture conditioning of the exposed subgrade materials to the moisture content criteria outlined in the Structural Fill section will reduce this swell potential of the dry materials. As an alternative, the dry materials could be undercut and replaced with structural fill.

EXCAVATIONS

Excavations will be required for site grading, foundations and utilities. Based on the borings, it is anticipated that most of the excavations for this project will be in clay soils and/or in weathered shale or sandstone bedrock above the water table. The onsite clay soils and the soft, highly weathered shale and poorly cemented sandstone with a Standard Penetration Resistance (N) value of less than 25 blows per foot can generally be excavated with conventional heavy equipment such as backhoes, loaders, etc. Excavations that extend into the underlying harder, less weathered shale, cemented sandstone or limestone bedrock units will be more difficult and will probably require the use of rock teeth, pneumatic breakers, or some other method of hard rock removal to complete the excavations. It is anticipated that the cemented sandstone and the unweathered shale bedrock units can be excavated by ripping with a single tooth ripper on a large bulldozer

Temporary construction slopes should be designed in strict compliance with the most recent governing regulations. The naturally deposited clay soils encountered in the borings would generally be classified as Type B soils, under Part 1926 of the OSHA regulations pertaining to open excavations. For these soils, it is recommended that temporary construction slopes be no steeper than 1(H) to 1(V). Construction slopes should be closely observed for signs of mass movement: tension cracks near the crest, bulging at the toe, etc. If potential stability

problems are observed, the geotechnical engineer should be immediately contacted. The responsibility for excavation safety and stability of temporary construction slopes should lie solely with the contractor.

STRUCTURAL FILL

All structural fill should consist of approved materials, free of organic matter and debris. Fill placed within 24 inches of the building floor slabs and leveling course gravel should consist of a lower plasticity cohesive soil having a Liquid Limit less than 50. Higher plasticity soils could be used as structural fill in the lower portion of deep fill sections in the building areas and/or as structural fill in pavement areas, where more movement can be tolerated. Fill should be placed in lifts having a maximum loose lift thickness of 9 inches. All fill should be compacted to a minimum of 95 percent of the material's maximum dry density as determined by ASTM D-698 (standard Proctor compaction). The moisture content of the fill at time of compaction should be within a range of 0 to 4 percent above optimum moisture content as defined by the standard Proctor compaction procedure. Moisture contents should be maintained within this range until completion of building floor slabs. Periodic sprinkling may be required to maintain the subgrade soils within the recommended moisture content range.

Based on information obtained from the borings, there appears to be a limited quantity of onsite soil that will meet the criteria for the select, low volume change zone that has been recommended below building floor slabs. During the site preparation work, suitable low plasticity materials encountered during site grading work should be stockpiled. It is not known whether there is a sufficient volume of low volume change material available from onsite sources to complete the required select fill section. In addition, double handling of this material may be required and should be anticipated.

The onsite weathered shale and sandstone could be ripped and pulverized for use to construct structural fill sections. It is anticipated that the sandstone and shale units can be broken down sufficiently with heavy compaction equipment to develop satisfactory fill sections for support of structures and pavements. The sandstone and shale should be pulverized into pieces having a maximum size of no more than 2 inches. We anticipate that significant amounts of water will have to be added to the shale and sandstone to increase moisture contents of these materials to levels necessary to achieve the required degree of compaction. Larger size fragments of limestone and cemented sandstone, excavated from the cut areas, should be placed outside

planned structure and pavement areas, so that these materials do not hamper excavation of foundations and utilities.

In lieu of importing low plasticity material for use as low plasticity fill beneath the building floor slab, the onsite moderate to high plasticity clay soils could be stabilized with either hydrated lime or Portland cement. The amount of lime and cement that is typically required to achieve the desired reduction in shrink-swell potential is on the order of 5 percent and 8 percent for lime and cement, respectively (dry weight basis). Laboratory tests will be necessary to determine the actual amount required. Recommendations and typical specifications for this method of stabilization could be provided if desired.

PERMANENT SLOPES

Permanent cut or fill slopes should be no steeper than 3(H) to 1(V) to maintain long-term stability and to provide ease of maintenance. Steeper slopes are susceptible to erosion, will be difficult to maintain, and could experience problems with instability. The crest or toe of cut or fill slopes should be no closer than 10 feet from any foundation and no closer than 5 feet from the edge of any pavement.

Drainage should be carefully controlled to prevent migration of surface water into excavations. It is recommended that the contractor develop excavation plans for all new structures. As a minimum, the plans should indicate: the proposed method of excavation, the expected length of time that the excavation will be open, excavation side slopes, locations of stockpiles, as well as any temporary bracing, sheeting and/or dewatering measures that will be used. The plans should be submitted to the owner and engineer well in advance of the start of construction for review and comments regarding the impact of the planned construction on the existing structures and facility operations.

FOUNDATIONS

The types of foundation that would be suitable for support of the proposed buildings are dependent on the final location, configuration and finished floor levels of the buildings, as well as the magnitude of the foundation loads, sensitivity to differential settlement, thickness of new fill required for site development and other factors.

Buildings that have light foundation loads, (less than 100 kips), and a relatively minor amount of site grading can generally be supported on shallow spread footing that are founded in stiff, natural clay soils, controlled structural fill and/or weathered bedrock. Buildings that have higher foundation loads and/or more than 15 feet of new fill should be supported on drilled pier foundation and/or rock bearing footings to reduce the potential for adverse differential settlement of these structures. Recommendations for design and construction of shallow spread footings, as well as drilled pier foundations and rock bearing footings are presented in the following sections of our report.

SPREAD FOOTINGS

With the recommended site preparation procedures, it is anticipated that most of the proposed buildings can be supported on conventional spread footings that are founded in stiff, natural clay soils and/or in controlled structural fill and/or in weathered bedrock. The exception may be the MSO Building Complex, where there is a significant amount of grade change across the planned building areas and where column loads are expected to be much higher for the Conditioned Vehicle Storage portion of the structure. Support of footings on or above existing undocumented fill is not recommended and could result in adverse differential movement of buildings and other structures. Footings founded in the recommended materials may be proportioned for a maximum allowable bearing pressure of 2,500 psf. The recommended bearing pressure includes a safety factor of at least 3 against a bearing failure.

Formed continuous footings should have a minimum width of 16 inches and isolated spread footings should have a minimum width of 30 inches. Lightly loaded trench footings (bearing pressure less than 1,500 psf) should have a minimum width of 12 inches. All exterior footings and footings founded in the unheated portions of the structures should be supported a minimum of 3 feet below final exterior grade to provide protection against frost penetration. Where possible, footings should be earth-formed, i.e., poured to lines of neat excavation.

In areas where footings are supported on controlled structural fill, it is recommended that the structural fill extend a minimum of 5 feet beyond the footing lines and to a depth of at least one footing width or 3 feet, whichever is greater, below footing bearing elevation.

In areas where spread footings are supported on bedrock, it is recommended that these footings have a minimum width of 24 inches and be adequately reinforced to bridge over joint cracks or other discontinuities that may occur in the bedrock bearing surface. Rock bearing footings should extend a minimum of 2 feet below final exterior grade for minimal frost protection. The contractor should include a contingency to cover the cost of removing highly weathered and/or unsuitable rock.

Any uplift loads acting on the footings can be resisted by the effective dead weight of the footings plus the weight of the soil above the foundation element. For design purposes, soil backfill above the footings should be assumed to have a unit weight of 110 pcf.

Lateral loads acting on shallow footings resulting from short term dynamic loads, such as wind, may be resisted by the passive resistance of the native soils and by friction acting at the base of the foundation. The lateral load capacity of the structure foundation can be determined using an allowable equivalent fluid unit weight of 280 pounds per cubic foot (pcf) for calculating the passive lateral earth pressure acting on the edge of footings. The allowable equivalent fluid pressure includes a factor of safety of about 1.5. The recommended passive pressure parameter is applicable for earth-formed foundations and should be determined from final grade to the bottom of the foundation; however, the passive resistance provided in the upper 3 feet of the profile should be ignored, as this is the zone subject to moisture changes and frost penetration. For sliding friction, an allowable friction coefficient of 0.28 could be assigned to the base of the foundation. The recommended sliding friction value includes a factor of safety of about 1.5.

The base of all footing excavations should be clean and dry and free of all water and loose materials, prior to placement of concrete. Concrete should be placed as soon as possible after excavating so that excessive drying of bearing materials does not occur. Should the bearing materials become excessively wet or dry, the affected material should be removed prior to placement of concrete.

It is recommended that all footing excavations be observed and evaluated by the geotechnical engineer or his representative immediately prior to placement of foundation concrete. Unsuitable areas identified at this time should be corrected. Corrective procedures would be dependent upon conditions encountered and may include

deepening of foundation elements, or undercutting of unsuitable materials and replacement with lean concrete or flowable fill.

Long-term structural settlement for shallow spread footings designed and constructed as outlined above should be minor; i.e., 1 inch or less. Differential structural settlement due to foundation loading of up to ¾ inch should be anticipated across individual structures, since some footings will be founded on undisturbed soils or controlled structural fill while other footings are founded in weathered bedrock.

DRILLED PIER FOUNDATIONS

For structures that will have foundation loads that are greater than 100 kips and/or for buildings that require more than 15 feet of new fill for site development, we recommend that drilled pier foundations be used. If drilled pier foundations are used, it is recommended that all drilled piers be socketed a minimum of one shaft diameter or 5 feet, whichever is greater, into approved bedrock. Greater penetration into the bedrock may be required at some locations depending on the extent and severity of the weathering of the bedrock. In areas where the suitable bedrock is encountered at relatively shallow depths, rock bearing spread footings may be used in combination with drilled piers. Rock bearing footings should extend at least 2 feet into approved bedrock. Drilled piers that are founded in approved bedrock may be designed and proportioned using a net allowable end bearing pressure of 25,000 psf. Spread footings that are founded in approved bedrock may be designed and proportioned using a net allowable end bearing pressure of 12,000 psf. The recommended bearing pressures include a safety factor of at least 3 against a bearing failure.

Any uplift loads acting on the foundations can be resisted by the effective dead weight of the piers plus an allowable side friction value of 250 psf for the portion of the shaft in stiff, natural clay soils and/or structural fill and 1,500 psf for the portion of the shaft in weathered bedrock. Side friction should be neglected in the upper 5 feet of the shaft.

All drilled piers should have a minimum shaft diameter of 30-inches in order to accommodate dewatering equipment and/or to permit access for proper hand cleaning and observation of the base. To minimize disturbance to the bearing surfaces caused by ponding of water, it is recommended that concrete be placed

the same day that the drilled shafts are completed. The bottom of the pier excavation should be clean and dry and free of all water and loose materials prior to placement of the reinforcing steel and concrete. Concrete placement should be continuous from the bottom to the top elevation of the shaft. For dry excavations, concrete may be placed by the free fall method, provided that it can be directed down the center of the shaft without hitting the reinforcing steel or sides of the excavation. Wet excavated shafts will require that the concrete either be pumped from the bottom up or placed using a tremie. The tremie pipe should be clean and have a sufficient inside diameter for use with the specific concrete mix, but not less than 10 inches. The discharge end of the tremie should allow free radial flow of the concrete and be immersed at least 10 feet in concrete and maintain a positive pressure differential during placement to prevent water or spoil intrusion.

We anticipate that the piers can be installed with conventional drilling equipment. Rock augers and/or core barrels will probably be required to penetrate the bedrock and obtain the recommended rock socket.

It is recommended that all drilled pier and/or rock bearing footing excavations be observed and evaluated by the geotechnical engineer or his representative immediately prior to placement of foundation concrete. Unsuitable areas identified at this time should be corrected. Corrective procedures would be dependent upon conditions encountered and will most probably include deepening of the footings or drilled piers. The suitability of the bedrock will be evaluated by visual observation at the base of the excavation.

Long-term structural settlement of drilled piers and rock bearing footings designed and constructed as outlined above should be minor; i.e., ½ inch or less.

GEOPIER FOUNDATION SYSTEM

As an alternate to removal of the undocumented fill and supporting the proposed buildings on drilled pier foundations, shallow foundation support bearing on a *Geopier*® reinforced subgrade (rammed aggregate piers) appears to be a viable option for this project and may potentially provide an economic benefit to this project. Based on our experience with rammed aggregate piers, we anticipate that rammed aggregate pier reinforced subgrade could be designed to increase the net allowable soil bearing pressure at this site while limiting foundation settlement.

Rammed aggregate piers have been used for a number of years to support structures as an alternative to deep foundations and/or to the removal and replacement of unsuitable fill and soft soils. The system allows the use of conventional spread footings and floor slabs and reliably controls settlement to within design tolerances.

The *Geopier* soil reinforcement system consists of highly densified aggregate piers. The rammed aggregate pier elements are installed by drilling 30-inch diameter holes, and ramming thin lifts of well-graded aggregate within the holes to form very stiff, high-density aggregate piers. The drilled holes are typically spaced about 5 feet apart and would extend through the undocumented fill and naturally deposited soils to the underlying bedrock. Following drilling of the Geopier hole, well graded aggregate is compacted in 12-inch loose lifts in the drill hole. Ramming takes place with a high-energy beveled tamper that both densifies the aggregate and forces the aggregate laterally into the sidewalls of the hole. This action increases the lateral stress in surrounding soils, thereby further stiffening the reinforced composite soil mass. The result of *Geopier* installation is a significant strengthening and stiffening of subsurface soils that then support floor slabs and high-capacity footings.

Geopier designs are based on a two-layer settlement analysis as described by Lawton et al. (1994) and in the *Geopier* Reference Manual. Settlements within the "upper zone" (zone of soil that is reinforced with *Geopier* elements) are computed using a weighted modulus method that accounts for the stiffness of the *Geopier* elements, the stiffness of the matrix soil, and the area coverage of *Geopier* elements below supported footings. Settlements within the "lower zone" (zone of soils beneath the upper zone which receives lower intensity footing stresses) are computed using conventional geotechnical settlement methods.

The *Geopier* soil reinforcement system is a proprietary design-build system and *Geopier*/Tensar should be contacted to provide engineering analyses and project specific design information for this project. The local contact in our area is Mr. Aaron Gaul, PE, with *Geopier*/Tensar at (816) 421-4334. *Geopier*/Tensar will provide information regarding the final system design, including the allowable foundation bearing pressure, *Geopier* shaft lengths and spacing, anticipated floor slab thickness, and a cost to support the proposed buildings.

If the *Geopier* system is selected, Quality Assurance testing should be performed during installation, including documentation of the soil conditions encountered, the shaft lengths, amount of aggregate used, verification of the modulus test readings, and tests on the compacted aggregate lifts. CFS Engineers would be pleased to provide this service.

SEISMIC HAZARDS DETERMINATION

Earthquake hazard evaluation is a complex task. Seismic sources must be identified and characterized, path effects evaluated (i.e., selection of appropriate attenuation relationships), and ground motions must be completed. Finally, an analysis of the motion with respect to the proposed construction must be made. In addition to the multi-discipline nature of this process, there is substantial parameter and modeling uncertainty associated with each of the steps. Typically, code-based approaches are used for seismic hazard analyses. Our seismic hazard evaluation follows the IBC 2015 procedures.

Seismic Soil Classification. Table 1 presents the spectral acceleration parameters and accelerations from the United States Geological Survey (USGS) Design Maps website for this project location. From the USGS data in Table 1, the site geotechnical conditions are best characterized by a "Class D" seismic design category according to the 2015 International Building Code.

Table 1 - Seismic Parameters

Seismic Parameters	Value
S_s	0.096g
S_1	0.065g
S_{MS}	0.153g
S_{M1}	0.157g
S_{DS}	0.102g
S_{D1}	0.105g

BUILDING FLOOR SLABS

The recommendations outlined in the Site Preparation and Structural Fill sections of this report are intended to produce subgrades that are suitable for support of building floor slabs. These recommendations include undercutting of the building areas to allow placement of a minimum of 24 inches of select, low volume change material or stabilized soil below the floor slab and leveling course. The select fill and/or stabilized soil layer below the floor slabs has been recommended to reduce the potential for subgrade volume change and floor

slab movement. The recommended low plasticity structural fill thickness is in addition to any granular section that will be required below the floor slabs. The moisture content of the subgrade soils should be maintained within the recommended range until floor slabs are completed. Depending upon weather conditions, periodic wetting may be required.

Immediately prior to construction of the building floor slabs, it is recommended that the exposed subgrade be evaluated to determine whether moisture contents are within the recommended range and to identify areas disturbed by construction operations. Unsuitable or disturbed areas should be reworked prior to placement of the granular leveling course and construction of the floor slab.

Details regarding proper backfill of utility trenches and stem walls below building floor slab areas should be planned. Suitable low to moderate plasticity clays or granular material should be used as backfill materials. The backfill should be placed and compacted in accordance with the recommendations previously discussed.

Where possible, floor slabs should be designed and constructed as free slabs to allow for some differential movement between the walls, column points and floor slabs. It is recommended that a granular leveling course, having a minimum thickness of 4 inches, be used below normally loaded building floor slabs supported on soil subgrades. The granular section provides a capillary moisture break and acts as a leveling course. Clean crushed limestone gravel, with a nominal size of ½ to ¾ inch, would be recommended for the leveling course. A modulus of subgrade reaction of 100 pci may be used to design floor slabs constructed on an untreated clay subgrade.

In areas where floor loads are greater than 200 psf, it is recommended that a minimum of 12 inches of crushed limestone aggregate be placed below the building floor slab. The crushed rock may be substituted for a portion of 24 inches of select, low volume change fill layer recommended for normally loaded floor slabs. The purpose of the crushed rock is to provide an improved subgrade for the more heavily loaded floor slab areas. In addition, the crushed rock will also provide a good working surface during construction. It is recommended that the crushed rock have a gradation similar to KDOT AB-1. The crushed rock should be placed in 6-inch lifts and compacted to a minimum of 95 percent of the material's maximum dry density as determined by ASTM D 698. The moisture content of the crushed rock should be between plus and minus 3 percent of the optimum

moisture content at the time of compaction. A modulus of subgrade reaction of 250 pci may be used to design floor slabs constructed on 12 inches of compacted crushed limestone aggregate.

Subsurface moisture and moisture vapor naturally migrate upward through the soil and, where the soil is covered by a building or pavement, this moisture will collect. To reduce the impact of this subsurface moisture and the potential impact of future induced moisture (such as landscape irrigation or precipitation), the current industry standard is to place a vapor retarder below the compacted crushed limestone layer. This membrane typically consists of visquene or polyvinyl plastic sheeting, having a thickness of at least 10 mils. It should be noted that although vapor barrier systems are currently the industry standard, this system may not be completely effective in preventing floor slab moisture problems. These systems typically will not necessarily assure that floor slab moisture transmission rates will meet floor covering manufacturer standards and that indoor humidity levels be appropriate to inhibit mold growth. The design and construction of such systems are totally dependent on the proposed use and design of the proposed building and all elements of building design and function should be considered in the slab-on-grade floor design. Building design and construction may have a greater role in perceived moisture problems since sealed buildings/rooms or inadequate ventilation may produce excessive moisture in a building and affect indoor air quality. Coordinate the City Environmental Consultant and Architect for vapor barrier recommendations due to site soil contamination issues.

Special precautions must be taken during the placement and curing of all concrete slabs. Excessive slump (high water-cement ratio) of the concrete and/or improper curing procedures used during either hot or cold weather conditions could lead to excessive shrinkage, cracking or curling of the slabs. High water-cement ratio and/or improper curing also greatly increase the water vapor permeability of the concrete. We recommend that all concrete placement and curing operations be performed in accordance with the American Concrete Institute (ACI) Manual.

The above procedures should reduce the potential for subgrade moisture variations and consequently reduce floor slab movement and cracking. However, these procedures will not completely eliminate the volume change characteristics of the natural clay soils and, because of the presence of unaltered clay soils that extend to much greater depths, some long-term volume change may occur along with some floor slab movement and cracking. Isolation of floor slabs from walls and columns should be considered to accommodate minor

differential movement of floor slabs. If it is desired to further minimize the potential for subgrade volume change, the use of a greater thickness of low volume change material beneath the floor slab should be considered.

LATERAL EARTH PRESSURES

Based on our experience with soils similar to those encountered at the site, all basement walls and other below grade walls that are subject to an unbalanced lateral earth pressure should be designed using an equivalent fluid pressure of 55 pounds per cubic foot. This lateral earth pressure assumes an "at rest" stress distribution condition; i.e., no wall rotation is allowed. For retaining walls that are not fixed at the top and able to rotate, the equivalent fluid pressure may be reduced to 45 pounds per cubic foot. Neither of the previous load distributions includes a factor of safety or take into account the influence of any hydrostatic loading of the wall. Also, the stress distributions do not include the influence of any foundations, pavements or other surcharge loads located in or adjacent to wall backfill.

To prevent hydrostatic loading on the walls and/or seepage into the lower building levels, it is recommended that a perforated drain line be installed at the base of all below grade walls. The drain line should be sloped to provide positive gravity drainage outside the building areas or should extend to a sump where water can be collected and removed. The drain line should be wrapped with filter fabric to prevent intrusion of fines. The drain line should be backfilled with free draining granular material extending vertically above the drain line to within 2 feet of final grade. The remaining portion of the excavation should be backfilled with cohesive soils to minimize the infiltration of surface water. The granular section behind the wall should have a minimum width of 2 feet and should be encapsulated in the suitable filter fabric to minimize intrusion of fines. The use of a prefabricated drainage blanket on the foundation wall could also be considered to prevent hydrostatic loading. Drainage blankets should be installed in accordance with the manufacturer's recommendations.

PAVEMENTS

Parking and drive area subgrades should be prepared in accordance with the recommendations given in the Site Preparation and Structural Fill sections of this report. The site soils and structural fill sections constructed

with these soils are considered poor subgrade materials for support of pavements. Based on the soil types encountered at this site and previous experience with materials of this type, a design CBR value of 3 is recommended for design of pavement sections. For this design value, a full-depth asphaltic concrete section having a minimum thickness of 6 inches is recommended for automobile parking areas and 7.5 inches is recommended for the access drives that are not used by heavy trucks. For asphaltic concrete pavements, a minimum surface course thickness of 2 inches is normally recommended. Tables 2 and 3 show recommended options for Light Duty Pavements for Parking Lots and Heavy Duty Pavements used by heavy truck traffic.

Table 2: Light Duty Pavement Thicknesses (Parking Lots)

Asphalt Pavement	**Option 1**	**Option 2**	**Option 3**
Surface Mix - KDOT HMA Commercial Grade 12.5A	2.0”	2.0”	
Base Mix - KDOT HMA Commercial Grade 12.5A	4.0”	4.0”	
Cement or Lime Stabilized Subgrade	9.0”	no	
Crushed Rock Base KDOT AB-1	no	9.0”	
Concrete Pavement			5.0”
Clean Rock ASTM C-33, No. 57			4.0”
Crushed Rock or Stabilized Subgrade			5.0”

Table 3: Heavy Duty Pavement Thicknesses (Truck Drives)

Asphalt Pavement	**Option 1**	**Option 2**	**Option 3**
Surface Mix - KDOT HMA Commercial Grade 12.5A	2.0”	2.0”	
Base Mix - KDOT HMA Commercial Grade 12.5A	8.0”	8.0”	
Cement or Lime Stabilized Subgrade	9.0”	no	
Crushed Rock Base KDOT AB-1	no	9.0”	
Concrete Pavement			8.0”
Clean Rock ASTM C-33, No. 57			4.0”
Crushed Rock or Stabilized Subgrade			5.0”

Portland cement concrete pavements are recommended for approach slabs, dock aprons, truck drives and parking areas, trash dumpster pads and other areas where heavy wheel loads will be concentrated. These areas should have concrete pavements with a minimum thickness of 8 inches as indicated in Table 3.

In lieu of importing crushed rock for use below pavements and building floor slabs, it should be feasible to recycle the existing onsite concrete obtained during the demolition of pavements and old foundations of the former structures. Any reinforcing steel in the concrete should be removed and the old concrete could then be crushed and screened to produce recycled concrete with either an AB-1 gradation for use below pavements or an ASTM C-33, No. 57 gradation for use as a leveling course below building floor slabs. This should reduce both the cost of disposal of the old concrete and the cost of importing crushed rock to the site.

We recommend that the pavement subgrades be evaluated by proofrolling immediately prior to paving. The moisture content and density of the top 8 inches of the subgrade should be checked within two days prior to commencement of actual paving operations. If the material is not in compliance with the required ranges of moisture or density, the subgrade should then be moisture conditioned and recompacted. If any significant event, such as precipitation, occurs after the evaluation, the subgrade should be reviewed by qualified personnel immediately prior to placing the pavement. The subgrade should be in its finished form at the time of the final review.

Proper drainage is a key to the long-term performance of any pavement section. It is recommended that all pavements be properly sloped to provide rapid runoff of surface water. Water should not be allowed to pond on or adjacent to pavements, since this could result in saturation of the subgrade and cause premature deterioration of pavements. Pavements in Kansas are normally subjected to 30 or more freeze-thaw cycles in any given year. Because of this, periodic maintenance of all of the pavements is essential to long term performance and should be anticipated. This should include sealing of all cracks and joints and by maintaining proper surface drainage next to paved areas.

PLANS AND SPECIFICATIONS REVIEW

It is recommended that the geotechnical engineer be provided the opportunity to review the plans and specifications so that comments can be made regarding the interpretation and implementation of our geotechnical engineering recommendations in the design and specifications. In the event that CFS Engineers is not given the opportunity to perform this recommended review, we will assume no responsibility for misinterpretation of our geotechnical engineering recommendations.

CONSTRUCTION OBSERVATION AND TESTING

To effectively achieve the intent of the geotechnical recommendations presented in this report and to maintain continuity from design through construction, CFS Engineers should be retained to provide observation and testing services during earthwork and foundation construction phases of the project. This will provide the geotechnical engineer with the opportunity to observe the subsurface conditions encountered during construction, evaluate the applicability of the geotechnical recommendations presented in our report as they relate to the soil and bedrock conditions encountered, and to provide follow up recommendations if conditions differ from those described in our report.

LIMITATIONS

The analysis and recommendations submitted in this report are based in part upon the subsurface information obtained from the exploration points performed at the indicated locations and our present knowledge of the proposed construction as outlined in the Project Description. Subsurface conditions may vary between the exploration points and across the site and our report does not reflect any variations which may occur. The nature and extent of such variations may not become evident until construction. If subsurface conditions are encountered during construction that differ from those described in this report, CFS Engineers should be notified immediately so that a review may be made and any supplemental recommendations provided. If the scope of the proposed construction, including the proposed loads, floor slab elevations or locations, changes

from that described in this report, our recommendations should also be reviewed and the recommendations modified accordingly.

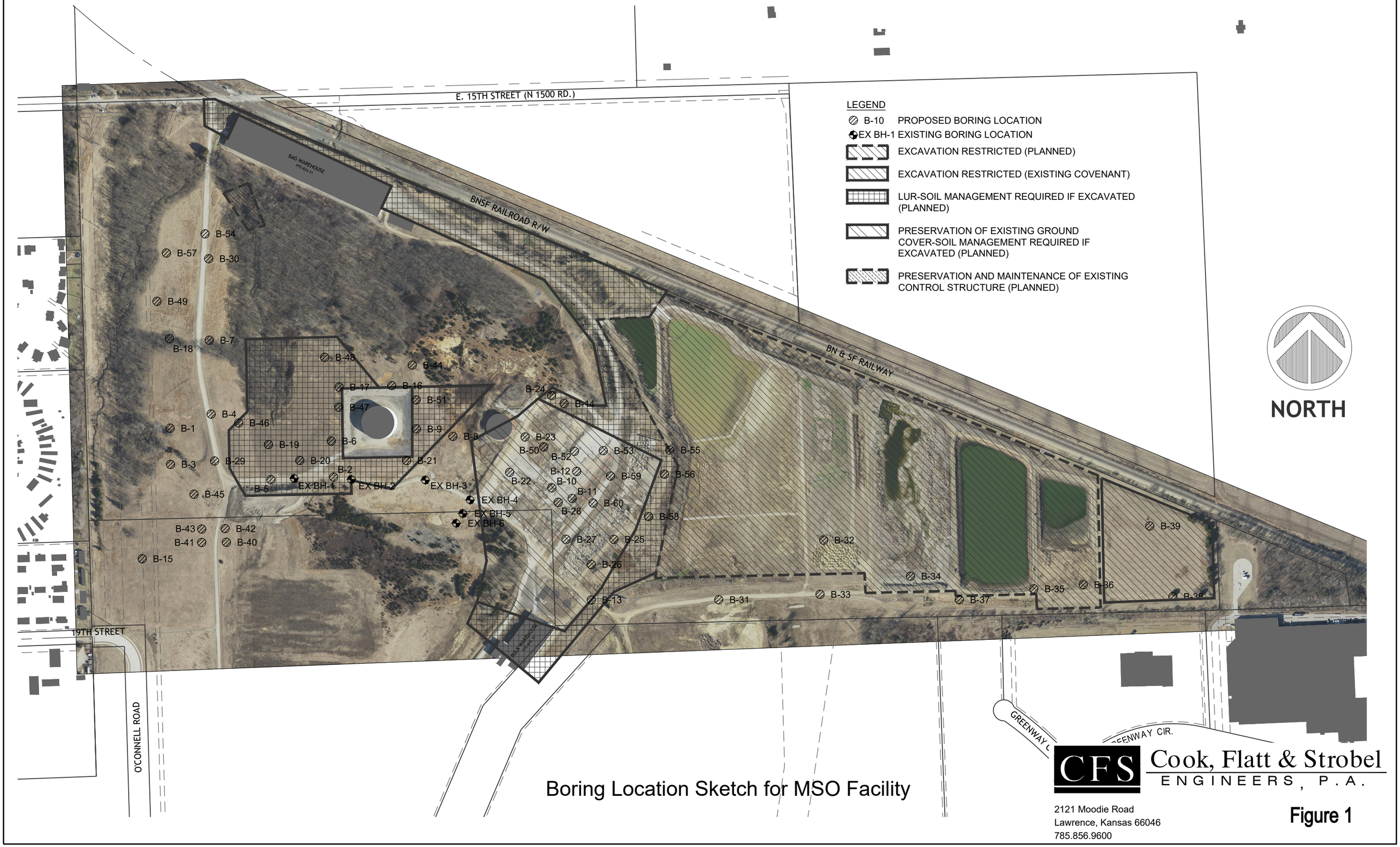
This report has been prepared in accordance with the generally accepted geotechnical engineering practice as it exists in the area at the time of our study. No warranty is expressed or implied. The recommendations provided in this report are based on the assumption that an adequate program of observation and testing will be conducted during the construction phase in order to evaluate compliance with our recommendations. Our scope of services did not include any environmental assessment or exploration for the presence of hazardous or toxic materials in the soil, surface water, groundwater or air, on, below or around this site.

This report has been prepared for the exclusive use of our client for specific application to the project discussed. Any party other than the client who wishes to use this report shall notify CFS Engineers in writing of such intended use. Additional work may be required before an updated report can be issued. Non-compliance with any of these requirements will release CFS Engineers from any liability resulting from the use of this report by any unauthorized party and client agrees to defend, indemnify and hold harmless CFS Engineers from any claim or liability associated with such unauthorized or non-compliance.

CFS ENGINEERS

APPENDIX

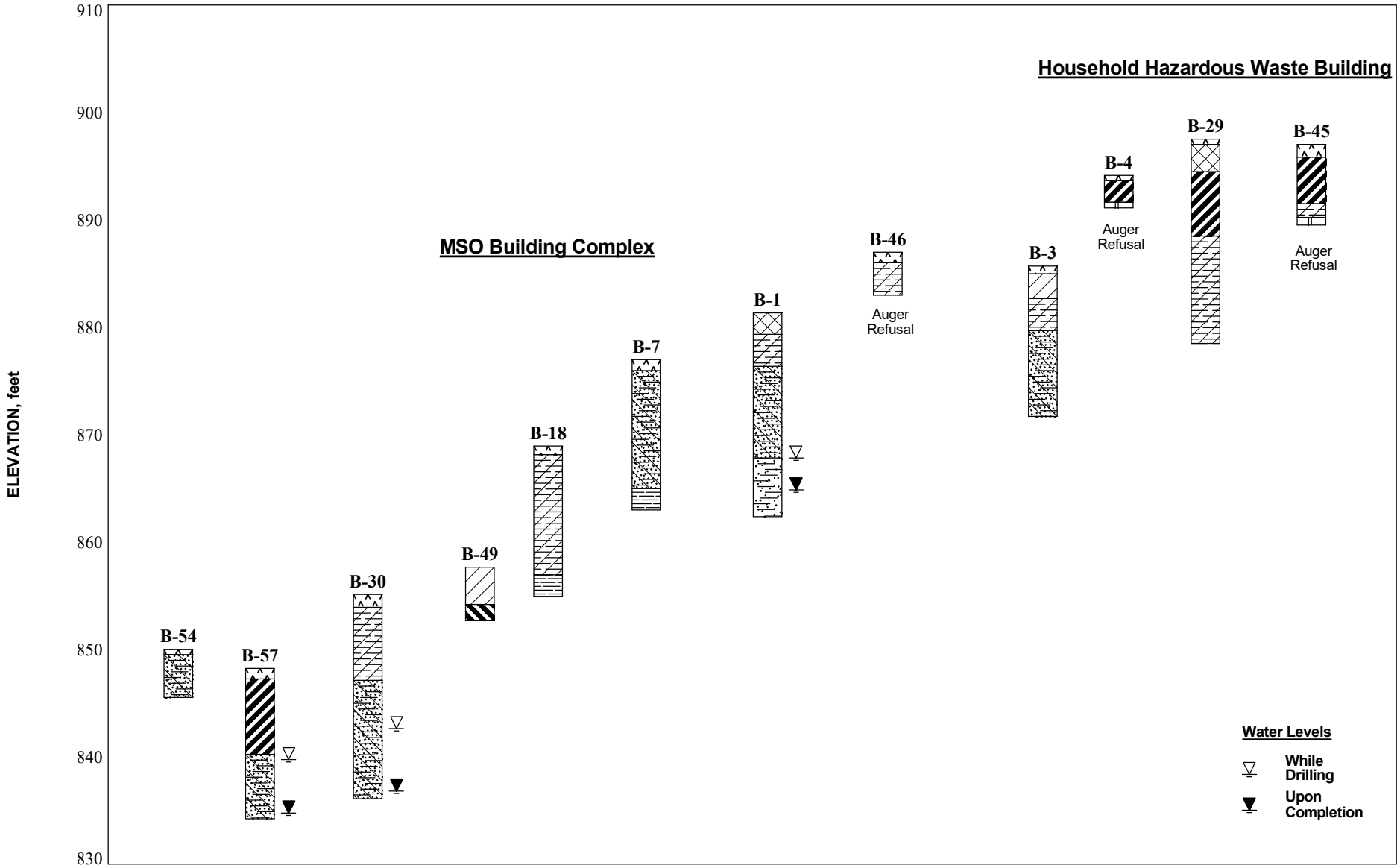
FIGURE 1: BORING LOCATION SKETCH
FIGURES 2, 3 & 4: GENERALIZED SUBSURFACE PROFILES
BORING LOGS
GENERAL NOTES AND TERMS
BORING LOG SYMBOLS
KEY TO SOIL SYMBOLS AND TERMS



Boring Location Sketch for MSO Facility

CFS Cook, Flatt & Strobel ENGINEERS, P.A.
2121 Moodie Road
Lawrence, Kansas 66046
785.856.9600

Figure 1



GENERALIZED SUBSURFACE PROFILE

FIGURE 2

MSO Field Operations Facility
19th Street & O'Connell Road
Lawrence, Kansas

Approved By: JJZ | **Project No.: 19-1196**

LEGEND

Topsoil	Silty Clay	Weathered Shale	Shale
Gravel	Fat Clay	Weathered Sandstone	Sandstone
Fill	Lean Clay	Lean to Fat Clay	Limestone

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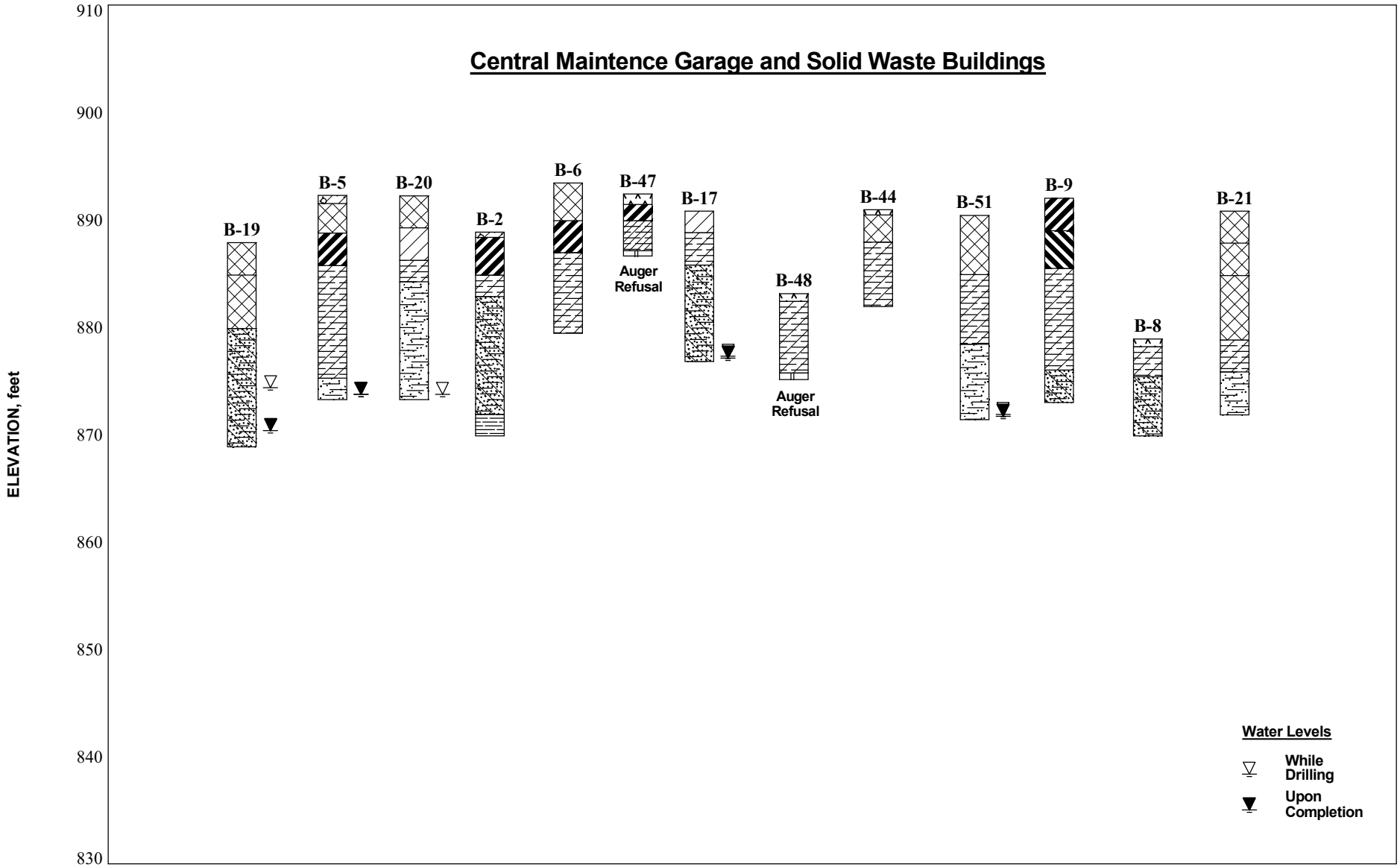

GENERALIZED SUBSURFACE PROFILE

FIGURE 3

MSO Field Operations Facility
19th Street & O'Connell Road
Lawrence, Kansas

Approved By: JJZ | **Project No.: 19-1196**

LEGEND

Topsoil	Silty Clay	Weathered Shale	Shale
Gravel	Fat Clay	Weathered Sandstone	Sandstone
Fill	Lean Clay	Lean to Fat Clay	Limestone

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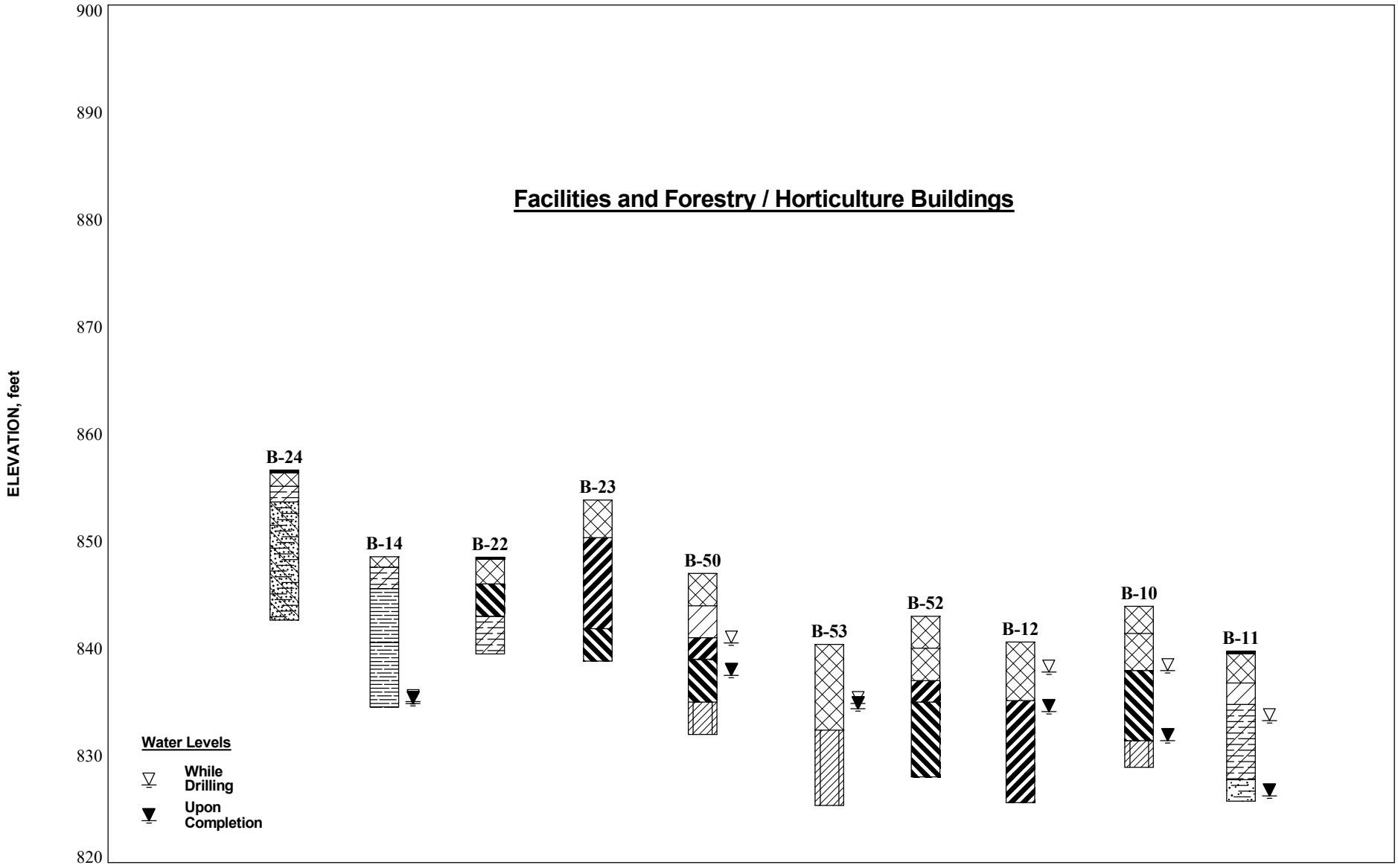

GENERALIZED SUBSURFACE PROFILE

FIGURE 4

MSO Field Operations Facility
19th Street & O'Connell Road
Lawrence, Kansas

Approved By: JJZ | **Project No.: 19-1196**

LEGEND

Topsoil	Shaly Clay	Weathered Shale	Shale
Gravel	Fat Clay	Weathered Sandstone	Sandstone
Fill	Lean Clay	Lean to Fat Clay	Limestone

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BOREHOLE INFORMATION Page 1 of 2

STATION OFFSET

NORTHING **237,857.0** EASTING **2,107,498.0**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-1

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION — Surface Elevation: 881.3
	PA									
1	SS	15	55/10"	*4500		16.9	CL		2.0	**FILL**, lean clay, very stiff, reddish brown to yellowish brown, with sandstone fragments — 879.3
	PA									
2	SS	9	69/9"			18.0				**SANDY SHALE**, weathered, mod. hard, yellowish tan to gray brown
	PA								5.0	— 876.3
3	SS	4	50/4"			15.0			5	**SHALY SANDSTONE**, weathered, poorly cemented, fine grained, light brown to tan
	PA									
4	SS	3	50/3"			14.8				
	PA								10	
									13.5	▽ — 867.8
5	SS	2	50/2"			23.6				**SANDSTONE**, weathered, poorly cemented to cemented, fine grained, light brown
	PA								15	▼
6	SS	2	50/2"			16.5			19.0	— 862.3
										BOTTOM OF BORING

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **13.5 feet W.D.**

▼ **16.5 feet A.B.**

Backfilled @ Completion

CFS ENGINEERS cfse.com

Boring Started	8-26-20		
Boring Completed	8-26-20		
Drill Rig	RC-550	Driller	LC
Approved By:	JJZ	Project No.	19-1196

BOREHOLE INFORMATION Page 2 of 2

STATION OFFSET

NORTHING **237,857.0** EASTING **2,107,498.0**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-1

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION

ATTERBERG LIMITS

Sample 1, Depth 1-2.5 feet

LL	PL	PI
26	20	6

**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **13.5 feet W.D.**

▼ **16.5 feet A.B.**

Backfilled @ Completion

CFS ENGINEERS cfse.com

Boring Started	**8-26-20**
Boring Completed	**8-26-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

BOREHOLE INFORMATION Page 1 of 2

STATION OFFSET

NORTHING **237,625.6** EASTING **2,108,272.6**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-2

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Surface Elevation: 888.9
	PA								0.5	**Crushed Limestone Gravel (6")** 888.4
1	SS	12	16	*8500		20.9	CH			**FAT CLAY**, very stiff, reddish brown
	PA									
									4.0	884.9
2	SS	18	61			19.9				**SHALE, weathered, sandy, mod. hard to hard, yellowish tan
	PA								5	
									6.0	882.9
3	SS	3	50/3"			14.0				**SHALY SANDSTONE, weathered, poorly cemented, fine grained, light brown
	PA									
4	SS	3	50/3"			14.4				
	PA								10	
5	SS	2	50/2"			14.7				
	PA								15	
									17.0	871.9
										**SANDY SHALE, hard, gray brown
6	SS	3	50/3"			16.5			19.0	869.9
										BOTTOM OF BORING

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

CFS ENGINEERS cfse.com

Boring Started	**8-25-20**
Boring Completed	**8-25-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

BOREHOLE INFORMATION Page 2 of 2

STATION OFFSET

NORTHING **237,625.6** EASTING **2,108,272.6**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-2

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ Dry W.D.

▼ Dry A.B.

Backfilled @ Completion

CFS ENGINEERS cfse.com

Boring Started	8-25-20		
Boring Completed	8-25-20		
Drill Rig	RC-550	Driller	LC
Approved By:	JJZ	Project No.	19-1196

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **237,685.8** EASTING **2,107,499.8**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-3

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL
	PA						
1	SS	12	16	*7500		18.4	CL
	PA						
2	SS	6	50/6"			15.3	
	PA						
3	SS	4	50/4"			14.7	
	PA						
4	SS	2	50/2"			14.1	
	PA						
5	SS	3	50/3"			18.1	

MATERIAL DESCRIPTION

Surface Elevation: 885.7

DEPTH, Feet.		
0.7	**Topsoil**, dark brown (8")	885.0
	LEAN CLAY, very stiff, brown to yellowish tan, with shale fragments (Possible Fill)	
3.0		882.7
5	**SHALE, weathered, mod. hard to hard, yellowish tan to rusty brown	
6.0		879.7
10	**SHALY SANDSTONE, weathered, poorly cemented, fine grained, light brown to tan	
14.0		871.7

BOTTOM OF BORING

ATTERBERG LIMITS
Sample 1, Depth 1-2.5 feet

LL	PL	PI
41	19	22

**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

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Boring Started	**8-27-20**
Boring Completed	**8-27-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **237,924.2** EASTING **2,107,692.4**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-4

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Surface Elevation: 893.7
	PA								0.5	**Topsoil**, dark brown (6") 893.2
1	SS	8	16	*6500		19.9	CH			**FAT CLAY**, very stiff, reddish brown
									2.5	891.2
	PA								3.0	**LIMESTONE**, hard 890.7

AUGER REFUSAL @ 3.0 FEET

**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

CFS ENGINEERS cfse.com

Boring Started	**8-25-20**
Boring Completed	**8-25-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

BOREHOLE INFORMATION Page 1 of 2

STATION OFFSET

NORTHING **237,613.2** EASTING **2,107,975.3**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-5

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION	Surface Elevation: 892.2
	PA								0.8	**Gravel and Clay Mixture (8")**	891.5
1	SS	10	16	*8500		22.1	CH			**FILL**, fat clay, very stiff, reddish brown and brown mixed	
	PA								3.5		888.7
2	SS	12	12	*5500		24.3	CH			**FAT CLAY**, very stiff, brown	
	PA								5		
3	SS	14	30	*8500		29.8			6.5		885.7
	PA									**SHALE, weathered, mod. hard to hard, yellowish gray brown to gray brown	
4	SS	3	50/3"			14.1					
	PA								10		
5	SS	2	50/2"			16.2					
	PA								15		
									17.0		875.2
6	SS	2	50/2"			22.0				**SANDSTONE, weathered, poorly cemented, fine grained, light brown, moist ▼	
									19.0		873.2
										BOTTOM OF BORING	

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **18.5 feet W.D.**

▼ **18.5 feet A.B.**

Backfilled @ Completion

CFS ENGINEERS
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Boring Started	8-17-20		
Boring Completed	8-17-20		
Drill Rig	RC-550	Driller	LC
Approved By:	JJZ	Project No.	19-1196

BOREHOLE INFORMATION Page 2 of 2

STATION OFFSET

NORTHING **237,613.2** EASTING **2,107,975.3**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-5

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION

ATTERBERG LIMITS

Sample 1, Depth 1-2.5 feet

LL	PL	PI
58	23	35

**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **18.5 feet W.D.**

▼ **18.5 feet A.B.**

Backfilled @ Completion

CFS ENGINEERS cfse.com

Boring Started	**8-17-20**		
Boring Completed	**8-17-20**		
Drill Rig	**RC-550**	Driller	**LC**
Approved By:	**JJZ**	Project No.	**19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **237,796.2** EASTING **2,108,261.5**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-6

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION	
										Surface Elevation:	**893.4**
	PA									**FILL**, lean clay, very stiff, dark brown and light brown mixed, trace fine sand	
1	SS	14	13	*6500		22.9	CL				
	PA										
										3.5	889.9
2	SS	11	20	*8000		22.6	CH			**FAT CLAY**, very stiff, reddish brown	
	PA								5		
										6.5	886.9
3	SS	14	28	9000		25.1				**SHALE, weathered, soft to mod. hard, yellowish tan to gray brown	
	PA										
4	SS	4	50/4"			11.9					
	PA								10		
										14.0	879.4
5	SS	2	50/2"			13.9				**BOTTOM OF BORING**	

ATTERBERG LIMITS
Sample 2, Depth 3.5-5 feet

LL	PL	PI
59	25	34

**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

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Boring Started	**8-17-20**		
Boring Completed	**8-17-20**		
Drill Rig	**RC-550**	Driller	**LC**
Approved By:	**JJZ**	Project No.	**19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **238,274.4** EASTING **2,107,683.5**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-7

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Surface Elevation: 877.0
	PA								1.0	**Topsoil**, dark brown (12") 876.0
1	SS	6	50/6"			13.3				**SHALY SANDSTONE**, weathered, poorly cemented, fine grained, light brown to tan
	PA									
2	SS	3	50/3"			12.9				
	PA								5	
3	SS	3	50/3"			16.7				
	PA									
4	SS	3	50/3"			17.4				
	PA								10	
									12.0	865.0
5	SS	3	50/3"			10.2			14.0	**SHALE**, hard, light gray 863.0
										BOTTOM OF BORING
										**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

CFS ENGINEERS cfse.com

Boring Started	**8-25-20**
Boring Completed	**8-25-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **237,818.6** EASTING **2,108,838.0**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-8

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION	
										Surface Elevation:	**878.7**
	PA								0.7	**Topsoil**, dark brown (8")	878.0
1	SS	10	86/10"			12.6				**SHALE**, weathered, mod. hard to hard, yellowish tan	
	PA								3.5		875.2
2	SS	4	50/4"			13.0				**SHALY SANDSTONE**, weathered, poorly cemented, fine grained, light brown to tan	
	PA								5		
3	SS	3	50/3"			15.2					
	PA										
4	SS	3	50/3"			15.8			9.0		869.7

BOTTOM OF BORING

**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

CFS ENGINEERS cfse.com

Boring Started	**8-21-20**
Boring Completed	**8-21-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

BOREHOLE INFORMATION Page 1 of 2

STATION OFFSET

NORTHING **237,853.6** EASTING **2,108,665.2**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-9

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION — Surface Elevation: 892.0
	PA									**FAT CLAY**, stiff, brown (Possible Fill)
1	SS	12	6	*2500		25.4	CH			
	PA								3.0	889.0
	PA									**LEAN TO FAT CLAY**, very stiff, brown
2	SS	14	19	*5000		23.1	CL CH		5	
	PA								6.5	885.5
3	SS	18	19	*7500		17.4				**SHALE, weathered, soft to hard, yellowish tan to gray brown
	PA									
4	SS	8	80/8"			18.6			10	
	PA									
5	SS	3	50/3"			15.5				
	PA								15	
									16.0	876.0
										SHALY SANDSTONE, weathered, poorly cemented, fine grained, light brown
6	SS	2	50/2"			15.6			19.0	873.0
										BOTTOM OF BORING

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

CFS ENGINEERS cfse.com

Boring Started	**8-18-20**
Boring Completed	**8-18-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

BOREHOLE INFORMATION Page 2 of 2

STATION OFFSET

NORTHING **237,853.6** EASTING **2,108,665.2**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-9

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION

ATTERBERG LIMITS

Sample 2, Depth 3.5-5 feet

LL	PL	PI
49	21	28

**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

CFS ENGINEERS cfse.com

Boring Started	**8-18-20**		
Boring Completed	**8-18-20**		
Drill Rig	**RC-550**	Driller	**LC**
Approved By:	**JJZ**	Project No.	**19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **237,574.5** EASTING **2,109,306.9**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-10

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Surface Elevation: 844.3
	PA									
1	SS	8	14	*6000		12.4	CL CH			**FILL**, lean to fat clay, stiff, dark brown and brown mixed, trace gravel
									2.5	841.8
	PA									**FILL**, silty lean clay, soft, dark gray brown to black, trace organics
2	SS	18	4	*1000		27.3	CL		5	
	PA								6.0	▽ 838.3
3	SS	18	16	*6500		23.7	CL CH			**LEAN TO FAT CLAY**, very stiff to stiff, brown (Possible Fill)
	PA									
4	SS	18	7	*2000		24.2	CL CH		10	
	PA								12.5	▼ 831.8
5	SS	16	10	*4000		25.3	CL			**SILTY LEAN CLAY**, stiff, tan mottled light gray, trace fine sand
									15.0	829.3
										BOTTOM OF BORING

ATTERBERG LIMITS
Sample 3, Depth 6-7.5 feet

LL	PL	PI
49	20	29

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **6.0 feet W.D.**

▼ **12.5 feet A.B.**

Backfilled @ Completion

CFS ENGINEERS
cfse.com

Boring Started	**8-18-20**
Boring Completed	**8-18-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **237,524.4** EASTING **2,109,402.8**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-11

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION — Surface Elevation: 840.8
	PA									**Asphaltic Concrete (3")**
1	SS	14	10	*4000		18.7	CL			**FILL**, lean clay, stiff, dark gray brown and brown mixed, with some sand and gravel
	PA								3.0	837.8
2	SS	18	8	*3000		20.2	CL			**LEAN CLAY**, stiff, dark brown (Possible Fill or Buried Topsoil)
	PA								5.0	835.8
3	SS	18	28	*7500		20.5			5	**SHALE, weathered, soft to mod. hard, olive tan to gray brown ▽
	PA									
4	SS	18	42	*9000		14.7			10	
	PA								12.0	828.8
5	SS	4	50/4"			21.4				**SANDSTONE, weathered, poorly cemented, fine grained, light brown ▼
									14.0	826.8
										BOTTOM OF BORING
										**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **6.5 feet W.D.**

▼ **13.5 feet A.B.**

Backfilled @ Completion

CFS ENGINEERS
cfse.com

Boring Started	**8-20-20**		
Boring Completed	**8-20-20**		
Drill Rig	**RC-550**	Driller	**LC**
Approved By:	**JJZ**	Project No.	**19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **237,652.8** EASTING **2,109,424.4**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-12

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Surface Elevation: 841.0
	PA									
1	SS	10	3	*2500		26.6	CL CH			**FILL**, lean to fat clay, soft to medium stiff, brown and dark brown mixed, trace sand
	PA									▽
2	SS	18	6	*7000		14.9	CL CH		5	
	PA									5.5 835.5
3	SS	18	15	*4500		22.7	CH			**FAT CLAY**, very stiff to stiff, brown mottled light gray, trace iron nodules ▼
	PA									
4	SS	18	10	*3000		27.9	CH		10	
	PA									
5	SS	18	11	*3000		27.4	CH		15	15.0 826.0
										BOTTOM OF BORING

ATTERBERG LIMITS
Sample 3, Depth 6-7.5 feet

LL	PL	PI
70	22	48

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **2.8 feet W.D.**

▼ **6.5 feet A.B.**

Backfilled @ Completion

CFS ENGINEERS
cfse.com

Boring Started	**8-19-20**
Boring Completed	**8-19-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **237,043.1** EASTING **2,109,493.3**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-13

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Surface Elevation: 835.3
	PA									**Gravel (3")**
1	SS	6	11	*5500		25.6	CL CH			**FILL**, lean to fat clay, stiff to very stiff, brown, reddish brown and dark brown mixed, with gravel and some fine sand
	PA									
2	SS	15	10	*4500		21.7	CL CH			
									5	5.0 830.3
										BOTTOM OF BORING

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

CFS ENGINEERS cfse.com

Boring Started	**8-20-20**
Boring Completed	**8-20-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **237,973.9** EASTING **2,109,364.6**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-14

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION — Surface Elevation: 848.8
	PA									**FILL**, lean, brown, with gravel
									1.0	847.8
1	SS	6	50/6"			12.3				**SHALE, weathered, mod. hard to hard, light brown
	PA									
									3.0	845.8
2	SS	5	50/5"			15.2				**SANDY SHALE, hard, light brown
	PA								5	
3	SS	4	50/4"			13.7				
	PA									
									8.0	840.8
4	SS	3	50/3"			13.9				**SHALE, hard, light gray
	PA								10	
									14.0	834.8
										BOTTOM OF BORING
										**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **13.5 feet W.D.**

▼ **13.7 feet A.B.**

Backfilled @ Completion

CFS ENGINEERS cfse.com

Boring Started	**8-20-20**
Boring Completed	**8-20-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **237,238.2** EASTING **2,107,365.9**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-15

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION	
										Surface Elevation:	**892.8**
	PA								0.5	**Topsoil**, dark brown (6")	892.3
1	SS	8	7	*2500		25.6	CH			**FILL**, fat clay, stiff, brown	
									2.5		890.3
	PA									**LEAN CLAY**, very stiff, brown to reddish brown	
2	SS	16	54/10"			24.1	CL		4.4		888.4
									5.0	**SANDSTONE**, weathered, yellowish tan	887.8
									5	**BOTTOM OF BORING**	
										**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.	

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

Dry W.D.

Dry A.B.

Backfilled @ Completion

CFS ENGINEERS cfse.com

Boring Started	8-27-20		
Boring Completed	8-27-20		
Drill Rig	RC-550	Driller	LC
Approved By:	JJZ	Project No.	19-1196

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **238,059.0** EASTING **2,108,547.9**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-16

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION	
										Surface Elevation:	**893.7**
	PA									**FILL**, lean clay, very stiff, light brown and tan mixed, with some shale fragments and gravel	
1	SS	6	50/6"	*5000		11.2	CL		1.5		892.2
	PA								1.9	**LIMESTONE, hard	891.8

AUGER REFUSAL @ 1.9 FEET

**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

CFS ENGINEERS
cfse.com

Boring Started	**8-17-20**
Boring Completed	**8-7-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **238,059.8** EASTING **2,108,317.0**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-17

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

Offset 20 feet east-northeast

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Surface Elevation: 891.2
	PA									**LEAN CLAY**, stiff, brown
1	SS	14	13	*5000		24.3	CL		2.0	889.2
	PA									**SHALE, weathered, soft to hard, yellowish tan and rust to gray brown
2	SS	6	50/6"			13.5				
	PA								5.0	886.2
3	SS	4	50/4"			14.6			5	
	PA									**SHALY SANDSTONE, weathered, poorly cemented, fine grained, light brown
4	SS	3	50/3"			15.1				
	PA								10	
5	SS	2	50/2"			16.4			14.0	877.2
										BOTTOM OF BORING
										**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **13.5 feet W.D.**

▼ **13.7 feet A.B.**

Backfilled @ Completion

CFS ENGINEERS cfse.com

Boring Started	**8-17-20**
Boring Completed	**8-17-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **238,281.1** EASTING **2,107,495.2**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-18

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG
	PA							
1	SS	18	15	*5500		15.8		
	PA							
2	SS	11	74/11"			13.3		
	PA							
3	SS	5	50/5"			11.1		
	PA							
4	SS	4	50/4"			11.6		
	PA							
5	SS	4	50/4"			10.6		

** compressive strength in psi * Calibrated Penetrometer

MATERIAL DESCRIPTION

Surface Elevation: 868.9

DEPTH, Feet.

0.8 **Topsoil**, dark brown (9") 868.1

**__SHALE__, weathered, soft to hard, sandy, yellowish tan to gray brown

5

10

12.0 856.9

**__SHALE__, hard, light gray

14.0 854.9

BOTTOM OF BORING

__ATTERBERG LIMITS__

Sample 1, Depth 1-2.5 feet

LL	PL	PI
33	21	12

**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

CFS ENGINEERS cfse.com

Boring Started	**8-25-20**
Boring Completed	**8-25-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

BOREHOLE INFORMATION Page 1 of 2

STATION OFFSET

NORTHING **237,779.6** EASTING **2,107,964.1**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-19

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION — Surface Elevation: 888.1
	PA									**FILL**, fat clay, stiff, light brown and reddish brown mixed, trace gravel
1	SS	18	7	*2000		32.5	CH			
	PA								3.0	885.1
2	SS	15	11	*6500		23.0	CL CH			**FILL**, fat to fat clay, very stiff, light brown and brown mixed, trace gravel
	PA								5	
3	SS	14	12	*7500		25.0	CL CH			
	PA								8.0	880.1
4	SS	17	80/11"			16.3				**SHALY SANDSTONE**, weathered, poorly cemented to cemented, fine grained, light brown
	PA								10	
5	SS	2	50/2"			18.2				▽
	PA								15	▼
6	SS	3	50/3"			22.8			19.0	869.1
										BOTTOM OF BORING

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **13.5 feet W.D.**

▼ **17.5 feet A.B.**

Backfilled @ Completion

CFS ENGINEERS cfse.com

Boring Started	8-17-20		
Boring Completed	8-17-20		
Drill Rig	RC-550	Driller	LC
Approved By:	JJZ	Project No.	19-1196

BOREHOLE INFORMATION Page 2 of 2

STATION OFFSET

NORTHING **237,779.6** EASTING **2,107,964.1**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-19

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION

ATTERBERG LIMITS

Sample 1, Depth 1-2.5 feet

LL	PL	PI
51	23	28

**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **13.5 feet W.D.**

▼ **17.5 feet A.B.**

Backfilled @ Completion

CFS ENGINEERS cfse.com

Boring Started	**8-17-20**
Boring Completed	**8-17-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

BOREHOLE INFORMATION Page 1 of 2

STATION OFFSET

NORTHING **237,704.3** EASTING **2,108,112.3**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-20

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION — Surface Elevation: 892.2
	PA									**FILL**, lean to fat clay, stiff to very stiff, dark brown, brown and tan, with shale fragments and trace gravel
1	SS	17	10	*4000		22.5	CL CH			
	PA								3.0	889.2
2	SS	18	16	*7500		24.5	CL			**LEAN CLAY**, very stiff, brown to reddish brown
	PA								5	
									6.0	886.2
3	SS	4	50/4"			13.6				**SHALE, weathered, mod. hard, gray brown
	PA								8.0	884.2
4	SS	2	50/2"			14.9				**SANDSTONE, weathered, poorly cemented to cemented, fine grained, light brown
	PA								10	
5	SS	2	50/2"			17.4				
	PA								15	
										▽
6	SS	2	50/2"			18.2			19.0	873.2
										BOTTOM OF BORING

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **18.5 feet W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

CFS ENGINEERS cfse.com

Boring Started	**8-17-20**
Boring Completed	**8-17-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

BOREHOLE INFORMATION Page 2 of 2

STATION OFFSET

NORTHING **237,704.3** EASTING **2,108,112.3**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-20

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION

ATTERBERG LIMITS

Sample 2, Depth 3.5-5 feet

LL	PL	PI
46	23	23

**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **18.5 feet W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

CFS ENGINEERS cfse.com

Boring Started	**8-17-20**		
Boring Completed	**8-17-20**		
Drill Rig	**RC-550**	Driller	**LC**
Approved By:	**JJZ**	Project No.	**19-1196**

BOREHOLE INFORMATION Page 1 of 2

STATION OFFSET

NORTHING **237,703.8** EASTING **2,108,618.6**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-21

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION — Surface Elevation: 890.8
	PA									**FILL**, fat clay, stiff, dark brown and brown mixed
1	SS	6	7	*2500		17.1	CH			
	PA								3.0	887.8
										FILL, lean clay, stiff, brown and tan mixed, with shale fragments and trace gravel
2	SS	14	6	*2000		27.4	CL		5	
	PA								6.0	884.8
3	SS	14	11	*4000		20.7	CL CH			**FILL**, lean to fat clay, stiff to very stiff, dark gray brown to black, trace gravel
	PA									
4	SS	18	11	4500		21.3	CL CH		10	
	PA								12.0	878.8
										**SHALE, weathered, mod. hard to hard, light brown mottled light gray
5	SS	6	50/6"			14.1			15	875.8
	PA									**SANDSTONE, weathered, poorly cemented, fine grained, light brown
6	SS	2	50/2"			17.4			19.0	871.8
										BOTTOM OF BORING

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

CFS ENGINEERS cfse.com

Boring Started	**8-18-20**
Boring Completed	**8-18-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

BOREHOLE INFORMATION Page 2 of 2

STATION OFFSET

NORTHING **237,703.8** EASTING **2,108,618.6**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-21

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ Dry W.D.

▼ Dry A.B.

Backfilled @ Completion

CFS ENGINEERS
cfse.com

Boring Started	8-18-20		
Boring Completed	8-18-20		
Drill Rig	RC-550	Driller	LC
Approved By:	JJZ	Project No.	19-1196

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **237,647.9** EASTING **2,109,106.7**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-22

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Surface Elevation: 848.9
	PA									**Asphaltic Concrete (2")**
1	SS	16	11	*4500		16.6	CL			**FILL**, lean clay, stiff to very stiff, desiccated, dark brown, with gravel
									2.5	846.4
	PA									**LEAN TO FAT CLAY**, stiff to very stiff, gray brown and rust
2	SS	18	10	*4000		20.5	CL CH			
	PA								5	
									5.5	843.4
	PA									**SHALE, weathered, mod. hard to hard, sandy, light brown
3	SS	9	81/9"			14.3				
	PA									
4	SS	3	50/3"			14.8			9.0	839.9
										BOTTOM OF BORING

ATTERBERG LIMITS
Sample 1, Depth 1-2.5 feet

LL	PL	PI
41	19	22

**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

CFS ENGINEERS
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Boring Started	**8-20-20**		
Boring Completed	**8-20-20**		
Drill Rig	**RC-550**	Driller	**LC**
Approved By:	**JJZ**	Project No.	**19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **237,815.5** EASTING **2,109,179.8**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-23

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION — Surface Elevation: 854.0
	PA									**FILL**, lean to fat clay, stiff, dark gray brown to black
1	SS	10	7	*2500		21.4	CL CH			
	PA								3.5	850.5
2	SS	18	6	*2000		25.4	CH			**FAT CLAY**, stiff, brown
	PA								5	
3	SS	18	7	*3000		25.2	CH			
	PA									- very stiff below 8 feet
4	SS	18	19	*7500		26.8	CH		10	
	PA								12.0	842.0
5	SS	18	10	*5500		23.4	CL CH			**LEAN TO FAT CLAY**, stiff, reddish brown mottled light gray, trace fine sand
									15.0	839.0
									15	**BOTTOM OF BORING**

ATTERBERG LIMITS
Sample 2, Depth 3.5-5 feet

LL	PL	PI
58	19	39

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

CFS ENGINEERS
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Boring Started	**8-18-20**
Boring Completed	**8-18-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **238,011.6** EASTING **2,109,355.3**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-24

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

Offset 50' east, due to power line

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION	Surface Elevation: 857.5
	PA									**Asphaltic Concrete (3")**	
1	SS	9	62/9"			14.8				**FILL**, lean clay, stiff, brown, with gravel	
									1.5		856.0
	PA									**SHALE, weathered, soft to mod. hard, light brown	
									3.0		854.5
2	SS	4	50/4"			14.8				**SHALY SANDSTONE, weathered, poorly cemented to cemented, fine grained, light brown	
	PA								5		
3	SS	4	50/4"			14.6					
	PA										
4	SS	8	88/8"			12.8					
	PA								10		
5	SS	3	50/3"			14.0					
									14.0		843.5
										BOTTOM OF BORING	
										**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.	

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

CFS ENGINEERS
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Boring Started	**8-20-20**		
Boring Completed	**8-20-20**		
Drill Rig	**RC-550**	Driller	**LC**
Approved By:	**JJZ**	Project No.	**19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **237,330.5** EASTING **2,109,600.7**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-25

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Surface Elevation: 842.4
	PA									**Topsoil**, dark brown (3"), weeds
1	SS	12	13	*5000		19.1	CL			**FILL**, lean clay, very stiff to stiff, brown and dark brown mixed, with gravel and some fine sand
	PA									
2	SS	12	8	*3500		26.0	CL			
									5	5.0 837.4
										BOTTOM OF BORING

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

CFS ENGINEERS
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Boring Started	**8-20-20**
Boring Completed	**8-20-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **237,211.5** EASTING **2,109,493.5**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-26

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Surface Elevation: 842.8
	PA									**Gravel (3")**
1	SS	10	12	*5500		18.6	CL CH			**FILL**, lean to fat clay, stiff to very stiff, brown and dark brown mixed, with gravel and some fine sand
	PA									
2	SS	18	15	*6000		25.0	CL CH			
									5	5.0 837.8
										BOTTOM OF BORING

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

CFS ENGINEERS cfse.com

Boring Started	**8-20-20**
Boring Completed	**8-20-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **237,330.8** EASTING **2,109,373.6**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-27

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Surface Elevation: 840.7
	PA									**FILL**, clayey silt, very stiff, brown, trace gravel
1	SS	18	24	*8000		17.3	CL ML			
	PA								3.0	837.7
2	SS	18	8	*2500		25.5	CL			**LEAN CLAY**, stiff, dark brown, trace fine sand (Possible Fill)
									5.0	835.7
									5	**BOTTOM OF BORING**

ATTERBERG LIMITS
Sample 1, Depth 1-2.5 feet

LL	PL	PI
28	20	8

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

CFS ENGINEERS
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Boring Started	**8-19-20**		
Boring Completed	**8-19-20**		
Drill Rig	**RC-550**	Driller	**LC**
Approved By:	**JJZ**	Project No.	**19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **237,506.1** EASTING **2,109,346.3**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-28

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Surface Elevation: 843.9
	PA									**FILL**, crushed limestone gravel, very dense, gray
1	SS	6	50/6"			8.0	GM			
									2.0	841.9
	PA									**FILL**, lean to fat clay, very stiff, dark gray brown, trace gravel and cinders
2	SS	18	21	*4500		22.2	CL CH			
									5.0	838.9
										BOTTOM OF BORING

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

CFS ENGINEERS cfse.com

Boring Started	**8-19-20**		
Boring Completed	**8-19-20**		
Drill Rig	**RC-550**	Driller	**LC**
Approved By:	**JJZ**	Project No.	**19-1196**

BOREHOLE INFORMATION Page 1 of 2

STATION OFFSET

NORTHING **237,701.9** EASTING **2,107,708.6**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-29

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION — Surface Elevation: 897.5
	PA									**Topsoil**, dark brown (6")
1	SS	8	12	*6500		20.0	CL CH			**FILL**, lean to fat clay, very stiff, dark gray brown and brown mixed, trace gravel
	PA								3.0	894.5
2	SS	14	6	*2000		20.7	CH			**FAT CLAY**, medium stiff to stiff, brown to reddish brown
	PA								5	
3	SS	18	6	*2500		25.3	CH			
	PA									
									9.0	888.5
4	SS	15	22	*9000		16.0				**SHALE, weathered, soft to hard, yellowish tan to gray brown
	PA								10	
5	SS	9	83/9"			22.3				
	PA								15	
6	SS	3	50/3"			17.0			19.0	878.5
										BOTTOM OF BORING

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

CFS ENGINEERS cfse.com

Boring Started	**8-26-20**
Boring Completed	**8-26-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

BOREHOLE INFORMATION Page 2 of 2

STATION OFFSET

NORTHING **237,701.9** EASTING **2,107,708.6**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-29

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION

ATTERBERG LIMITS

Sample 2, Depth 3.5-5 feet

LL	PL	PI
58	20	38

**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

Dry W.D.

Dry A.B.

Backfilled @ Completion

CFS ENGINEERS cfse.com

Boring Started	8-26-20		
Boring Completed	8-26-20		
Drill Rig	RC-550	Driller	LC
Approved By:	JJZ	Project No.	19-1196

BOREHOLE INFORMATION Page 1 of 2

STATION OFFSET

NORTHING **238,660.6** EASTING **2,107,680.7**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-30

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Surface Elevation: 855.1
	PA									**Topsoil**, brown (14")
									1.2	853.9
1	SS	18	50			11.0				**SHALE, weathered, sandy, mod. hard to hard, sandy, yellowish tan to gray brown
	PA									
2	SS	16	76/10"			15.6			5	
	PA									
3	SS	6	50/6"			14.4				
	PA									
									8.0	847.1
4	SS	4	50/4"			18.5				**SHALY SANDSTONE, weathered, poorly cemented, fine grained, light brown to tan
	PA								10	
										▽
5	SS	6	50/6"			19.1				
	PA								15	
										▼
6	SS	4	50/4"			18.9			19.0	836.1
										BOTTOM OF BORING

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **12.5 feet W.D.**

▼ **18.3 feet A.B.**

Backfilled @ Completion

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Boring Started	**8-26-20**
Boring Completed	**8-26-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

BOREHOLE INFORMATION Page 2 of 2

STATION OFFSET

NORTHING **238,660.6** EASTING **2,107,680.7**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-30

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION

ATTERBERG LIMITS

Sample 1, Depth 1-2.5 feet

LL	PL	PI
24	18	6

**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **12.5 feet W.D.**

▼ **18.3 feet A.B.**

Backfilled @ Completion

CFS ENGINEERS cfse.com

Boring Started	**8-26-20**
Boring Completed	**8-26-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **237,044.0** EASTING **2,110,097.7**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-31

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Surface Elevation: 838.0
	PA								0.5	**Topsoil**, dark brown (6") 837.5
1	SS	9	96/9"			14.6			2.0	**SANDSTONE**, weathered, poorly cemented to cemented, light brown 836.0
	PA									**SHALE**, weathered, mod. hard to hard, sandy, yellowish
2	SS	5	50/5"			12.8			4.0	834.0

BOTTOM OF BORING

**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

CFS ENGINEERS
cfse.com

Boring Started	**8-21-20**
Boring Completed	**8-21-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **237,356.8** EASTING **2,110,594.7**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-32

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

Offset 30 feet north

Surface Elevation: 832.7

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
	PA									**FILL**, clayey silt, soft to medium stiff, light brown, trace fine sand ▼
1	SS	18	4	*1000		21.9	CL ML			
	PA								3.0	829.7
										CLAYEY SILT, very soft, light gray brown, with some fine sand
2	SS	18	WOH			40.8	ML		5.0	827.7
									5	**BOTTOM OF BORING**

Note: WOH - Weight of Hammer

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **2.0 feet W.D.**

▼ **2.0 feet A.B.**

Backfilled @ Completion

CFS ENGINEERS cfse.com

Boring Started	**8-21-20**
Boring Completed	**8-21-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **237,069.5** EASTING **2,110,577.3**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-33

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Surface Elevation: 830.3
	PA									
1	SS	18	19	*8500		15.3	CL CH			**FILL**, lean to fat clay, very stiff to stiff, dark gray brown
	PA									
2	SS	18	9	*3000		19.5	CL CH			
									5	5.0 825.3
										BOTTOM OF BORING

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

CFS ENGINEERS cfse.com

Boring Started	**8-21-20**		
Boring Completed	**8-21-20**		
Drill Rig	**RC-550**	Driller	**LC**
Approved By:	**JJZ**	Project No.	**19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **237,155.7** EASTING **2,111,005.8**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-34

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION (Surface Elevation: 829.0)
	PA									**FILL**, lean clay, stiff, dark brown and brown mixed, trace gravel
1	SS	18	6	*2500		14.5	CL			
	PA								3.0	826.0
2	SS	18	5	*2000		20.6	CL ML			**SILTY LEAN CLAY**, medium stiff, light brown
									5.0	824.0
									5	**BOTTOM OF BORING**

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

CFS ENGINEERS cfse.com

Boring Started	**8-21-20**
Boring Completed	**8-21-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **237,095.8** EASTING **2,111,570.8**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-35

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

Offset 20' west, due to power line

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Surface Elevation: 827.8
	PA									
1	SS	14	7	*2000		23.8	CL			**FILL**, lean clay, stiff, dark gray brown, trace gravel
	PA									
2	SS	18	7	*2500		25.2	CL			
									5	5.0 822.8
										BOTTOM OF BORING

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

CFS ENGINEERS cfse.com

Boring Started	**8-21-20**		
Boring Completed	**8-21-20**		
Drill Rig	**RC-550**	Driller	**LC**
Approved By:	**JJZ**	Project No.	**19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **237,115.1** EASTING **2,111,824.6**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-36

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Surface Elevation: 828.0
	PA									
1	SS	15	10	*3500		15.9	CL			**FILL**, lean clay, stiff to soft, brown and gray mixed, trace gravel
	PA									
2	SS	18	3	*1000		21.4	CL			
									5	5.0 823.0
										BOTTOM OF BORING

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

CFS ENGINEERS cfse.com

Boring Started	**8-21-20**		
Boring Completed	**8-21-20**		
Drill Rig	**RC-550**	Driller	**LC**
Approved By:	**JJZ**	Project No.	**19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **237,044.1** EASTING **2,111,237.6**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-37

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Surface Elevation: 821.0
	PA									**FILL**, lean to fat clay, very stiff to medium stiff, dark brown
1	SS	18	11	*6000		20.9	CL CH			
	PA									
2	SS	18	5	*1500		34.9	CL CH			
									5	5.0 816.0
										BOTTOM OF BORING

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

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Boring Started	**8-21-20**
Boring Completed	**8-21-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **237,059.0** EASTING **2,112,248.9**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-38

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Surface Elevation: 822.8
	PA									
1	SS	15	6	*2000		28.1	CH			**FAT CLAY**, medium stiff to stiff, dark brown to brown
	PA									
2	SS	18	9	*3500		28.8	CH			
									5	5.0 817.8
										BOTTOM OF BORING

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

CFS ENGINEERS cfse.com

Boring Started	**8-21-20**
Boring Completed	**8-21-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **237,393.8** EASTING **2,112,139.8**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-39

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Surface Elevation: 828.7
	PA									
1	SS	18	11	*4500		29.1	CL CH			**FILL**, lean to fat clay, very stiff to stiff, brown, trace gravel and sand
	PA									
2	SS	18	7	*2500		25.7	CL CH			
									5	5.0 823.7
										BOTTOM OF BORING

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

CFS ENGINEERS cfse.com

Boring Started	**8-21-20**		
Boring Completed	**8-21-20**		
Drill Rig	**RC-550**	Driller	**LC**
Approved By:	**JJZ**	Project No.	**19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **237,316.7** EASTING **2,107,764.6**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-40

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Surface Elevation: 894.9
	PA									
									1.0	**FILL**, lean clay, stiff, dark brown 893.9
1	SS	8	9	*4500		29.4	CH			**FAT CLAY**, very stiff, brown
	PA									
2	SS	18	11	*6500		23.2	CH		5	
	PA									
									5.8	▽ 889.1
3	SS	1	50/1"			5.1			6.3	**LIMESTONE, hard ▼ 888.6

AUGER REFUSAL @ 6.3 FEET

ATTERBERG LIMITS
Sample 2, Depth 3.5-5 feet

LL	PL	PI
51	20	31

**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **5.8 feet W.D.**

▼ **6.1 feet A.B.**

Backfilled @ Completion

CFS ENGINEERS
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Boring Started	**8-27-20**		
Boring Completed	**8-27-20**		
Drill Rig	**RC-550**	Driller	**LC**
Approved By:	**JJZ**	Project No.	**19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **237,315.6** EASTING **2,107,647.5**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-41

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Surface Elevation: 896.7
	PA									**FILL**, lean to fat clay, very stiff, dark gray brown
1	SS	9	12	*5500		25.8	CL CH			
									2.5	894.2
	PA									**SILTY LEAN CLAY**, stiff, brown, trace fine sand
2	SS	18	9	*4000		20.5	CL		5	
	PA								6.0	890.7
3	SS	18	47	*5000		26.5	CH			**FAT CLAY**, very stiff, light brown
									7.3	889.4
	PA								7.9	**LIMESTONE**, hard
										888.8

AUGER REFUSAL @ 7.9 FEET

ATTERBERG LIMITS
Sample 2, Depth 3.5-5 feet

LL	PL	PI
32	16	16

**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

Dry W.D.

Dry A.B.

Backfilled @ Completion

CFS ENGINEERS
cfse.com

Boring Started	8-27-20
Boring Completed	8-27-20
Drill Rig RC-550	Driller LC
Approved By: JJZ	Project No. 19-1196

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **237,381.3** EASTING **2,107,758.6**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-42

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION — Surface Elevation: 897.6
	PA									**Topsoil**, dark brown (12")
									1.0	896.6
1	SS	6	12	*6500		25.4	CH			**FAT CLAY**, very stiff, dark brown
	PA								3.0	894.6
2	SS	18	9	*3000		21.3	CL			**SILTY LEAN CLAY**, stiff, brown, trace fine sand
	PA								5	
3	SS	10	54/10"	*5000		29.5	CL			
	PA								6.8	890.8
									7.3	**LIMESTONE, hard 890.3

AUGER REFUSAL @ 7.3 FEET

ATTERBERG LIMITS
Sample 2, Depth 3.5-5 feet

LL	PL	PI
30	15	15

**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

CFS ENGINEERS
cfse.com

Boring Started	8-27-20		
Boring Completed	8-27-20		
Drill Rig	RC-550	Driller	LC
Approved By:	JJZ	Project No.	19-1196

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **237,379.3** EASTING **2,107,647.5**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-43

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Surface Elevation: 898.5
	PA									**Topsoil**, dark brown (12")
									1.0	897.5
1	SS	9	6	*2000		24.1	CL CH			**LEAN TO FAT CLAY**, medium stiff, dark brown
	PA								3.0	895.5
2	SS	18	7	*3000		20.9	CL			**LEAN CLAY**, stiff, brown, trace fine sand
	PA								5	
									6.0	892.5
3	SS	18	12	*5000		22.5	CL			**SHALY CLAY**, very stiff, light brown
	PA								8.4	890.1
4	SS	3	50/3"			15.2			9.0	**LIMESTONE**, hard 889.5

AUGER REFUSAL @ 9.0 FEET

ATTERBERG LIMITS
Sample 1, Depth 1-2.5 feet

LL	PL	PI
49	22	27

**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

CFS ENGINEERS
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Boring Started	**8-27-20**		
Boring Completed	**8-27-20**		
Drill Rig	**RC-550**	Driller	**LC**
Approved By:	**JJZ**	Project No.	**19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **238,156.5** EASTING **2,108,645.2**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-44

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION	
										Surface Elevation:	**890.9**
	PA								0.5	**Topsoil**, dark brown (6")	890.4
1	SS	6	13	*7500		27.5	CL CH			**FILL**, lean to fat clay, very stiff, brown and reddish brown mixed, trace gravel	
	PA								3.0		887.9
2	SS	12	70/11"	*8500		26.6				**SHALE**, weathered, mod. hard to hard, sandy, light gray brown to tan and light gray	
	PA								5		
3	SS	4	50/4"			13.1					
	PA										
4	SS	4	50/4"			14.1			9.0		881.9

BOTTOM OF BORING

ATTERBERG LIMITS
Sample 2, Depth 3.5-5 feet

LL	PL	PI
25	19	6

**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

CFS ENGINEERS
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Boring Started	**8-18-20**
Boring Completed	**8-18-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **237,544.3** EASTING **2,107,610.9**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-45

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Surface Elevation: 897.0
	PA									**Topsoil**, dark brown (14")
									1.2	895.8
1	SS	10	6	*2500		21.7	CH			**FAT CLAY**, medium stiff, brown to light brown
	PA									
2	SS	12	5	*2000		28.4	CH		5	
	PA								5.5	891.5
3	SS	10	58/10"	*9000		18.9			6.8	**SHALE, weathered, mod. hard to hard, yellowish tan 890.2
	PA								7.5	**LIMESTONE, hard 889.5

AUGER REFUSAL @ 7.5 FEET

ATTERBERG LIMITS
Sample 2, Depth 3.5-5 feet

LL	PL	PI
82	29	53

**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

CFS ENGINEERS
cfse.com

Boring Started	**8-26-20**		
Boring Completed	**8-26-20**		
Drill Rig	**RC-550**	Driller	**LC**
Approved By:	**JJZ**	Project No.	**19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **237,882.1** EASTING **2,107,823.2**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-46

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Surface Elevation: 887.0
	PA									**Topsoil**, dark brown (12")
									1.0	886.0
1	SS	18	88			14.0				**SHALE**, weathered, mod. hard to hard, yellowish tan
	PA									
0	SS	6	50/6"			14.5			4.0	883.0
										BOTTOM OF BORING
										**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

CFS ENGINEERS
cfse.com

Boring Started	**8-25-20**		
Boring Completed	**8-25-20**		
Drill Rig	**RC-550**	Driller	**LC**
Approved By:	**JJZ**	Project No.	**19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **237,956.6** EASTING **2,108,297.0**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-47

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Surface Elevation: 892.4
	PA									**Topsoil**, dark brown (12")
									1.0	891.4
1	SS	12	20	*7500		18.5	CH			**FAT CLAY**, very stiff, brown
									2.5	889.9
	PA									**SHALY CLAY**, very stiff, yellowish tan, with shale fragments
2	SS	18	14	*6000		18.4	CL			
	PA								5	
									5.3	887.1
									5.8	**LIMESTONE, hard 886.6

AUGER REFUSAL @ 5.8 FEET

**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

CFS ENGINEERS
cfse.com

Boring Started	**8-27-20**
Boring Completed	**8-27-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **238,193.3** EASTING **2,108,230.2**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-48

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Surface Elevation: 883.8
	PA								0.7	**Topsoil**, dark brown (8") 883.1
1	SS	18	53			14.6				**SHALE**, weathered, mod. hard to hard, yellowish tan to gray brown
	PA									
2	SS	5	50/5"			15.3				
	PA								5	
3	SS	6	50/6"			19.2				
	PA								7.4	876.4
									8.0	**LIMESTONE**, hard 875.8

AUGER REFUSAL @ 8.0 FEET

**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

CFS ENGINEERS
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Boring Started	**8-25-20**
Boring Completed	**8-25-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **238,458.5** EASTING **2,107,435.7**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-49

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION — Surface Elevation: 857.7
	PA									**LEAN CLAY**, soft to medium stiff, dark gray brown, trace organics (Topsoil)
1	SS	12	4	*2500		24.7	CL OL			
	PA									
									3.5	854.2
2	SS	15	6	*3000		27.2	CL CH			**LEAN TO FAT CLAY**, medium stiff to stiff, brown
									5.0	852.7
									5	**BOTTOM OF BORING**

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

CFS ENGINEERS cfse.com

Boring Started	**8-26-20**
Boring Completed	**8-26-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **237,768.6** EASTING **2,109,268.4**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-50

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL
	PA						
1	SS	4	2	*500		20.6	CL
	PA						
2	SS	18	9	*4000		25.6	CL
	PA						
3	SS	18	7	*3000		26.0	CH
	PA						
4	SS	18	6	*2500		26.3	CL CH
	PA						
5	SS	18	4	*1500		27.6	CL

MATERIAL DESCRIPTION

Surface Elevation: 847.4

DEPTH, Feet.		
	FILL, lean clay, soft to very soft, dark gray brown, trace wood, gravel and rubber	
3.0		844.4
	LEAN CLAY, stiff, gray brown mottled reddish brown, trace fine sand	
6.0		841.4
	FAT CLAY, stiff, dark brown to gray	
8.0		839.4
	LEAN TO FAT CLAY, medium stiff to stiff, gray	
12.0		835.4
	SILTY LEAN CLAY, soft to medium stiff, light brown mottled light gray, trace fine sand	
15.0		832.4
	BOTTOM OF BORING	

ATTERBERG LIMITS
Sample 2, Depth 3.5-5 feet

LL	PL	PI
42	17	25

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **6.5 feet W.D.**

▼ **9.5 feet A.B.**

Backfilled @ Completion

CFS ENGINEERS
cfse.com

Boring Started	**8-19-20**
Boring Completed	**8-19-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

BOREHOLE INFORMATION Page 1 of 2

STATION OFFSET

NORTHING **237,991.3** EASTING **2,108,664.0**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-51

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL
	PA						
1	SS	10	15	*7500		18.5	CL
	PA						
2	SS	15	7	*2500		22.8	CL
	PA						
3	SS	4	50/4"	*3500		16.7	
	PA						
4	SS	5	50/5"			15.1	
	PA						
5	SS	2	50/2"			16.2	
	PA						
6	SS	2	50/2"			21.9	

GRAPHIC LOG

DEPTH, Feet.

MATERIAL DESCRIPTION

Surface Elevation: 889.9

5

FILL, lean clay, very stiff to stiff, dark gray brown and brown mixed, trace gravel

5.5 884.4

10

SHALE, weathered, mod. hard to hard, light gray brown

12.0 877.9

15

SANDSTONE, weathered, poorly cemented to cemented, shaley, fine grained, light brown to light gray

19.0 870.9

BOTTOM OF BORING

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **18.5 feet W.D.**

▼ **18.7 feet A.B.**

Backfilled @ Completion

CFS ENGINEERS cfse.com

Boring Started	**8-18-20**
Boring Completed	**8-18-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

BOREHOLE INFORMATION Page 2 of 2

STATION OFFSET

NORTHING **237,991.3** EASTING **2,108,664.0**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-51

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION

ATTERBERG LIMITS

Sample 1, Depth 1-2.5 feet

LL	PL	PI
43	19	24

**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **18.5 feet W.D.**

▼ **18.7 feet A.B.**

Backfilled @ Completion

CFS ENGINEERS cfse.com

Boring Started	8-18-20		
Boring Completed	8-18-20		
Drill Rig	RC-550	Driller	LC
Approved By:	JJZ	Project No.	19-1196

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **237,748.1** EASTING **2,109,414.1**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-52

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Surface Elevation: 843.2
	PA									
1	SS	3	6	*2000		15.5	CL			**FILL**, lean clay, stiff, light brown and brown mixed, with shale fragments
	PA								3.0	840.2
2	SS	18	21			7.4	SP			**FILL**, sand, medium dense, fine to medium grained, poorly graded, brown
	PA								5	
									6.0	837.2
3	SS	18	25	*8500		21.2	CH			**FAT CLAY**, very stiff, gray brown
	PA								8.0	835.2
4	SS	18	15	*6500		22.2	CL CH			**LEAN TO FAT CLAY**, very stiff, brown to light brown mottled reddish brown
	PA								10	
5	SS	18	20	*7500		23.1	CL CH			
									15	
									15.0	828.2
										BOTTOM OF BORING

ATTERBERG LIMITS
Sample 3, Depth 6-7.5 feet

LL	PL	PI
54	23	31

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

CFS ENGINEERS
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Boring Started	**8-18-20**
Boring Completed	**8-18-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **237,750.8** EASTING **2,109,550.2**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-53

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Surface Elevation: 840.3
	PA									
1	SS	8	10			6.4	GM			**FILL**, crushed limestone aggregate, loose, brown
	PA									
2	SS	8	8			4.5	GM		5	
	PA									
3	AS					6.1	GM			
	PA									
									8.0	832.3
4	SS	18	7	*2000		27.1	CL			**SILTY LEAN CLAY**, medium stiff to stiff, reddish brown, trace fine sand
	PA								10	
5	SS	18	14	*3500		30.8	CL			
									15.0	825.3
									15	**BOTTOM OF BORING**

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **5.5 feet W.D.**

▼ **6.0 feet A.B.**

Backfilled @ Completion

CFS ENGINEERS
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Boring Started	**8-19-20**
Boring Completed	**8-19-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **238,778.4** EASTING **2,107,663.3**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-54

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Surface Elevation: 850.0
	PA								0.5	**Topsoil**, dark brown (4") 849.5
1	SS	11	93/11"			13.4				**SHALY SANDSTONE**, weathered, poorly cemented, fine grained, light brown to tan
	PA									
2	SS	11	92/11"			11.6			4.5	845.5

BOTTOM OF BORING

**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

CFS ENGINEERS
cfse.com

Boring Started	**8-26-20**
Boring Completed	**8-26-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **237,753.5** EASTING **2,109,865.2**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-55

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Surface Elevation: 841.8
	PA									
1	SS	11	6	*2000		21.3	CL CH			**FILL**, lean to fat clay, medium stiff to stiff, dark gray brown and brown mixed
	PA									
2	SS	18	7	*2500		28.1	CL CH			
									5	5.0 836.8
										BOTTOM OF BORING

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

CFS ENGINEERS cfse.com

Boring Started	**8-19-20**
Boring Completed	**8-19-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **237,639.0** EASTING **2,109,840.4**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-56

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Surface Elevation: 842.3
	PA									**Topsoil**, dark brown (3"), weeds
1	SS	10	7	*2500		19.3	CL CH			**FILL**, lean to fat clay, stiff to very stiff, brown and dark brown mixed, with gravel and some fine sand
	PA									
2	SS	14	10	*4500		17.2	CL CH			
									5	5.0 837.3
										BOTTOM OF BORING

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

CFS ENGINEERS
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Boring Started	**8-20-20**
Boring Completed	**8-20-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **238,687.7** EASTING **2,107,480.1**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-57

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL
	PA						
1	SS	18	9	*3500		27.2	CH
	PA						
2	SS	15	7	*2500		27.1	CH
	PA						
3	SS	18	9	*4000		25.3	CH
	PA						
4	SS	6	50/6"			13.7	
	PA						
5	SS	6	50/6"			19.6	

** compressive strength in psi * Calibrated Penetrometer

MATERIAL DESCRIPTION

Surface Elevation: 848.2

1.0 — 847.2

Topsoil, dark brown (12")

FAT CLAY, stiff, brown to light brown

8.0 — 840.2

SHALY SANDSTONE, weathered, poorly cemented, fine grained, light brown to tan

14.0 — 834.2

BOTTOM OF BORING

ATTERBERG LIMITS
Sample 1, Depth 1-2.5 feet

LL	PL	PI
57	20	37

**Rock classification is based on drilling characteristics and visual observation of disturbed samples. Core samples may reveal other rock types.

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **8.5 feet W.D.**

▼ **13.5 feet A.B.**

Backfilled @ Completion

CFS ENGINEERS
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Boring Started	**8-26-20**
Boring Completed	**8-26-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **237,438.7** EASTING **2,109,764.5**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-58

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Surface Elevation: 841.5
	PA									
1	SS	14	7	*3500		22.0	CH			**FILL**, fat clay, stiff to soft, light brown and reddish brown mixed, trace gravel
	PA									
2	SS	11	3	*1500		27.3	CH		5	5.0 836.5
										BOTTOM OF BORING

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

CFS ENGINEERS cfse.com

Boring Started	**8-20-20**
Boring Completed	**8-20-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **237,630.4** EASTING **2,109,584.9**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-59

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Surface Elevation: 840.0
	PA									
1	SS	12	18	*9000		16.5	CL			**FILL**, lean clay, very stiff, desiccated, dark gray brown and brown mixed, trace gravel
									2.5	837.5
	PA									
2	SS	16	15	*5500		20.6	CL CH			**FILL**, lean to fat clay, very stiff, desiccated, dark gray brown and brown mixed, trace gravel
									5.0	835.0
									5	**BOTTOM OF BORING**

ATTERBERG LIMITS
Sample 1, Depth 1-2.5 feet

LL	PL	PI
42	20	22

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

CFS ENGINEERS
cfse.com

Boring Started	**8-19-20**
Boring Completed	**8-19-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

BOREHOLE INFORMATION Page 1 of 1

STATION OFFSET

NORTHING **237,502.2** EASTING **2,109,501.9**

DRILLING COMPANY **RC Drilling, Inc.**

METHOD **6-inch Flight Augers** HAMMER **Auto**

LOG OF BORING NO. B-60

PROJECT NAME **MSO Field Operations Facility**

SITE LOCATION **19th Street & O'Connell Road Lawrence, Kansas**

OWNER / ARCHITECT **Dake | Wells Architecture**

SAMPLE NO.	SAMPLE TYPE	RECOVERY	STANDARD PENETRATION BLOWS/FT.	UNCONFINED STRENGTH PSF	DRY DENSITY PCF	MOISTURE CONTENT, %	UNIFIED SOIL SYMBOL	GRAPHIC LOG	DEPTH, Feet.	MATERIAL DESCRIPTION
										Surface Elevation: 840.5
	PA									
1	SS	10	8	*3500		24.6	CL CH			**FILL**, lean to fat clay, stiff to very stiff, dark gray brown and brown mixed, trace gravel
	PA									
2	SS	18	15	*7000		17.4	CL CH		5	5.0 835.5
										BOTTOM OF BORING

** compressive strength in psi * Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil and rock types. In-situ the transition may be more gradational in nature.

WATER LEVEL OBSERVATIONS

▽ **Dry W.D.**

▼ **Dry A.B.**

Backfilled @ Completion

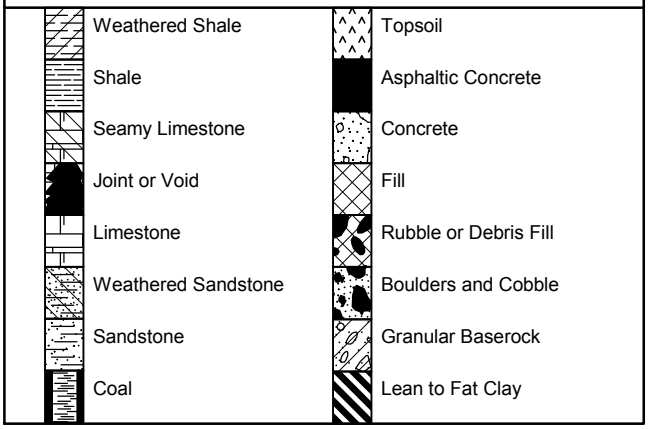
CFS ENGINEERS cfse.com

Boring Started	**8-19-20**
Boring Completed	**8-19-20**
Drill Rig **RC-550**	Driller **LC**
Approved By: **JJZ**	Project No. **19-1196**

UNIFIED SOIL CLASSIFICATION (ASTM D-2487-98)

MATERIAL TYPES	CRITERIA FOR ASSIGNING SOIL GROUP NAMES			GROUP SYMBOL	SOIL GROUP NAMES & LEGEND
COARSE-GRAINED SOILS >50% RETAINED ON NO. 200 SIEVE	GRAVELS >50% OF COARSE FRACTION RETAINED ON NO 4. SIEVE	CLEAN GRAVELS <5% FINES	Cu>4 AND 1<Cc<3	GW	WELL-GRADED GRAVEL
			Cu>4 AND 1>Cc>3	GP	POORLY-GRADED GRAVEL
		GRAVELS WITH FINES >12% FINES	FINES CLASSIFY AS ML OR CL	GM	SILTY GRAVEL
			FINES CLASSIFY AS CL OR CH	GC	CLAYEY GRAVEL
	SANDS >50% OF COARSE FRACTION PASSES ON NO 4. SIEVE	CLEAN SANDS <5% FINES	Cu>6 AND 1<Cc<3	SW	WELL-GRADED SAND
			Cu>6 AND 1>Cc>3	SP	POORLY-GRADED SAND
		SANDS AND FINES >12% FINES	FINES CLASSIFY AS ML OR CL	SM	SILTY SAND
			FINES CLASSIFY AS CL OR CH	SC	CLAYEY SAND
FINE-GRAINED SOILS >50% PASSES NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT<50	INORGANIC	PI>7 AND PLOTS>"A" LINE	CL	LEAN CLAY
			PI>4 AND PLOTS<"A" LINE	ML	SILT
		ORGANIC	LL (oven dried)/LL (not dried)<0.75	OL	ORGANIC CLAY OR SILT
	SILTS AND CLAYS LIQUID LIMIT>50	INORGANIC	PI PLOTS >"A" LINE	CH	FAT CLAY
			PI PLOTS <"A" LINE	MH	ELASTIC SILT
		ORGANIC	LL (oven dried)/LL (not dried)<0.75	OH	ORGANIC CLAY OR SILT
HIGHLY ORGANIC SOILS		PRIMARILY ORGANIC MATTER, DARK IN COLOR, AND ORGANIC ODOR		PT	PEAT

BEDROCK AND OTHER MATERIAL SYMBOLS



BEDROCK PROPERTIES & DESCRIPTIONS

ROCK QUALITY DESIGNATION

DESCRIPTION	RQD (%)
Very Poor	0 - 25
Poor	25 - 50
Fair	50 - 75
Good	75 - 90
Excellent	90 -100

BEDDING CHARACTERISTICS

TERM	THICKNESS (inches)
Massive	> 60
Very Thick Bedded	36 - 60
Thick Bedded	12 - 36
Medium Bedded	4 - 12
Thin Bedded	1 - 4
Very Thin Bedded	0.4 - 1
Laminated	< 0.4

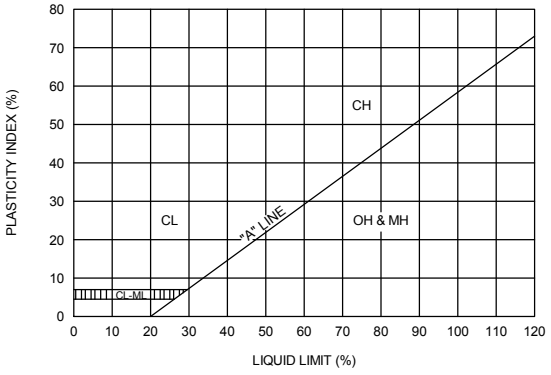
DEGREE OF WEATHERING

Slightly Weathered - Slight decomposition of Parent material in joints and seams.
Weathered - Well-developed and decomposed joints and seams.
Highly Weathered - Rock highly decomposed, may be extreemly broken.

BEDROCK DISCONTINUITIES

Bedding Planes — Planes dividing the individual layers, beds or strata of rocks.
Joints — Fractures in rock, generally more or less vertical to the bedding.
Seams — Applies to bedding planes with an unspecified degree of weathering.

PLASTICITY CHART



PENETRATION RESISTANCE
(RECORDED AS BLOWS / 0.5 FT)

SAND & GRAVEL		SILT & CLAY		
RELATIVE DENSITY	BLOWS/FOOT*	CONSISTENCY	BLOWS/FOOT*	COMPRESSIVE STRENGTH (TSF)
VERY LOOSE	0 - 4	VERY SOFT	0 - 2	0 - 0.25
LOOSE	4 - 10	SOFT	2 - 4	0.25 - 0.50
MEDIUM DENSE	10 - 30	MEDIUM STIFF	4 - 8	0.50 - 1.0
DENSE	30 - 50	STIFF	8 - 15	1.0 - 2.0
VERY DENSE	OVER 50	VERY STIFF	15 - 30	2.0 - 4.0
		HARD	OVER 30	OVER 4.0

* NUMBER OF BLOWS OF 140 LB HAMMER FALLING 30 INCHES TO DRIVE A 2 INCH O.D. (1-3/8 INCH I.D.) SPLIT-BARREL SAMPLER THE LAST 12 INCHES OF AN 18-INCH DRIVE (ASTM-1586 STANDARD PENETRATION TEST).

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General Notes and Terms

Graph:LOGNOTES 11/6/2007 8:23:13 AM

BORING LOG SYMBOLS

SURFACE MATERIALS

TOPSOIL

FILL MATERIAL

ASPHALTIC CONCRETE

CONCRETE

GRANULAR BASE

COHESIVE SOILS

SILT

CLAYEY SILT

LEAN CLAY

LEAN TO FAT CLAY

FAT CLAY

LARGE GRANULAR SOILS

COBBLES & BOULDERS

WELL GRADED GRAVEL

POORLY GRADED GRAVEL

SILTY GRAVEL

CLAYEY GRAVEL

GRANULAR SOILS

SANDY SILT

SILTY SAND

FINE SAND

POORLY GRADED SAND

WELL GRADED SAND

GRAVELLY SAND

BEDROCK UNITS

SHALE

FISSILE SHALE

SANDSTONE

LIMESTONE

COAL

WEATHERED BEDROCK

JOINT OR VOID

WEATHERED SHALE

WEATHERED SANDSTONE

WEATHERED LIMESTONE

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Key to Soil Symbols and Terms

TERMS DESCRIBING CONSISTENCY OR CONDITION

COARSE-GRAINED SOILS (major portions retained on No. 200 sieve): includes (1) clean gravel and sands and (2) silty or clayey gravels and sands. Condition is rated according to relative density as determined by laboratory tests or standard penetration resistance tests.

Descriptive Terms	Relative Density	SPT Blow Count
Very loose	0 to 15 %	< 4
Loose	15 to 35 %	4 to 10
Medium dense	35 to 65 %	10 to 30
Dense	65 to 85 %	30 to 50
Very dense	85 to 100 %	> 50

FINE-GRAINED SOILS (major portions passing on No. 200 sieve): includes (1) inorganic and organic silts and clays, (2) gravelly, sandy, or silty clays, and (3) clayey silts. Consistency is rated according to shearing strength, as indicated by penetrometer readings, SPT blow count, or unconfined compression tests.

Descriptive Terms	Unconfined Compressive Strength kPa	SPT Blow Count
Very soft	< 25	< 2
Soft	25 to 50	2 to 4
Medium stiff	50 to 100	4 to 8
Stiff	100 to 200	8 to 15
Very stiff	200 to 400	15 to 30
Hard	> 400	> 30

GENERAL NOTES

1. Classifications are based on the United Soil Classification System and include consistency, moisture, and color. Field descriptions have been modified to reflect results of laboratory tests where deemed appropriate.

2. Descriptions on the boring logs apply only at the specific boring locations and at the time the borings were made. They are not guaranteed to be representative of subsurface conditions at other locations or times.

WATER LEVEL OBSERVATIONS

Water level shown on the boring logs were measured at the times indicated, In sands and other granular soils, the indicated levels may reflect the location of groundwater. In clays and other low permeability soils, the accurate determination of the level of the groundwater is not possible with only short-term observations.

WATER LEVEL OBSERVATION DESIGNATION

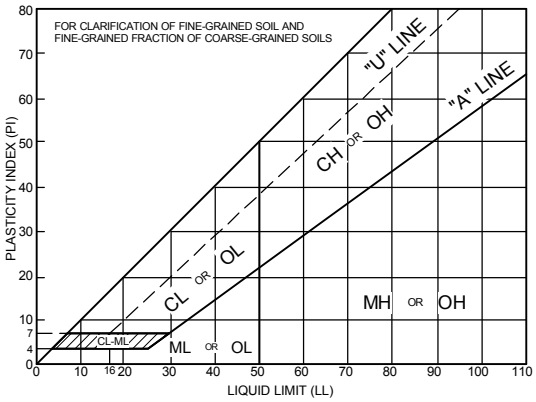
W.D. - While Drilling A.B. - After Boring
B.C.R. - Before Casing Removal A.C.R - After Casing Removal
24 hr. - Water Level takes at approximately 24 hours after boring completion

Major Divisions			Group Symbols	Typical Names	Laboratory Classification Criteria
Coarse-Grained soils (More than half the material is larger than No. 200 sieve size)	Gravels (More than half of coarse fraction is larger than No. 4 sieve size)	Clean gravel (Little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	$C_U = \frac{D_{60}}{D_{10}}$ greater than 4; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3
			GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines	Not meeting all gradation requirements for GW
		Gravel with fines (Appreciable amount of fines)	GM* d / u	Silty gravels, gravel-sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4
			GC	Clayey gravels, gravel-sand-silt mixtures	Atterberg limits above "A" line or P.I. greater than 7
	Sands (More than half of coarse fraction is smaller than No. 4 sieve size)	Clean sands (Little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines	$C_U = \frac{D_{60}}{D_{10}}$ greater than 6; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3
			SP	Poorly-graded sands, gravelly sands, little or no fines	Not meeting all gradation requirements for SW
		Sands with fines (Appreciable amount of fines)	SM* d / u	Silty sands, sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4
			SC	Clayey sands, sand-clay mixtures	Atterberg limits above "A" line or P.I. greater than 7
Fine-Grained soils (More than half the material is smaller than No. 200 sieve size)	Silts and Clays (Liquid limit less than 60)		ML	Inorganic silts and very fine sands, rock floor, silty or clayey fine sands or clayey silts with slight plasticity	
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	
			OL	Organic silts and organic silty clays of low plasticity	
	Silts and Clays (Liquid limit greater than 60)		MH	Inorganic silts, micaceous or disto-maceous fine sandy or silty soils, organic silts	
			CH	Inorganic clays of high plasticity, fat clays	
			OH	Organic clays of medium to high plasticity, organic silts	
	Highly Organic Soils		Pt	Peat and other highly organic soils	

Determine percentages of sand and gravel from grain size curve, Depending on percentage of fines (fraction smaller than No. 200 sieve) coarse-grained soils are classified as follows:
Less than 5 percent..... GW, GP, SW, SP
More than 12 percent..... GM, GC, SM, SC
6 to 12 percent..... Borderline case4s requiring dual symbols**

Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols

Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols



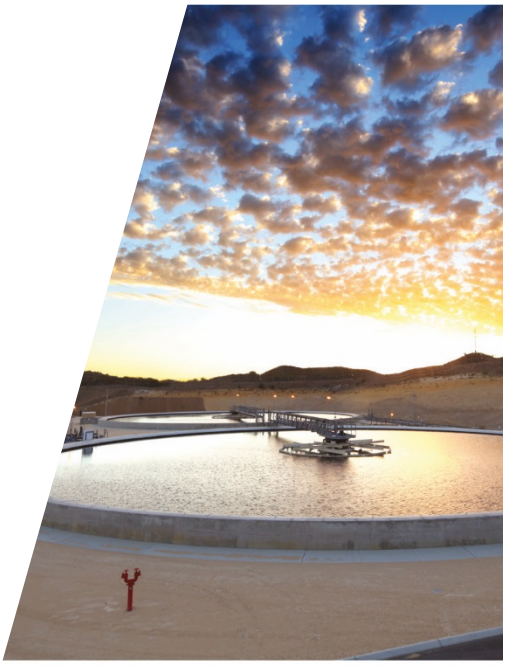
Plasticity Chart

Material	Particle Size mm	Particle Size Sieve
Gravel	4.76 to 19.1	#4 to 3/4 in.
Fine	4.76 to 19.1	#4 to 3/4 in.
Coarse	19.1 to 76.2	3/4 in. to 3 in.
Cobble	76.2 to 304.8	3 in. to 12 in.
Boulders	304.8 to 914.4	12 in. to 36 in.

Material	Particle Size mm	Particle Size Sieve sizes
Silt or clay	< 0.074	< #200
Sand	0.074 to 0.42	#200 to #40
Fine	0.074 to 0.42	#200 to #40
Medium	0.42 to 2.00	#40 to #10
Coarse	2.00 to 4.76	#10 to #4

* Division of GM and SM groups into subdivisions of d and u are for roads and airfields only. Subdivision is based on Atterberg Limits: suffix d used when L.L. is 23 or less and the P.I. is 6 or less; the suffix is used when L.L. is greater than 26.

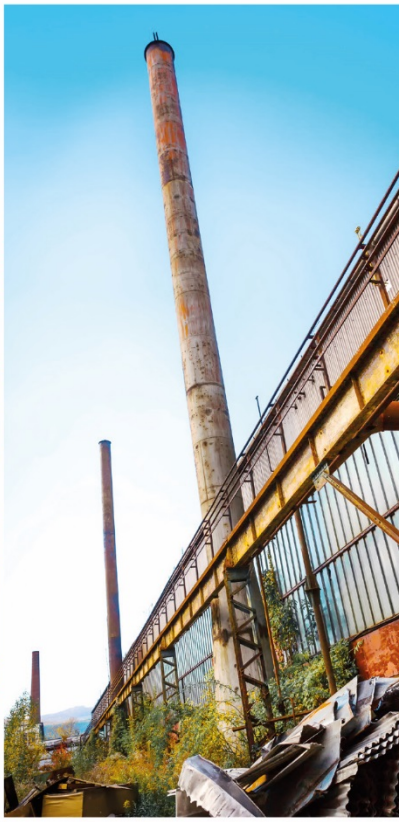
** Borderline classifications used for soils possessing characteristics of two groups are designated by combinations of groups symbols. For example; GW-GC, well-graded gravel-sand mixture with clay binder.



Environmental Soil Sampling Report – August 2020

Farmland Nitrogen Plant Remediation
MSO Environmental Sampling
Lawrence, Kansas

The City of Lawrence



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   - 1.1 Site Description 1
   - 1.2 Site History 1
2. Field Activities 2
   - 2.1 Quality Control Samples 3
   - 2.2 Laboratory Analytical Methods 3
   - 2.3 Analytical Results Summary 3
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Figure Index

Figure 1 Site Location Map

Figure 2 Soil Boring and Concentration Map

Table Index

Table 1 Soil Sample Analytical Results Summary

Table 2 Rinsate Sample Analytical Results Summary

Table 3 Investigation-Derived Waste Sample Analytical Results Summary

Appendix Index

Appendix A Field Notes

Appendix B Laboratory Analytical Results and Chain-of-Custody

Appendix C Laboratory Analytical Results and Chain-of-Custody (Investigation-Derived Waste)

Appendix D Reduced Data Validation Memo

1. Introduction

This report was prepared by GHD Services Inc. (GHD) to present the results of soil sampling performed by GHD during geotechnical drilling at the Former Farmland Nitrogen Plant Site (Site) located at 1608 N 1400 Road in the City of Lawrence, Kansas (the City). The geotechnical drilling was performed by Cook, Flatt & Strobel Engineers (CFS) to provide support for planning and design for future development of a Municipal Services Operations (MSO) Facility at the Site. GHD collected soil samples from the geotechnical boreholes for laboratory analysis for nitrogen compounds to support soil management of nitrogen-impacted soils during redevelopment of the Site. The data is also anticipated to be used to support potential future remediation decisions.

1.1 Site Description

The Site is located within Section 4 of Township 13 South, Range 20 East of the Public Lands Survey System. The original Farmland Site encompassed approximately 467 acres, not including approximately 30 acres of farm ground located between the BNSF Railroad right-of-way and 15th Street. More than 200 acres of land in the southern part of the Site have been redeveloped as an industrial park known as the Lawrence Venture Park business park. The location of relevant areas of the Site subject to the development of the MSO Facility are illustrated on Figure 1.

The Site lies between Kansas State Highway K-10 on the south and 15th Street to the north. Land use in the Site's vicinity includes commercial/industrial and residential use to the west, and commercial/industrial use to the south and east. Agricultural land occupies areas beyond East 1500 Road north of the Site, and the Kansas River flows east-southeasterly approximately one-half mile north of the Site.

Geology of the highlands on-site is comprised of unconsolidated clay overburden overlying alternating layers of shale, siltstone, and sandstone. Geology of the lowland is described as terrace deposits overlying sandstone and shale on the south trending to a sandy alluvial aquifer to the north which increases in depth and thickness toward the main river channel.

1.2 Site History

Manufacturing of nitrogen fertilizers began at the Site in 1954 and ended in 2001. Products manufactured and distributed by Farmland at this facility included anhydrous ammonia, granular urea, prilled ammonium nitrate, nitric acid, and urea-ammonium nitrate. As a result of the manufacturing operations and incidental spills over the course of the facility's operating history, soils and groundwater at the Site are impacted with nitrogen compounds, including ammonia, nitrate and nitrite. The nitrogen-impacted soils and groundwater were characterized and remedial alternatives implemented by Farmland Industries under a Consent Order with the Kansas Department of Health and Environment. After Farmland's bankruptcy in 2002, remediation activities were performed by the Farmland Industries Kansas Remediation Trust (FIKRT). On September 29, 2010, FIKRT and the City entered into an agreement by which the Site was acquired by the City.

The City is actively redeveloping this Site as corrective actions are implemented. The southern portion has been successfully re-purposed as a business park (VenturePark). The remaining

northern portion, subject to the associated geotechnical evaluation, is currently being considered by the City for redevelopment as a Site for field operations for their Municipal Services Operations.

2. Field Activities

From August 17 to August 20, 2020, GHD collected a total of 99 soil samples for chemical laboratory analysis from boreholes being advanced for the purpose of obtaining geotechnical information. The drilling was performed by R.C. Drilling as a subcontractor to CFS Engineers. GHD provided work space breathing zone monitoring for ammonia utilizing a calibrated photoionization detector (PID) utilizing a 10.6 eV lamp.

The Scope of Work included soil sample collection for laboratory analysis of nitrate, nitrite, and ammonia at 18 geotechnical borehole locations shown on Figure 2. Following standard industry practices for the collection of environmental samples, qualified GHD staff collected soils from each borehole location, described the samples according to the United Soil Classification System (USCS) as well as additional observations and information provided by the geotechnical drill crew. GHD collected samples using a new pair of disposable nitrile gloves and placed the samples directly into air-tight baggies for field screening headspace analysis. GHD collected soil samples for laboratory analysis directly into laboratory-supplied containers, blind-labeled the sample containers with unique sample identifications, and placed the containers in a laboratory-supplied cooler with ice to maintain a sample temperature of no more than 4°C. Each sample was labeled using the following format:

Sample ID:	SO – 081720 – XX – ###
SO	designates media (SO soil)
081720	designates date of collection presented as month/day/year
XX	sampler's initials
###	sequential sample number

All samples were shipped on ice, under legal chain-of-custody protocols to Pace Analytical Laboratories (Pace) located in Lenexa, Kansas.

After each use, the split-spoon was decontaminated using clean water and detergent. The decontamination water was collected and staged in on-site 55-gallon drums. A rinsate sample was collected at the end of each day from the split-spoon by pouring distilled water over the recently decontaminated sampler directly into laboratory-supplied containers. GHD collected a composite sample of the collected decontamination water (also known as investigation derived waste or IDW) and submitted the sample for analysis to the same laboratory under a separate chain-of-custody.

The only deviations from the planned scope of work were the offsetting of two soil borings. BH-17 was offset due to an underground obstruction. BH-16 was offset due encountering shallow bedrock. The offset provided the same result and efforts to install this boring were discontinued at a termination depth of 2 feet. These offsets are reflected on Figure 2. Field notes and boring logs for the borings from which GHD collected soil samples for environmental analyses are provided in Appendix A.

2.1 Quality Control Samples

To ensure the validity of the sampling and analysis program, field quality control (QC) samples were collected with the investigative samples. Field QC samples consisted of five duplicate soil samples collected from soil borings BH-27, BH-53, BH-55, BH-58 and BH-60 and two rinsate samples collected from the decontaminated split-spoon sampler.

2.2 Laboratory Analytical Methods

GHD submitted soil samples and IDW water samples to Pace with a request for a standard-turn-around time of ten business days for the following:

- Nitrate and Nitrate as Nitrogen by SW-846 Method 350.1
- Ammonia as Nitrogen by SW-846 Method 353.2
- Percent Moisture by ASTM Standard D2974

2.3 Analytical Results Summary

The laboratory analysis report submitted by Pace is provided in Appendix B. The laboratory analytical results are summarized in Table 1 as well as in presented on Figure 2.

GHD collected 99 soil samples for laboratory analysis from 18 boreholes. Ammonia was reported in 92 of the soil samples at concentrations ranging from 1.2 J- mg/kg to 5,510 J- mg/kg. Ammonia was reported in samples collected from every borehole with the exception of BH-16 which was terminated at less than 2 feet below ground surface (ft bgs) due to refusal. The highest concentrations were present in samples collected from 13.5-15 ft bgs at boreholes BH-10 (5,160 mg/kg) and BH-53 (5,510 mg/kg) east of AST #5. Ammonia was present throughout the soil profile across most of the Site. Ammonia was not detected above method reporting limits ranging from 1.0 J to 1.2 J- mg/kg in seven of the samples collected by GHD.

Nitrate (as N) was detected in 96 samples at concentrations ranging from 1.3 mg/kg to 2,710 J-mg/kg. Nitrate was reported in samples from all 18 boreholes. The highest concentrations were present in samples collected from 6-7.5 ft bgs at borehole BH-06 (2,240 mg/kg) near AST #6 and from 13.5-15 ft bgs at BH-10 (2,710 mg/kg) east of AST #5. Nitrate was present throughout the soil profile across the Site. Nitrate as N was not detected above method reporting limits of 1.1 mg/kg and 1.2 mg/kg in three samples collected by GHD.

Nitrite (as N) was detected in eight samples at concentrations ranging from 1.2 mg/kg to 2.2 J-mg/kg. Nitrite (as N) was reported in samples from five boreholes (BH-17A, BH-23, BH-52, BH-58 and BH-60); however, the laboratory detection limits were elevated for many analytical results and several analytical results were rejected during the data validation process described in Section 2.4. Nitrite (as N) was not detected above method reporting limits ranging from 1.1 to 67.7 mg/kg in 91 soil samples collected by GHD.

Pace reported no detected ammonia, nitrate (as N) or nitrite (as N) in the two rinsate samples indicating that the field decontamination procedures were acceptable. This data is summarized in Table 2.

The IDW sample contained 70.5 mg/L of ammonia, 28.9 mg/L of nitrate (as N), and 2.1 mg/L of nitrite (as N). This data is summarized in Table 3. The laboratory analysis report for the IDW sample provided by Pace is provided in Appendix C.

2.4 Reduced Data Validation

A GHD project chemist performed a reduced validation of the laboratory data for quality assurance criteria which are consistent with guidance and quality control procedures established by the USEPA Contract Laboratory Program in *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review, United States Environmental Protection Agency (USEPA) 540-R-10-011, January 2010*. The evaluation of the data was based upon information obtained from chain-of-custody forms, finished report forms, blank data, duplicate data, and recovery data for matrix, laboratory control and surrogate spikes.

The results of the evaluation are reported in the Appendix D. Results of the data validation for events indicate that the data are acceptable with the exception that fourteen nitrite results and one nitrate result were rejected due to the matrix spike recoveries being outside of the recommended guidelines. The rejected results are represented by an “R” in Table 1 and on Figure 2.

3. Conclusions

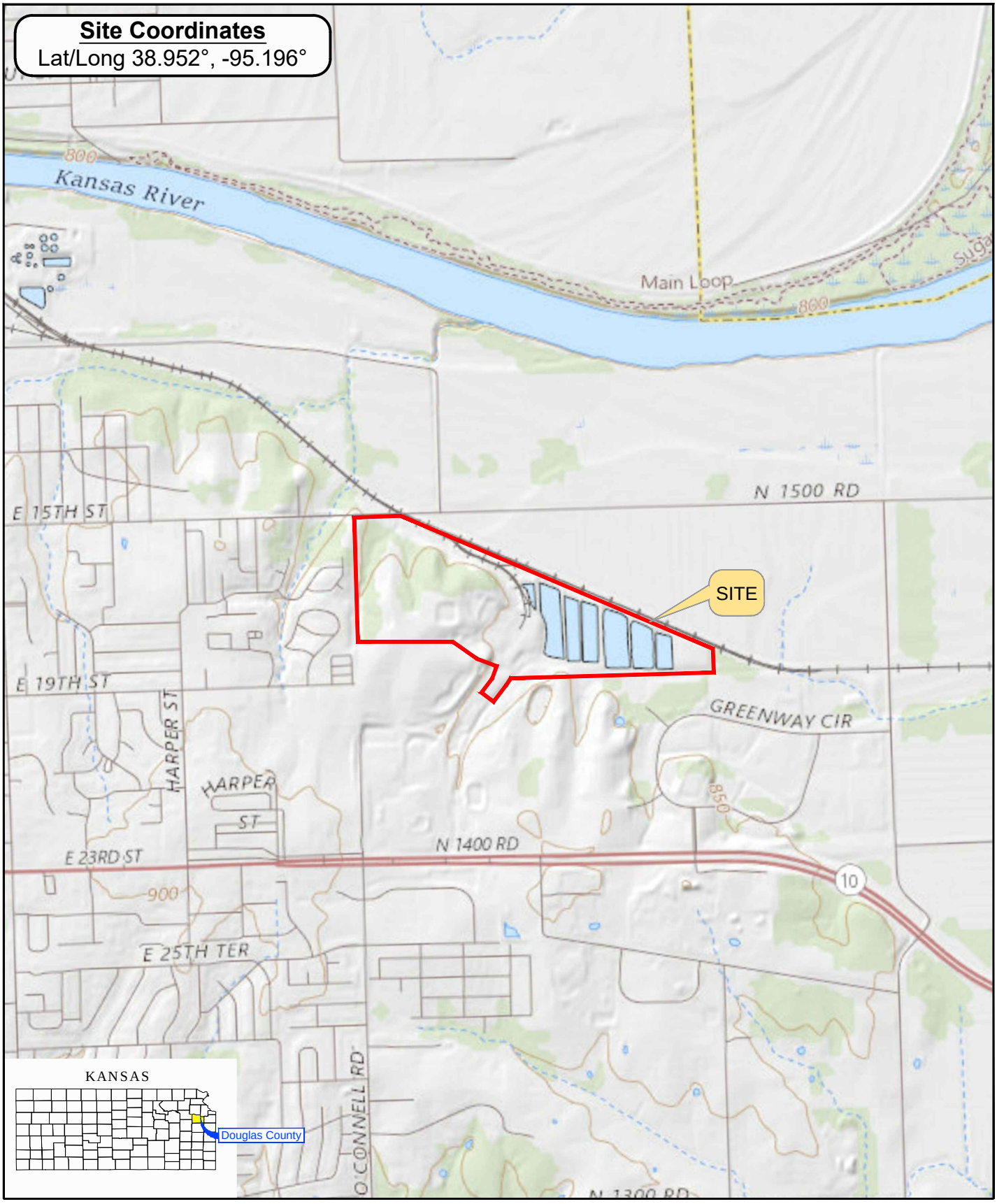
GHD collected soil samples for laboratory analysis from geotechnical boreholes in the area of a planned MSO facility at the Former Farmland Nitrogen Plant Site. The laboratory analytical data provide an understanding of the concentrations and distribution of ammonia, nitrate and nitrite in soils on which the MSO Facility will be constructed and is anticipated to be used for soil management decisions associated with future construction of the MSO Facility. Although ammonia and nitrate concentrations were present throughout the soil profile across most of the study area, the highest ammonia concentrations were generally east of AST #5 at boreholes BH-10, BH-52, BH-53 and BH-27, and an area southwest of AST #6 at BH-06. The collected data is valid, with the exception of rejected nitrite results, and may be used for the intended purpose of soil management of nitrogen-impacted soils during redevelopment of the Site and to support potential future remediation decisions.

All of Which is Respectfully Submitted,

GHD

Travis Kogl, P.G (KS #62)

Figures



Source: USGS 7.5 MINUTE QUAD "LAWRENCE EAST, KANSAS"

0 1000 2000ft

Coordinate System:
STATE PLANE -
KANSAS SOUTH

FORMER FARMLAND INDUSTRIES NITROGEN PLANT
COST BENEFIT ANALYSIS REPORT
1608 N 1400 ROAD, LAWRENCE, KANSAS

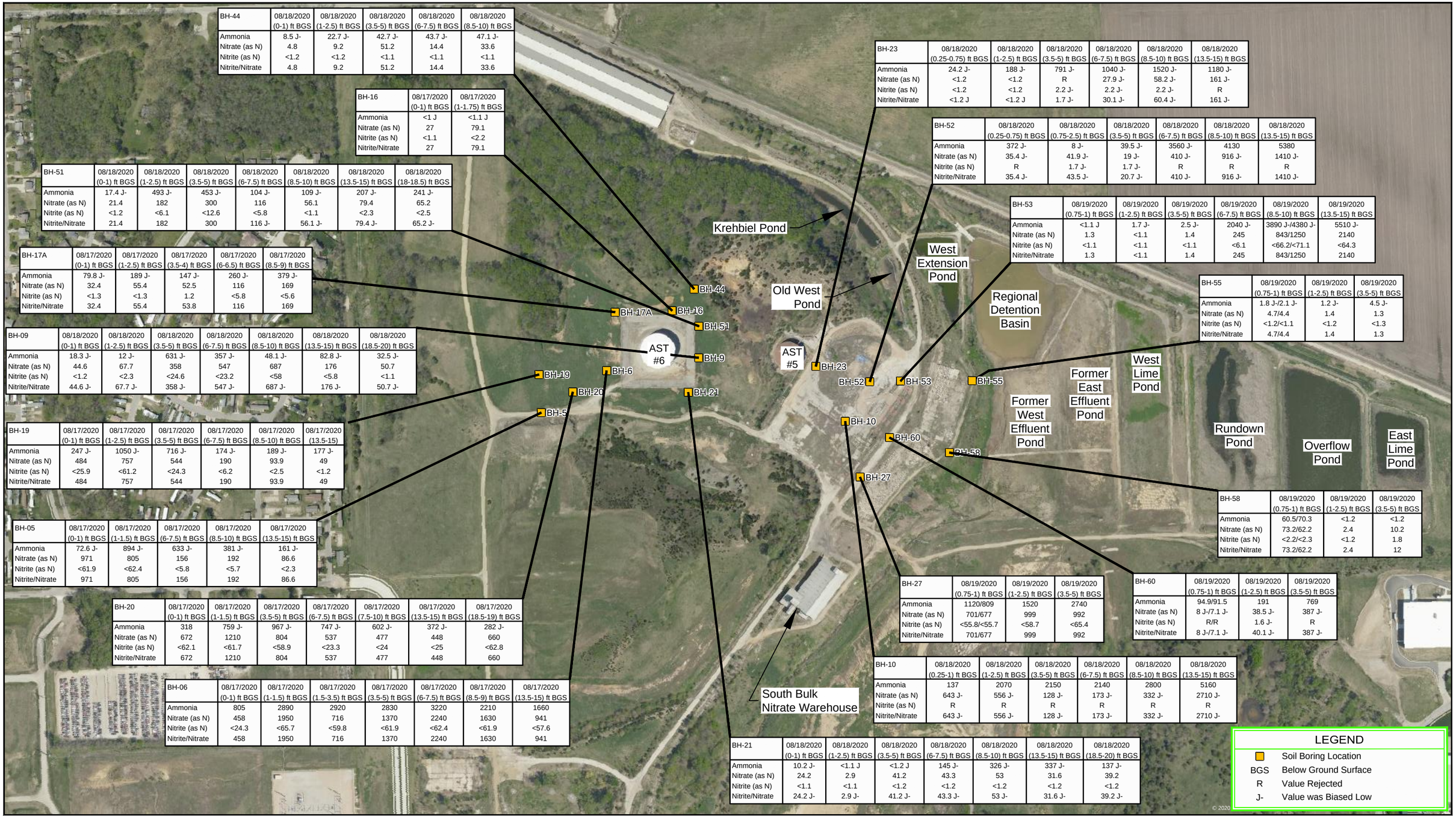
11216633-01

Sep 22, 2020

SITE LOCATION MAP

FIGURE 1

CAD File: \\ghdnet\ghd\US\Topeka\Projects\563\11216633\Digital_Design\ACAD 2017\Figures\11216633-01(004)\11216633-01(004)GN-DL001_Topo.dwg



BH-44	08/18/2020 (0-1) ft BGS	08/18/2020 (1-2.5) ft BGS	08/18/2020 (3.5-5) ft BGS	08/18/2020 (6-7.5) ft BGS	08/18/2020 (8.5-10) ft BGS
Ammonia	8.5 J-	22.7 J-	42.7 J-	43.7 J-	47.1 J-
Nitrate (as N)	4.8	9.2	51.2	14.4	33.6
Nitrite (as N)	<1.2	<1.2	<1.1	<1.1	<1.1
Nitrite/Nitrate	4.8	9.2	51.2	14.4	33.6

BH-16	08/17/2020 (0-1) ft BGS	08/17/2020 (1-1.75) ft BGS
Ammonia	<1 J	<1.1 J
Nitrate (as N)	27	79.1
Nitrite (as N)	<1.1	<2.2
Nitrite/Nitrate	27	79.1

BH-51	08/18/2020 (0-1) ft BGS	08/18/2020 (1-2.5) ft BGS	08/18/2020 (3.5-5) ft BGS	08/18/2020 (6-7.5) ft BGS	08/18/2020 (8.5-10) ft BGS	08/18/2020 (13.5-15) ft BGS	08/18/2020 (18-18.5) ft BGS
Ammonia	17.4 J-	493 J-	453 J-	104 J-	109 J-	207 J-	241 J-
Nitrate (as N)	21.4	182	300	116	56.1	79.4	65.2
Nitrite (as N)	<1.2	<6.1	<12.6	<5.8	<1.1	<2.3	<2.5
Nitrite/Nitrate	21.4	182	300	116 J-	56.1 J-	79.4 J-	65.2 J-

BH-17A	08/17/2020 (0-1) ft BGS	08/17/2020 (1-2.5) ft BGS	08/17/2020 (3.5-4) ft BGS	08/17/2020 (6-6.5) ft BGS	08/17/2020 (8.5-9) ft BGS
Ammonia	79.8 J-	189 J-	147 J-	260 J-	379 J-
Nitrate (as N)	32.4	55.4	52.5	116	169
Nitrite (as N)	<1.3	<1.3	1.2	<5.8	<5.6
Nitrite/Nitrate	32.4	55.4	53.8	116	169

BH-09	08/18/2020 (0-1) ft BGS	08/18/2020 (1-2.5) ft BGS	08/18/2020 (3.5-5) ft BGS	08/18/2020 (6-7.5) ft BGS	08/18/2020 (8.5-10) ft BGS	08/18/2020 (13.5-15) ft BGS	08/18/2020 (18.5-20) ft BGS
Ammonia	18.3 J-	12 J-	631 J-	357 J-	48.1 J-	82.8 J-	32.5 J-
Nitrate (as N)	44.6	67.7	358	547	687	176	50.7
Nitrite (as N)	<1.2	<2.3	<24.6	<23.2	<58	<5.8	<1.1
Nitrite/Nitrate	44.6 J-	67.7 J-	358 J-	547 J-	687 J-	176 J-	50.7 J-

BH-19	08/17/2020 (0-1) ft BGS	08/17/2020 (1-2.5) ft BGS	08/17/2020 (3.5-5) ft BGS	08/17/2020 (6-7.5) ft BGS	08/17/2020 (8.5-10) ft BGS	08/17/2020 (13.5-15)
Ammonia	247 J-	1050 J-	716 J-	174 J-	189 J-	177 J-
Nitrate (as N)	484	757	544	190	93.9	49
Nitrite (as N)	<25.9	<61.2	<24.3	<6.2	<2.5	<1.2
Nitrite/Nitrate	484	757	544	190	93.9	49

BH-05	08/17/2020 (0-1) ft BGS	08/17/2020 (1-1.5) ft BGS	08/17/2020 (6-7.5) ft BGS	08/17/2020 (8.5-10) ft BGS	08/17/2020 (13.5-15) ft BGS
Ammonia	72.6 J-	894 J-	633 J-	381 J-	161 J-
Nitrate (as N)	971	805	156	192	86.6
Nitrite (as N)	<61.9	<62.4	<5.8	<5.7	<2.3
Nitrite/Nitrate	971	805	156	192	86.6

BH-20	08/17/2020 (0-1) ft BGS	08/17/2020 (1-1.5) ft BGS	08/17/2020 (3.5-5) ft BGS	08/17/2020 (6-7.5) ft BGS	08/17/2020 (7.5-10) ft BGS	08/17/2020 (13.5-15) ft BGS	08/17/2020 (18.5-19) ft BGS
Ammonia	318	759 J-	967 J-	747 J-	602 J-	372 J-	282 J-
Nitrate (as N)	672	1210	804	537	477	448	660
Nitrite (as N)	<62.1	<61.7	<58.9	<23.3	<24	<25	<62.8
Nitrite/Nitrate	672	1210	804	537	477	448	660

BH-06	08/17/2020 (0-1) ft BGS	08/17/2020 (1-1.5) ft BGS	08/17/2020 (1.5-3.5) ft BGS	08/17/2020 (3.5-5) ft BGS	08/17/2020 (6-7.5) ft BGS	08/17/2020 (8.5-9) ft BGS	08/17/2020 (13.5-15) ft BGS
Ammonia	805	2890	2920	2830	3220	2210	1660
Nitrate (as N)	458	1950	716	1370	2240	1630	941
Nitrite (as N)	<24.3	<65.7	<59.8	<61.9	<62.4	<61.9	<57.6
Nitrite/Nitrate	458	1950	716	1370	2240	1630	941

BH-23	08/18/2020 (0.25-0.75) ft BGS	08/18/2020 (1-2.5) ft BGS	08/18/2020 (3.5-5) ft BGS	08/18/2020 (6-7.5) ft BGS	08/18/2020 (8.5-10) ft BGS	08/18/2020 (13.5-15) ft BGS
Ammonia	24.2 J-	188 J-	791 J-	1040 J-	1520 J-	1180 J-
Nitrate (as N)	<1.2	<1.2	R	27.9 J-	58.2 J-	161 J-
Nitrite (as N)	<1.2	<1.2	2.2 J-	2.2 J-	2.2 J-	R
Nitrite/Nitrate	<1.2 J	<1.2 J	1.7 J-	30.1 J-	60.4 J-	161 J-

BH-52	08/18/2020 (0.25-0.75) ft BGS	08/18/2020 (0.75-2.5) ft BGS	08/18/2020 (3.5-5) ft BGS	08/18/2020 (6-7.5) ft BGS	08/18/2020 (8.5-10) ft BGS	08/18/2020 (13.5-15) ft BGS
Ammonia	372 J-	8 J-	39.5 J-	3560 J-	4130	5380
Nitrate (as N)	35.4 J-	41.9 J-	19 J-	410 J-	916 J-	1410 J-
Nitrite (as N)	R	1.7 J-	1.7 J-	R	R	R
Nitrite/Nitrate	35.4 J-	43.5 J-	20.7 J-	410 J-	916 J-	1410 J-

BH-53	08/19/2020 (0.75-1) ft BGS	08/19/2020 (1-2.5) ft BGS	08/19/2020 (3.5-5) ft BGS	08/19/2020 (6-7.5) ft BGS	08/19/2020 (8.5-10) ft BGS	08/19/2020 (13.5-15) ft BGS
Ammonia	<1.1 J	1.7 J-	2.5 J-	2040 J-	3890 J-/4380 J-	5510 J-
Nitrate (as N)	1.3	<1.1	1.4	245	843/1250	2140
Nitrite (as N)	<1.1	<1.1	<1.1	<6.1	<66.2/<71.1	<64.3
Nitrite/Nitrate	1.3	<1.1	1.4	245	843/1250	2140

BH-55	08/19/2020 (0.75-1) ft BGS	08/19/2020 (1-2.5) ft BGS	08/19/2020 (3.5-5) ft BGS
Ammonia	1.8 J-/2.1 J-	1.2 J-	4.5 J-
Nitrate (as N)	4.7/4.4	1.4	1.3
Nitrite (as N)	<1.2/<1.1	<1.2	<1.3
Nitrite/Nitrate	4.7/4.4	1.4	1.3

BH-58	08/19/2020 (0.75-1) ft BGS	08/19/2020 (1-2.5) ft BGS	08/19/2020 (3.5-5) ft BGS
Ammonia	60.5/70.3	<1.2	<1.2
Nitrate (as N)	73.2/62.2	2.4	10.2
Nitrite (as N)	<2.2/<2.3	<1.2	1.8
Nitrite/Nitrate	73.2/62.2	2.4	12

BH-27	08/19/2020 (0.75-1) ft BGS	08/19/2020 (1-2.5) ft BGS	08/19/2020 (3.5-5) ft BGS
Ammonia	1120/809	1520	2740
Nitrate (as N)	701/677	999	992
Nitrite (as N)	<55.8/<55.7	<58.7	<65.4
Nitrite/Nitrate	701/677	999	992

BH-60	08/19/2020 (0.75-1) ft BGS	08/19/2020 (1-2.5) ft BGS	08/19/2020 (3.5-5) ft BGS
Ammonia	94.9/91.5	191	769
Nitrate (as N)	8 J-/7.1 J-	38.5 J-	387 J-
Nitrite (as N)	R/R	1.6 J-	R
Nitrite/Nitrate	8 J-/7.1 J-	40.1 J-	387 J-

BH-10	08/18/2020 (0.25-1) ft BGS	08/18/2020 (1-2.5) ft BGS	08/18/2020 (3.5-5) ft BGS	08/18/2020 (6-7.5) ft BGS	08/18/2020 (8.5-10) ft BGS	08/18/2020 (13.5-15) ft BGS
Ammonia	137	2070	2150	2140	2800	5160
Nitrate (as N)	643 J-	556 J-	128 J-	173 J-	332 J-	2710 J-
Nitrite (as N)	R	R	R	R	R	R
Nitrite/Nitrate	643 J-	556 J-	128 J-	173 J-	332 J-	2710 J-

BH-21	08/18/2020 (0-1) ft BGS	08/18/2020 (1-2.5) ft BGS	08/18/2020 (3.5-5) ft BGS	08/18/2020 (6-7.5) ft BGS	08/18/2020 (8.5-10) ft BGS	08/18/2020 (13.5-15) ft BGS	08/18/2020 (18.5-20) ft BGS
Ammonia	10.2 J-	<1.1 J	<1.2 J	145 J-	326 J-	337 J-	137 J-
Nitrate (as N)	24.2	2.9	41.2	43.3	53	31.6	39.2
Nitrite (as N)	<1.1	<1.1	<1.2	<1.2	<1.2	<1.2	<1.2
Nitrite/Nitrate	24.2 J-	2.9 J-	41.2 J-	43.3 J-	53 J-	31.6 J-	39.2 J-

LEGEND

- Soil Boring Location
- BGS — Below Ground Surface
- R — Value Rejected
- J- — Value was Biased Low

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Source: GOOGLE AERIAL IMAGE DATED SEPTEMBER 21, 2018

0 200 400ft

N

NOTE:

1. Soil concentrations presented in milligrams per kilogram (mg/kg).

GHD

FORMER FARMLAND INDUSTRIES NITROGEN PLANT
MSO ENVIRONMENTAL SAMPLING
1608 N 1400 ROAD, LAWRENCE, KANSAS

11216633-01

Oct 5, 2020

SOIL BORING AND CONCENTRATION MAP

FIGURE 2

CAD File: \\ghdnet\ghd\US\Topeka\Projects\563\11216633\Digital_Design\ACAD 2017\Figures\11216633-01(004)\11216633-01(004)GN-DL002.dwg

Tables

Table 1
Soil Sample Analytical Results Summary
MSO Environmental Sampling
Former Farmland Industries Nitrogen Plant Site
Lawrence, Kansas

Location	Sample Identification	Date	Depth	Sample Type	Ammonia mg/kg	Nitrate (as N) mg/kg	Nitrite (as N) mg/kg	Nitrite/Nitrate mg/kg	Moisture %
BH-05	SO-081720-NL-021	08/17/2020	(0-1) ft BGS		72.6 J-	971	<61.9	971	18.1
BH-05	SO-081720-NL-022	08/17/2020	(1-1.5) ft BGS		894 J-	805	<62.4	805	20.9
BH-05	SO-081720-NL-023	08/17/2020	(6-7.5) ft BGS		633 J-	156	<5.8	156	15.1
BH-05	SO-081720-NL-024	08/17/2020	(8.5-10) ft BGS		381 J-	192	<5.7	192	12.8
BH-05	SO-081720-NL-025	08/17/2020	(13.5-15) ft BGS		161 J-	86.6	<2.3	86.6	14.3
BH-06	SO-081720-NL-001	08/17/2020	(0-1) ft BGS		805	458	<24.3	458	17.9
BH-06	SO-081720-NL-002	08/17/2020	(1-1.5) ft BGS		2890	1950	<65.7	1950	22.8
BH-06	SO-081720-NL-003	08/17/2020	(1.5-3.5) ft BGS		2920	716	<59.8	716	17.6
BH-06	SO-081720-NL-004	08/17/2020	(3.5-5) ft BGS		2830	1370	<61.9	1370	20.1
BH-06	SO-081720-NL-005	08/17/2020	(6-7.5) ft BGS		3220	2240	<62.4	2240	18.3
BH-06	SO-081720-NL-006	08/17/2020	(8.5-9) ft BGS		2210	1630	<61.9	1630	17.6
BH-06	SO-081720-NL-007	08/17/2020	(13.5-15) ft BGS		1660	941	<57.6	941	14
BH-09	SO-081820-NL-045	08/18/2020	(0-1) ft BGS		18.3 J-	44.6	<1.2	44.6 J-	13.6
BH-09	SO-081820-NL-046	08/18/2020	(1-2.5) ft BGS		12 J-	67.7	<2.3	67.7 J-	15.6
BH-09	SO-081820-NL-047	08/18/2020	(3.5-5) ft BGS		631 J-	358	<24.6	358 J-	17.4
BH-09	SO-081820-NL-048	08/18/2020	(6-7.5) ft BGS		357 J-	547	<23.2	547 J-	14.8
BH-09	SO-081820-NL-049	08/18/2020	(8.5-10) ft BGS		48.1 J-	687	<58	687 J-	14.2
BH-09	SO-081820-NL-050	08/18/2020	(13.5-15) ft BGS		82.8 J-	176	<5.8	176 J-	12.3
BH-09	SO-081820-NL-051	08/18/2020	(18.5-20) ft BGS		32.5 J-	50.7	<1.1	50.7 J-	11.9
BH-10	SO-081820-NL-071	08/18/2020	(0.25-1) ft BGS		137	643 J-	R	643 J-	6.7
BH-10	SO-081820-NL-072	08/18/2020	(1-2.5) ft BGS		2070	556 J-	R	556 J-	14.1
BH-10	SO-081820-NL-073	08/18/2020	(3.5-5) ft BGS		2150	128 J-	R	128 J-	21.8
BH-10	SO-081820-NL-074	08/18/2020	(6-7.5) ft BGS		2140	173 J-	R	173 J-	18.2
BH-10	SO-081820-NL-075	08/18/2020	(8.5-10) ft BGS		2800	332 J-	R	332 J-	19.9
BH-10	SO-081820-NL-076	08/18/2020	(13.5-15) ft BGS		5160	2710 J-	R	2710 J-	18.8
BH-16	SO-081720-NL-026	08/17/2020	(0-1) ft BGS		<1 J	27	<1.1	27	9.1
BH-16	SO-081720-NL-027	08/17/2020	(1-1.75) ft BGS		<1.1 J	79.1	<2.2	79.1	9.9

Table 1
Soil Sample Analytical Results Summary
MSO Environmental Sampling
Former Farmland Industries Nitrogen Plant Site
Lawrence, Kansas

Location	Sample Identification	Date	Depth	Sample Type	Ammonia mg/kg	Nitrate (as N) mg/kg	Nitrite (as N) mg/kg	Nitrite/Nitrate mg/kg	Moisture %
BH-17A	SO-081720-NL-028	08/17/2020	(0-1) ft BGS		79.8 J-	32.4	<1.3	32.4	19.3
BH-17A	SO-081720-NL-029	08/17/2020	(1-2.5) ft BGS		189 J-	55.4	<1.3	55.4	20.5
BH-17A	SO-081720-NL-030	08/17/2020	(3.5-4) ft BGS		147 J-	52.5	1.2	53.8	12.2
BH-17A	SO-081720-NL-031	08/17/2020	(6-6.5) ft BGS		260 J-	116	<5.8	116	12.9
BH-17A	SO-081720-NL-032	08/17/2020	(8.5-9) ft BGS		379 J-	169	<5.6	169	12.4
BH-19	SO-081720-NL-015	08/17/2020	(0-1) ft BGS		247 J-	484	<25.9	484	21.8
BH-19	SO-081720-NL-016	08/17/2020	(1-2.5) ft BGS		1050 J-	757	<61.2	757	19.5
BH-19	SO-081720-NL-017	08/17/2020	(3.5-5) ft BGS		716 J-	544	<24.3	544	19.2
BH-19	SO-081720-NL-018	08/17/2020	(6-7.5) ft BGS		174 J-	190	<6.2	190	19.9
BH-19	SO-081720-NL-019	08/17/2020	(8.5-10) ft BGS		189 J-	93.9	<2.5	93.9	20.8
BH-19	SO-081720-NL-020	08/17/2020	(13.5-15)		177 J-	49	<1.2	49	16.7
BH-20	SO-081720-NL-008	08/17/2020	(0-1) ft BGS		318	672	<62.1	672	17.9
BH-20	SO-081720-NL-009	08/17/2020	(1-1.5) ft BGS		759 J-	1210	<61.7	1210	20.4
BH-20	SO-081720-NL-010	08/17/2020	(3.5-5) ft BGS		967 J-	804	<58.9	804	16.3
BH-20	SO-081720-NL-011	08/17/2020	(6-7.5) ft BGS		747 J-	537	<23.3	537	14
BH-20	SO-081720-NL-012	08/17/2020	(7.5-10) ft BGS		602 J-	477	<24	477	17.9
BH-20	SO-081720-NL-013	08/17/2020	(13.5-15) ft BGS		372 J-	448	<25	448	18.9
BH-20	SO-081720-NL-014	08/17/2020	(18.5-19) ft BGS		282 J-	660	<62.8	660	21.4
BH-21	SO-081820-NL-052	08/18/2020	(0-1) ft BGS		10.2 J-	24.2	<1.1	24.2 J-	12.6
BH-21	SO-081820-NL-053	08/18/2020	(1-2.5) ft BGS		<1.1 J	2.9	<1.1	2.9 J-	9.6
BH-21	SO-081820-NL-054	08/18/2020	(3.5-5) ft BGS		<1.2 J	41.2	<1.2	41.2 J-	20.3
BH-21	SO-081820-NL-055	08/18/2020	(6-7.5) ft BGS		145 J-	43.3	<1.2	43.3 J-	16.9
BH-21	SO-081820-NL-056	08/18/2020	(8.5-10) ft BGS		326 J-	53	<1.2	53 J-	19
BH-21	SO-081820-NL-057	08/18/2020	(13.5-15) ft BGS		337 J-	31.6	<1.2	31.6 J-	13.4
BH-21	SO-081820-NL-058	08/18/2020	(18.5-20) ft BGS		137 J-	39.2	<1.2	39.2 J-	14.5

Table 1
Soil Sample Analytical Results Summary
MSO Environmental Sampling
Former Farmland Industries Nitrogen Plant Site
Lawrence, Kansas

Location	Sample Identification	Date	Depth	Sample Type	Ammonia mg/kg	Nitrate (as N) mg/kg	Nitrite (as N) mg/kg	Nitrite/Nitrate mg/kg	Moisture %
BH-23	SO-081820-NL-059	08/18/2020	(0.25-0.75) ft BGS		24.2 J-	<1.2	<1.2	<1.2 J	12.4
BH-23	SO-081820-NL-060	08/18/2020	(1-2.5) ft BGS		188 J-	<1.2	<1.2	<1.2 J	20.1
BH-23	SO-081820-NL-061	08/18/2020	(3.5-5) ft BGS		791 J-	R	2.2 J-	1.7 J-	21.1
BH-23	SO-081820-NL-062	08/18/2020	(6-7.5) ft BGS		1040 J-	27.9 J-	2.2 J-	30.1 J-	20.5
BH-23	SO-081820-NL-063	08/18/2020	(8.5-10) ft BGS		1520 J-	58.2 J-	2.2 J-	60.4 J-	17.9
BH-23	SO-081820-NL-064	08/18/2020	(13.5-15) ft BGS		1180 J-	161 J-	R	161 J-	19.5
BH-27	SO-081920-NL-081	08/19/2020	(0.75-1) ft BGS	Parent	1120	701	<55.8	701	11.9
BH-27	SO-081920-NL-082	08/19/2020	(0.75-1) ft BGS	Duplicate	809	677	<55.7	677	11.9
BH-27	SO-081920-NL-083	08/19/2020	(1-2.5) ft BGS		1520	999	<58.7	999	16.1
BH-27	SO-081920-NL-084	08/19/2020	(3.5-5) ft BGS		2740	992	<65.4	992	22
BH-44	SO-081820-NL-033	08/18/2020	(0-1) ft BGS		8.5 J-	4.8	<1.2	4.8	15.6
BH-44	SO-081820-NL-034	08/18/2020	(1-2.5) ft BGS		22.7 J-	9.2	<1.2	9.2	17.7
BH-44	SO-081820-NL-035	08/18/2020	(3.5-5) ft BGS		42.7 J-	51.2	<1.1	51.2	11
BH-44	SO-081820-NL-036	08/18/2020	(6-7.5) ft BGS		43.7 J-	14.4	<1.1	14.4	11.3
BH-44	SO-081820-NL-037	08/18/2020	(8.5-10) ft BGS		47.1 J-	33.6	<1.1	33.6	12.5
BH-51	SO-081820-NL-038	08/18/2020	(0-1) ft BGS		17.4 J-	21.4	<1.2	21.4	16.2
BH-51	SO-081820-NL-039	08/18/2020	(1-2.5) ft BGS		493 J-	182	<6.1	182	18
BH-51	SO-081820-NL-040	08/18/2020	(3.5-5) ft BGS		453 J-	300	<12.6	300	20.1
BH-51	SO-081820-NL-041	08/18/2020	(6-7.5) ft BGS		104 J-	116	<5.8	116 J-	12.9
BH-51	SO-081820-NL-042	08/18/2020	(8.5-10) ft BGS		109 J-	56.1	<1.1	56.1 J-	12.2
BH-51	SO-081820-NL-043	08/18/2020	(13.5-15) ft BGS		207 J-	79.4	<2.3	79.4 J-	14
BH-51	SO-081820-NL-044	08/18/2020	(18-18.5) ft BGS		241 J-	65.2	<2.5	65.2 J-	19.1
BH-52	SO-081820-NL-065	08/18/2020	(0.25-0.75) ft BGS		372 J-	35.4 J-	R	35.4 J-	11.7
BH-52	SO-081820-NL-066	08/18/2020	(0.75-2.5) ft BGS		8 J-	41.9 J-	1.7 J-	43.5 J-	16.8
BH-52	SO-081820-NL-067	08/18/2020	(3.5-5) ft BGS		39.5 J-	19 J-	1.7 J-	20.7 J-	4.7
BH-52	SO-081820-NL-068	08/18/2020	(6-7.5) ft BGS		3560 J-	410 J-	R	410 J-	19.5
BH-52	SO-081820-NL-069	08/18/2020	(8.5-10) ft BGS		4130	916 J-	R	916 J-	18.9
BH-52	SO-081820-NL-070	08/18/2020	(13.5-15) ft BGS		5380	1410 J-	R	1410 J-	19.1

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Soil Sample Analytical Results Summary
MSO Environmental Sampling
Former Farmland Industries Nitrogen Plant Site
Lawrence, Kansas

Location	Sample Identification	Date	Depth	Sample Type	Ammonia mg/kg	Nitrate (as N) mg/kg	Nitrite (as N) mg/kg	Nitrite/Nitrate mg/kg	Moisture %
BH-53	SO-081920-NL-093	08/19/2020	(0.75-1) ft BGS		<1.1 J	1.3	<1.1	1.3	7
BH-53	SO-081920-NL-094	08/19/2020	(1-2.5) ft BGS		1.7 J-	<1.1	<1.1	<1.1	5.2
BH-53	SO-081920-NL-095	08/19/2020	(3.5-5) ft BGS		2.5 J-	1.4	<1.1	1.4	4.6
BH-53	SO-081920-NL-096	08/19/2020	(6-7.5) ft BGS		2040 J-	245	<6.1	245	18.2
BH-53	SO-081920-NL-097	08/19/2020	(8.5-10) ft BGS	Parent	3890 J-	843	<66.2	843	24.5
BH-53	SO-081920-NL-098	08/19/2020	(8.5-10) ft BGS	Duplicate	4380 J-	1250	<71.1	1250	29.1
BH-53	SO-081920-NL-099	08/19/2020	(13.5-15) ft BGS		5510 J-	2140	<64.3	2140	22.4
BH-55	SO-081920-NL-089	08/19/2020	(0.75-1) ft BGS	Parent	1.8 J-	4.7	<1.2	4.7	13.1
BH-55	SO-081920-NL-090	08/19/2020	(0.75-1) ft BGS	Duplicate	2.1 J-	4.4	<1.1	4.4	13.1
BH-55	SO-081920-NL-091	08/19/2020	(1-2.5) ft BGS		1.2 J-	1.4	<1.2	1.4	16.5
BH-55	SO-081920-NL-092	08/19/2020	(3.5-5) ft BGS		4.5 J-	1.3	<1.3	1.3	23.1
BH-58	SO-081920-NL-085	08/19/2020	(0.75-1) ft BGS	Parent	60.5	73.2	<2.2	73.2	11
BH-58	SO-081920-NL-086	08/19/2020	(0.75-1) ft BGS	Duplicate	70.3	62.2	<2.3	62.2	11
BH-58	SO-081920-NL-087	08/19/2020	(1-2.5) ft BGS		<1.2	2.4	<1.2	2.4	18.6
BH-58	SO-081920-NL-088	08/19/2020	(3.5-5) ft BGS		<1.2	10.2	1.8	12	18.4
BH-60	SO-081920-NL-077	08/19/2020	(0.75-1) ft BGS	Parent	94.9	8 J-	R	8 J-	9.9
BH-60	SO-081920-NL-078	08/19/2020	(0.75-1) ft BGS	Duplicate	91.5	7.1 J-	R	7.1 J-	10.6
BH-60	SO-081920-NL-079	08/19/2020	(1-2.5) ft BGS		191	38.5 J-	1.6 J-	40.1 J-	15
BH-60	SO-081920-NL-080	08/19/2020	(3.5-5) ft BGS		769	387 J-	R	387 J-	18.8

Notes:

J - Estimated concentration.
R - Rejected.
< - Not detected at the associated reporting limit.
J- - Estimated concentration, result may be biased low.
ft BGS - Feet below ground surface.

Table 2
Rinsate Sample Analytical Results Summary
MSO Environmental Sampling
Former Farmland Industries Nitrogen Plant Site
Lawrence, Kansas

Location	Sample Identification	Date	Ammonia mg/L	Nitrate (as N) mg/L	Nitrite (as N) mg/L	Nitrite/Nitrate mg/L
Rinsate	WW-081820-NL-001	08/18/2020	<0.10	<0.10	<0.10	<0.10
Rinsate	WW-081920-NL-022	08/17/2020	<0.10	<0.10	<0.10	<0.10

Notes:

< - Not detected at the associated reporting limit.

Table 3
Investigation-Derived Waste Sample Analytical Results Summary
MSO Environmental Sampling
Former Farmland Industries Nitrogen Plant Site
Lawrence, Kansas

Location	Sample Identification	Date	Ammonia mg/L	Nitrate (as N) mg/L	Nitrite (as N) mg/L	Nitrite/Nitrate mg/L
IDW	WW-081920-NL-003	08/19/2020	70.5	28.9	2.1	31

Notes:

< - Not detected at the associated reporting limit.
IDW - Investigation-derived waste

Appendices

Appendix A
Field Notes

Stratigraphy Log (Borehole/Test Pit/Trench/Monitoring Well/Overburden)
(Adapted from SP-14)
Page 1 of 2

Project name: LAWRENCE MSD
Project number: 112 1616 33
Client: ~~Surface~~ SURFACE
(A.M.): VGS Drilling method:
Drilling contractor: RC DRILLING
Driller: Date/Time started:
Elevation: Date/Time completed:
(P.M.): GHD supervisor:
Hole designation: BH-06
8/17 @ 09:45
Sunny; 80s
8/17 @ 10:30
Location: Weather N. LAWRENCE - GHD

Stratigraphic Intervals (Depths in ft/m BGS) From	At	To	Sample Description: Order of descriptors: Soil type symbol(s) - primary component(s), (nature of deposit), secondary components, relative density/consistency, grain size/plasticity, gradation/structure, colour, moisture content, Note: Plasticity determination requires the addition of moisture if the sample is too dry to roll (indicate if moisture was added or not).	Sample Details: Sample Number	Sampling Method	Penetration Record Split Spoon Blows (Record N-Values & Recoveries) 6"	6"	6"	6"	N	R	Sample Interval	PID/FID (ppm)	Chemical Analysis	Grain Size/ Other Analysis
0			Vegetation - CL - Silty Clay	001 @0950	PA	—	—	—	—				0.1		
		1	fine sand; trace GRAVEL; dry; brown		↓										
1		1.5	CL - Clay trace silty fine sand	002 @0955	SS	6	6	7	—				0.3		
1.5		1.5	blocky; low plastic; red-brown; dry		↓										
1.5		3.5	—	003 @1000	PA								0.0		
3.5		4	CL - Clay and Sand; soft; some fine	004 @1005	SS	5	9	11	—				0.3		
			gravel; stiff; no plastic; red-		↓										
		5	brown; dry		↓										
6			CL - Silty Clay trace fine Sand, Trace	005 @1010	SS	9	11	17	—				0.5		
			blocky structure; no plastic; dry		↓										
		7	red brown; dry		↓										
7			CL - fine sandy; silty clay; trace		↓										
		7.5	layered; dry; red-tan-brown		↓										
7.5		8.5	—	—	PA								0.4		

Notes and Comments
Depth of borehole caving _____ Depth of first groundwater encounter _____ Topsoil thickness _____
Water level in open borehole on completion _____ After _____ Hours _____
Notes:

Stratigraphy Log burden)
(...m SP-14)
Page 1 of 2

Project name: LAWRENCE NSO
Project: 11216633
Client:Surface: Vea
(A.M.):Drilling method:

Drilling contractor: RC Drilling
number:Driller:Date/Time
elevation:Date/Time

(P.M.):GHD supervisor:

Hole designation: BH-56
started: 5/17 @ 0915
completed: 5/17 @ 1030
Location:Weather: Sunny, 80s
N. Lawless

Stratigraphic Intervals (Depths in ft/m BGS)			Sample Description	Sample Details											
			Order of descriptors: Soil type symbol(s) - primary component(s), (nature of deposit), secondary components, relative density/consistency, grain size/plasticity, gradation/structure, colour, moisture content,			Penetration Record Split Spoon Blows (Record N-Values & Recoveries)									
From	At	To	Note: Plasticity determination requires the addition of moisture if the sample is too dry to roll (indicate if moisture was added or not).	Sample Number	Sampling Method	6"	6"	6"	6"	N	R	Sample Interval	PID/FID (ppm)	Chemical Analysis	Grain Size/ Other Analysis
0.5			Fine sandy weathered	SS	0806 @ 1015	50	–	–			4"		0-5		
		9	silic - grey - tan	↓		5									
13.5		15	SAA	SS	0826 1025	50	–	–			2"		0-1		
	15		Refusal on weathered												
			Shale / sandstone - End of												
			Borehole												

Notes and Comments

Depth of borehole caving _____ Depth of first groundwater encounter _____ Topsoil thickness _____

Water level in open borehole on completion _____ After _____ Hours _____

Notes:

LOCATION pre-surface

Stratigraphy Log (...burden)
(...n SP-14)
Page 1 of 2

Project name: LAWRENCE MSO
Project: 11216633
Client:Surface:
Vac
(A.M.):Drilling method:

Drilling contractor: RC DRILLING
number:Driller:Date/Time:
elevation:Date/Time: elev: 801.49
(P.M.):GHD supervisor:

Hole designation: R-20
started: R-20 @ 10:45
completed: R-20 @ 11:20
Location:Weather: N. LAWRENCE

Stratigraphic Intervals (Depths in ft/m BGS) From	At	To	Sample Description: Order of descriptors: Soil type symbol(s) - primary component(s), (nature of deposit), secondary components, relative density/consistency, grain size/plasticity, gradation/structure, colour, moisture content, Note: Plasticity determination requires the addition of moisture if the sample is too dry to roll (indicate if moisture was added or not).	Sample Details: Sample Number	Sampling Method	Penetration Record Split Spoon Blows (Record N-Values & Recoveries) 6"	6"	6"	6"	N	R	Sample Interval	PID/FID (ppm)	Chemical Analysis	Grain Size/ Other Analysis
0			Vegetative: Cl- Clay some silt, some fine sand, plastic - moist, firm, brown, SAND 10YR	PA	0056							0-2			
		1	clay; brown; blocky												
1			Cl-Clay, trace silt & fine sand; blocky; low plastic; red-brown;	SS	009 @1047	3	3	5	-			0-1			
		1.5	clay												
2.5			Cl-Clay, trace silt, trace fine sand;	SS	010 @ 10:50	5	8	6	-			0-0			
		3	V. Firm; low plastic; layered; dry;												
		4	mottled brown & tan; stiff												
4			Cl-Clay, silt & trace fine sand;												
			no plastic; firm; layered; dry;												
		5	tan, fine grey sand lenses;												
6			Cl-Clay, fine sand; silt; dry; no plastic	SS	011 @ 11:00	50/4"	-				0"	0.7			
8.5		9.5	clayey; low plasticity; grey-brown												

Notes and Comments:
Depth of borehole caving _____ Depth of first groundwater encounter _____ Topsoil thickness
Water level in open borehole on completion _____ After _____ Hours _____
Notes:

Stratigraphy Log burden)
(...m SP-14)
Page 2 of 7

Project name:
Project
Client:Surface

(A.M.):Drilling method:

Drilling contractor:
number:Driller:Date/Time
elevation:Date/Time

(P.M.):GHD supervisor:

Hole designation: BH-20
started: 8/17 @ 1015
completed: 8/17 @
Location:Weather

Stratigraphic Intervals (Depths in ft/m BGS)			Sample Description	Sample Details											
			Order of descriptors: Soil type symbol(s) - primary component(s), (nature of deposit), secondary components, relative density/consistency, grain size/plasticity, gradation/structure, colour, moisture content,			Penetration Record Split Spoon Blows (Record N-Values & Recoveries)									
From	At	To	Note: Plasticity determination requires the addition of moisture if the sample is too dry to roll (indicate if moisture was added or not).	Sample Number	Sampling Method	6"	6"	6"	6"	N	R	Sample Interval	PID/FID (ppm)	Chemical Analysis	Grain Size/ Other Analysis
7.5			MH - Silty Some clay; low cohesion	012 @1105	SS	50/4"					3"				
		10	dry tan		↓										
13.5			[illegible] SAA	013 @1110	SS	50/1					2"				
			SAA		↓	50					2				
18.5		20	Silty Sandy clay; low cohesion, moist, stiff	014 @1115	SS	50					2"				
	19		water												
	20		End of Boring												

Notes and Comments

Depth of borehole caving _____ Depth of first groundwater encounter _____ Topsoil thickness _____

Water level in open borehole on completion _____ After _____ Hours _____

Notes:

Stratigraphy Log (Borehole/Test Pit/Trench/Excavation/Monitoring Well/Burden)
(Modified from SP-14)
Page 1 of 2

Project name: Lawrence Mall
Project: 112 Iluka 33
Client:Surface:

(A.M.):Drilling method:

Drilling contractor: RC Drilling
number:Driller:Date/Time:
elevation:Date/Time: SEP.08

(P.M.):GHD supervisor:

Hole designation: BH-19
started: Sept 11:40
completed: Sept 12:45
Location:Weather:

Stratigraphic Intervals (Depths in ft/m BGS)			Sample Description	Sample Details											
			Order of descriptors: Soil type symbol(s) - primary component(s), (nature of deposit), secondary components, relative density/consistency, grain size/plasticity, gradation/structure, colour, moisture content,			Penetration Record Split Spoon Blows (Record N-Values & Recoveries)									
From	At	To	Note: Plasticity determination requires the addition of moisture if the sample is too dry to roll (indicate if moisture was added or not).	Sample Number	Sampling Method	6"	6"	6"	6"	N	R	Sample Interval	PID/FID (ppm)	Chemical Analysis	Grain Size/ Other Analysis
0			Veg - Cl - Clay & silt; fine and;	05 @1145	Augers	-	-	-	-			0-1	0.0		
			fine fine grained; blocky;												
		1	silty; dry; brown												
1		2.5	SAA	06 @1145	SS	3	3	4	-			1-2.5	0.1		
2.5			Cl-Mg & Silt; fine fine sand;	07 @1150								2.5-3			
		5	fine; layered structure; brown;												
5			M- Clay & silt; fine fine sand;	08 @ 1155	SS	2	5	-	-			4.5-5	0.7		
			layered & silt; brown & grey;												
			Silt; fine sand;												
		15													
15				09 @ 12:05	SS	6	3	50	-		2	15-15	0.3		
		20													
20			fine sand; silt; weathered; grey;												
		21	Basalt												

Notes and Comments

Depth of borehole caving _____ Depth of first groundwater encounter _____ Topsoil thickness _____

Water level in open borehole on completion _____ After _____ Hours _____

Notes:

Stratigraphy Log (Borehole/Test Pit/Trench/Excavation/Monitoring Well/Burden)
(Modified from SP-14)
Page 1 of 2

Project name:
Project
Client:Surface

(A.M.):Drilling method:

Drilling contractor:
number:Driller:Date/Time
elevation:Date/Time

(P.M.):GHD supervisor:

Hole designation: RH-19
started:
completed:
Location:Weather

Stratigraphic Intervals (Depths in ft/m BGS) From	At	To	Sample Description Order of descriptors: Soil type symbol(s) - primary component(s), (nature of deposit), secondary components, relative density/consistency, grain size/plasticity, gradation/structure, colour, moisture content, Note: Plasticity determination requires the addition of moisture if the sample is too dry to roll (indicate if moisture was added or not).	Sample Details: Sample Number	Sampling Method	Penetration Record Split Spoon Blows (Record N-Values & Recoveries) 6"	6"	6"	6"	N	R	Sample Interval	PID/FID (ppm)	Chemical Analysis	Grain Size/ Other Analysis
13.5			Cl-Silty Clay, trace fine sand	020 @12:10	SS	50					2"		1.1		
			soft, low plasticity, dry, brown												
		15	no recovery												
14.5		15	wet - water level												
18.5			silty Clay, trace sand, soft,	—	SS	50					5"				
		20	no plastic, dry, beyond, trace												
	19		wet												

Notes and Comments

Depth of borehole caving _____ Depth of first groundwater encounter _____ Topsoil thickness _____

Water level in open borehole on completion _____ After _____ Hours _____

Notes:

Stratigraphy Log (Borehole burden)
(Modified from SP-14)

Project name: Lawrence MSD
Project number:Driller:Date/Time: 117 Hole 3?
Client:Surface elevation:Date/Time:
(A.M.):Drilling method:
Drilling contractor: RC Drilling
591-91
(P.M.):GHD supervisor:
Hole designation: BH-5
started: 8/17 @ 1320
completed:
Location:Weather:

Stratigraphic Intervals (Depths in ft/m BGS) From	At	To	Sample Description: Order of descriptors: Soil type symbol(s) - primary component(s), (nature of deposit), secondary components, relative density/consistency, grain size/plasticity, gradation/structure, colour, moisture content, Note: Plasticity determination requires the addition of moisture if the sample is too dry to roll (indicate if moisture was added or not).	Sample Number	Sampling Method	Penetration Record Split Spoon Blows (Record N-Values & Recoveries) 6"	6"	6"	6"	N	R	Sample Interval	PID/FID (ppm)	Chemical Analysis	Grain Size/ Other Analysis
0			GRAVEL ROAD — Silty Fine sand	021 @1330	Aug	—	-	-	—			0-8"	0.0		
		1	fine-med GRAVEL (FILL);		↓							↓			
1			CL-CLAY; ~~TRACE FINE SAND~~; SILTY	022 @1335	SS	4	8	8	-			1-25	0.2		
			black SILTY lithics (1-2cm);												
			FIRM; no plastic; blocky												
		2.5	dry; reddish brown		↓							↓			
3.5		5	SAA	Not enough recovery to sample	SS	4	6	10	—			3.5-5	0.3		
6			M-CLAY; salt; FIRM; layered;	023 @1345	SS	8	12	15	—			6-7.5	0.7		
			stiff; no plastic; dry; trace												
		7.5	sand; alternating layers		↓							↓			
8.5		10	WEATHERED shale, grey; weak	024 @ 1350	SS	50+	—	—	—		3"	8.5-10	0.5		
13.5		14	SAA	025 @ 1355	SS	50+	—	—	—		6"	13.5-15	0.7		
14			CL-Silty clay; Fine sand; soft;												
		14.5	Broken concrete; dry; grey												

Notes and Comments
Depth of borehole caving _____ Depth of first groundwater encounter _____ Topsoil thickness _____
Water level in open borehole on completion _____ After _____ Hours _____
Notes:

Project name: _____ Drilling contractor: _____ Hole designation: BH5
Project number:Driller:Date/Time _____ started: 14:20 hrs
Client:Surface elevation:Date/Time _____ completed: _____
_____ Location:Weather _____
(A.M.):Drilling method: _____
(P.M.):GHD supervisor: _____

Stratigraphic Intervals (Depths in ft/m BGS)			Sample Description	Sample Details											
			Order of descriptors: Soil type symbol(s) - primary component(s), (nature of deposit), secondary components, relative density/consistency, grain size/plasticity, gradation/structure, colour, moisture content,			Penetration Record Split Spoon Blows (Record N-Values & Recoveries)									
From	At	To	Note: Plasticity determination requires the addition of moisture if the sample is too dry to roll (indicate if moisture was added or not).	Sample Number	Sampling Method	6"	6"	6"	6"	N	R	Sample Interval	PID/FID (ppm)	Chemical Analysis	Grain Size/ Other Analysis
14.5		15	Weathered Shale, grey		↓							↓			
18.5			no recovery - refusal on	—	SS	50/—	—	—	—		2"	0	—		
	18.5		Sandy weathered shale												

Notes and Comments

Depth of borehole caving _____ Depth of first groundwater encounter _____ Topsoil thickness _____

Water level in open borehole on completion _____ After _____ Hours _____

Notes:

Stratigraphy Log (borehole/test pit/trench/burden)
(Modified from SP-14)
Page 1 of 1

Project name: Lawrence MSD
Project number:Driller:Date/Time started: 11/2/16 @ 14:35
Client:Surface elevation:Date/Time completed: 8/11/17 @ 14:30

Drilling contractor: RC Drilling
Hole designation: BH-17
Location:Weather: Sun. 60's

(A.M.):Drilling method:
(P.M.):GHD supervisor:

Stratigraphic Intervals (Depths in ft/m BGS)			Sample Description	Sample Details											
			Order of descriptors: Soil type symbol(s) - primary component(s), (nature of deposit), secondary components, relative density/consistency, grain size/plasticity, gradation/structure, colour, moisture content,			Penetration Record Split Spoon Blows (Record N-Values & Recoveries)									
From	At	To	Note: Plasticity determination requires the addition of moisture if the sample is too dry to roll (indicate if moisture was added or not).	Sample Number	Sampling Method	6"	6"	6"	6"	N	R	Sample Interval	PID/FID (ppm)	Chemical Analysis	Grain Size/ Other Analysis
0		1	Veg-												
	1		dropped spoons hit (hollow something hard-no effect												

Notes and Comments

Depth of borehole caving _____ Depth of first groundwater encounter _____ Topsoil thickness _____

Water level in open borehole on completion _____ After _____ Hours _____

Notes:

Stratigraphy Log (Borehole/Test Pit/Excavation/Trench/Overburden)
(Modified from SP-14)
Page 1 of 1

Project name: LAWRENCE MSO
Project: 11216633
Client:Surface:

Drilling contractor: RC DRILLING
number:Driller:Date/Time started:
elevation:Date/Time completed:
(A.M.):Drilling method:
Location:Weather:
(P.M.):GHD supervisor:

Hole designation: BH-16
8/11 @ 1450
8/11 @ 1510

Stratigraphic Intervals (Depths in ft/m BGS) From	At	To	Sample Description: Order of descriptors: Soil type symbol(s) - primary component(s), (nature of deposit), secondary components, relative density/consistency, grain size/plasticity, gradation/structure, colour, moisture content, Note: Plasticity determination requires the addition of moisture if the sample is too dry to roll (indicate if moisture was added or not).	Sample Number	Sampling Method	Penetration Record Split Spoon Blows (Record N-Values & Recoveries) 6"	6"	6"	6"	N	R	Sample Interval	PID/FID (ppm)	Chemical Analysis	Grain Size/ Other Analysis
0			Veg — loose sandy silty organics; dry; light brown	0226 14:55	PA	—	—	—	—				0-0		
		1			↓										
1			Weathered sandstone; fine	0227 15:00	SS	1	7						?		
		1.75	-med grain sand - brown		↓	8	50+	—	—				0-7		
	1.75		Refusal on grey limestone		↓										
			OFFset EAST by 30' retry												
@1510			⇒ same result as First push.												

Notes and Comments

Depth of borehole caving _____ Depth of first groundwater encounter _____ Topsoil thickness _____

Water level in open borehole on completion _____ After _____ Hours _____

Notes:

Stratigraphy Log (Borehole/Test Pit/Trench/Monitoring Well Installation) (Modified from SP-14)

Page 1 of 1

Project name: Lawrence NSO
Project #: 11211e633
Client: ~~Surface~~ Location
Location: Tank 6 area
(A.M.):Drilling method:

Drilling contractor: RC Drilling
number:Driller:Date/Time started:
elevation:Date/Time completed:
Location:Weather
(P.M.):GHD supervisor:

Hole designation: BH-17A
8/17 @ 15:15
8/17 @
N LAKATOS

Stratigraphic Intervals (Depths in ft/m BGS) From	At	To	Sample Description: Order of descriptors: Soil type symbol(s) - primary component(s), (nature of deposit), secondary components, relative density/consistency, grain size/plasticity, gradation/structure, colour, moisture content, Note: Plasticity determination requires the addition of moisture if the sample is too dry to roll (indicate if moisture was added or not).	Sample Details: Sample Number	Sampling Method	Penetration Record Split Spoon Blows (Record N-Values & Recoveries) 6"	6"	6"	6"	N	R	Sample Interval	PID/FID (ppm)	Chemical Analysis	Grain Size/ Other Analysis
0		1	Veg - CL- Clay w/ trace silt;	028 @ 15:20	Aug	—	—	—	—			0-1	0-7		
			trace fine sand, low plastic;		↓							↓			
		1	blocky, moist from dry; brown		↓							↓			
1			CL- Clay w/ silt & trace fine	029 @ 15:25	SS	2	7	6	—			1-2.5	0-1		
			sand, ~~brown~~ no plastic; MH		↓							↓			
		2.5	red dk brown layers; dry		↓							↓			
3.5			fine sandy weathered	030 @ 15:30	SS	50+	—	—			6"	3.5-4	0-3		
		4	shale; fissile; grey-tan; dry		↓							↓			
4			weathered shale w/ increased	031 @ 15:35	SS	~~50+~~	—	—	—		4½"	4-4.5	0-4		
		4.5	clay content; dry; grey-tan		↓										
4.5		8.5	—	—	PA										
8.5		9	SAA	032 @ 15:40	SS	50+	—	—	—		3"	8.5-9	0-3		
9		13.5	—	—	PA										
13.5		15	SAA - not enough recovery for sample		SS	50+	—	—			3"	—	—		

Notes and Comments

Depth of borehole caving: _____ Depth of first groundwater encounter: _____ Topsoil thickness: _____

Water level in open borehole on completion _____ After _____ Hours _____

Notes:

Stratigraphy Log (Borehole/Test Pit/Trench/Excavation/Soil Burden)
(Based on SP-14)
Page 1 of 1

Project name: LAWRENCE USD
Project number:Driller:Date/Time: 112Wele33
Client:Surface elevation:Date/Time:
(A.M.):Drilling method:
Drilling contractor: RC Drilling
891.29
(P.M.):GHD supervisor:
Hole designation: BH-4d
started: 8/18 @ 0810
completed: 8/18 @ 0855
Location:Weather

Stratigraphic Intervals (Depths in ft/m BGS) From	At	To	Sample Description: Order of descriptors: Soil type symbol(s) - primary component(s), (nature of deposit), secondary components, relative density/consistency, grain size/plasticity, gradation/structure, colour, moisture content, Note: Plasticity determination requires the addition of moisture if the sample is too dry to roll (indicate if moisture was added or not).	Sample Number	Sampling Method	Penetration Record Split Spoon Blows (Record N-Values & Recoveries) 6"	6"	6"	6"	N	R	Sample Interval	PID/FID (ppm)	Chemical Analysis	Grain Size/ Other Analysis
0			Veg - loose silty clay w/ trace	033@ 0830	Aug	—	—	—	—						
			fine sand, no plastic; dry;		↓										
		1	Blocky; brown		↓										
1.0			CL - Clay w/ silt & trace fine	034@ 0835	SS	4	6	7	—						
			sand. Blocky; no plastic;		↓										
		2.5	Firm; dry; dark brown		↓										
2.5		3.5	—	—	—	—	—	—	—						
3.5			Fine Sandstone (weathered) weathered shale;	035@ 0840	SS	20	50/2"	—							
		5	fissile, brittle; dry; grey/tan		↓										
5		6	—	—	—	—	—	—	—						
6		7.5	SAA -	036@ 0845	SS	50/4"	—	—	—						
7.5		8.5	—	—	—	—	—	—	—						
8.5		10	SAA	037@ 0850	SS	50/4"	—	—	—						
	10		End of Boring												

Notes and Comments
Depth of borehole caving _____ Depth of first groundwater encounter _____ Topsoil thickness _____
Water level in open borehole on completion _____ After _____ Hours _____
Notes:

Stratigraphy Log (Non-cohesive Soil) (Modified from SP-14)

Project name: LAWRENCE MSD
Project: TRAILHEAD
Client:Surface:

(A.M.):Drilling method:

Drilling contractor: RC Drilling
number:Driller:Date/Time: 8-29-11
elevation:Date/Time:

(P.M.):GHD supervisor:

Hole designation: BH-51
started: 8/18 @ 0930
completed: 8/18 @ 0950
Location:Weather:

Stratigraphic Intervals (Depths in ft/m BGS) From	At	To	Sample Description: Order of descriptors: Soil type symbol(s) - primary component(s), (nature of deposit), secondary components, relative density/consistency, grain size/plasticity, gradation/structure, colour, moisture content, Note: Plasticity determination requires the addition of moisture if the sample is too dry to roll (indicate if moisture was added or not).	Sample Details: Sample Number	Sampling Method	Penetration Record Split Spoon Blows (Record N-Values & Recoveries) 6"	6"	6"	6"	N	R	Sample Interval	PID/FID (ppm)	Chemical Analysis	Grain Size/ Other Analysis
0			Veg - Cl-Clay "/ silty trace fine	0930 0900	dup	–	–	–	–			0-5"	0.3		
			Sand; organics; loose; no plastic		↓							↓			
		1	dry; light brown		↓							↓			
1			Cl-Clay "/ silty trace fine sand	0930 0905	SS	5	7	8	–			1-25	2.7		
			layered "/ Alternating bands of		↓							↓			
			tan silt/clay; brown clay/		↓							↓			
			silts; Firm; no plastic; dry;		↓							↓			
		2.5	brown		↓							↓			
2.5		3.5	—	—	—							—	—		
3.5			Cl-Clay "/ silty fine sand; layered	0940 0915	SS	2	3	4	–			3.5-5	0.4		
		4.25	soft; to plastic; dry; dark brown		↓							↓			
3.5			Cl-Clay "/ fine silty trace fine		↓							↓			
		4	sand;		↓							↓			
4.25			- Sand "/ trace silty trace Cl		↓							↓			

Notes and Comments

Depth of borehole caving _____ Depth of first groundwater encounter _____ Topsoil thickness

Water level in open borehole on completion _____ After _____ Hours _____

Notes:

Project name:
Project
Client:Surface

(A.M.):Drilling method:

Drilling contractor:
number:Driller:Date/Time
elevation:Date/Time

(P.M.):GHD supervisor:

Hole designation: BH-S1
started:
completed:
Location:Weather

Stratigraphic Intervals (Depths in ft/m BGS)			Sample Description	Sample Details												
			Order of descriptors: Soil type symbol(s) - primary component(s), (nature of deposit), secondary components, relative density/consistency, grain size/plasticity, gradation/structure, colour, moisture content,			Penetration Record Split Spoon Blows (Record N-Values & Recoveries)										
From	At	To	Note: Plasticity determination requires the addition of moisture if the sample is too dry to roll (indicate if moisture was added or not).	Sample Number	Sampling Method	6"	6"	6"	6"	N	R	Sample Interval	PID/FID (ppm)	Chemical Analysis	Grain Size/ Other Analysis
			low cohesion; med-fine grain;		↓										
		5	subangular; damp; grey/tan		↓										
5		6	—	—	—							—	—		
6			fine Sandy, weathered shale;	BH1@ 0920	SS	5/4						6-7.5	0.3		
		7.5	fissile; dry; grey; tan		↓										
7.5		8.5	—	—	—							—	—		
8.5		10	SAA	BH2@ 0925	SS	22/2						8.5-10	0.5		
10		13.5	—	—	—							—	—		
13.5		15	SAA	BH3@ 0930	SS	5/4						13.5-15	0.3		
15		18.0	—	—	—							—	—		
18.0			CL- Clay w/ fine sand; low plastic;	BH4@ 0945	SS	5/2						18-18.5	1.2		
		18.5	soft; wet; grey/tan;		↓										
	18.5		wet;												
	18.5		end of boring												

Notes and Comments

Depth of borehole caving _____ Depth of first groundwater encounter _____ Topsoil thickness _____

Water level in open borehole on completion _____ After _____ Hours _____

Notes:

Stratigraphy Log (burden)
(m SP-14)
Page 1 of 2

Project name: LAURENCE MSO
Project number:Driller:Date/Time: 11216633
Client:Surface elevation:Date/Time:
(A.M.):Drilling method:
Drilling contractor: RC DRILLING
891.69
(P.M.):GHD supervisor:
Hole designation: BH-9
started: BHR @ 1005
completed: SHR @ 11:05
Location:Weather

Stratigraphic Intervals (Depths in ft/m BGS) From	At	To	Sample Description: Order of descriptors: Soil type symbol(s) - primary component(s), (nature of deposit), secondary components, relative density/consistency, grain size/plasticity, gradation/structure, colour, moisture content, Note: Plasticity determination requires the addition of moisture if the sample is too dry to roll (indicate if moisture was added or not).	Sample Number	Sampling Method	Penetration Record Split Spoon Blows (Record N-Values & Recoveries) 6"	6"	6"	6"	N	R	Sample Interval	PID/FID (ppm)	Chemical Analysis	Grain Size/ Other Analysis
0			Veg — CI-Clay w/ fine sand,	045@ 1010	Aug	—	—	—	—			0-5"	0-3		
			silt, organics; loose, wet		↓								↓		
		1	dry, brown		↓								↓		
1			CI- Clay w/ silt & trace fine sand,	046@ 1015	SS	2	3	3	—			1-2.5	1.0		
			firm, blocky; no plastic; dry		↓								↓		
		2.5	reddish brown		↓								↓		
2.5		3.5	—	—	PA							—	—		
3.5			CI- Clay w/ silt & trace fine	047@ 1020	SS	5	8	11	—			3.5-5	12.0		
			sand, firm; blocky; no plastic; dry		↓								↓		
		5	dark brownish-red; faint odour		↓								↓		
5		6	—	—	PA							—	—		
6			CI- Clay w/ silt, firm; layered w/	048@ 1025	SS	5	8	11	—			6-7.5	116.2		
			alternating layers of grey & tan		↓								↓		
		7.5	silty clay; no plastic; dry; trace		↓								↓		

Notes and Comments
Depth of borehole caving _____ Depth of first groundwater encounter _____ Topsoil thickness _____
Water level in open borehole on completion _____ After _____ Hours _____
Notes:

Stratigraphy Log (...burden)
(...m SP-14)

Project name: _____ Drilling contractor: _____ Hole designation: BH-9
Project _____ number:Driller:Date/Time _____ started: _____
Client:Surface _____ elevation:Date/Time _____ completed: _____
_____ Location:Weather _____
(A.M.):Drilling method: _____
(P.M.):GHD supervisor: _____

Stratigraphic Intervals (Depths in ft/m BGS)			Sample Description	Sample Details											
			Order of descriptors: Soil type symbol(s) - primary component(s), (nature of deposit), secondary components, relative density/consistency, grain size/plasticity, gradation/structure, colour, moisture content,			Penetration Record Split Spoon Blows (Record N-Values & Recoveries)									
From	At	To	Note: Plasticity determination requires the addition of moisture if the sample is too dry to roll (indicate if moisture was added or not).	Sample Number	Sampling Method	6"	6"	6"	6"	N	R	Sample Interval	PID/FID (ppm)	Chemical Analysis	Grain Size/ Other Analysis
7.5		8.5	—	—	—	—	—	—	—				—		
8.5			-Clayey silt + trace fine	049@ 1030	SS	30	5/5				8		4.0		
			sand, layered, soft, ~~DR~~ fissile,		↓										
		10	dry; brown		▽										
10		13.5	—	—	—	—	—	—	—				—		
13.5			-fine sandy weathered	050@ 1040	SS	5/3					3		2.6		
		15	shale, fissile, soft, grey/tan		▽										
15		18.5	—	—	—	—	—	—	—				—		
18.5		20	SAA	051@ 1050	SS	50/5	-	-	-		2		2.3		
	20		End of boring	—	—										

Notes and Comments

Depth of borehole caving _____ Depth of first groundwater encounter _____ Topsoil thickness _____

Water level in open borehole on completion _____ After _____ Hours _____

Notes:

Stratigraphy Log (burden)
(n SP-14)
Page 1 of 2

Project name: LAWRENCE MSO
Project number:Driller:Date/Time: 1121166233
Client:Surface elevation:Date/Time:
(A.M.):Drilling method:
Drilling contractor: RC DRILLING
(P.M.):GHD supervisor:
Hole designation: BH21
started: 8/18 1105
completed: 8/18 1153
Location:Weather:

Stratigraphic Intervals (Depths in ft/m BGS) From	At	To	Sample Description: Order of descriptors: Soil type symbol(s) - primary component(s), (nature of deposit), secondary components, relative density/consistency, grain size/plasticity, gradation/structure, colour, moisture content, Note: Plasticity determination requires the addition of moisture if the sample is too dry to roll (indicate if moisture was added or not).	Sample Number	Sampling Method	Penetration Record Split Spoon Blows (Record N-Values & Recoveries) 6"	6"	6"	6"	N	R	Sample Interval	PID/FID (ppm)	Chemical Analysis	Grain Size/ Other Analysis
0			Veg - CL - Clay & silt & fine Sand.	052@ 1110	Aug	-	-	-	-			0-8"	0.1		
			organics; loose; moist; dry;												
		1	light brown												
1			CL - Clay & silt & trace fine	053@ 11:15	SS	3	4	3	—			1-25	0.0		
			Sand; trace Coarse Sand;												
			fine grained; (FILL?)												
			blocky; dry; stiff; orange red;												
		2.5	brown												
2.5		3.5	—	—	—	—	—	—	—	—	—	—	—		
3.5			CL - Clay & silty & trace fine sand;	054@ 11:20	SS	2	3	3	—			3.5-5	0.3		
			blocky; wet; soft; low plastic;												
		5	drill; dark brown; wet												
5		6	—	—	—							—	—		
6			CL - Clay & silty & trace fine Sand;	055@ 11:25	SS	4	6	5	—			6-7.5	1.2		

Notes and Comments
Depth of borehole caving _____ Depth of first groundwater encounter _____ Topsoil thickness _____
Water level in open borehole on completion _____ After _____ Hours _____
Notes:

Project name: _____ Drilling contractor: _____ Hole designation: BH-21
Project _____ number:Driller:Date/Time _____ started: _____
Client:Surface _____ elevation:Date/Time _____ completed: _____
_____ _____ Location:Weather _____
(A.M.):Drilling method: _____ (P.M.):GHD supervisor: _____

Stratigraphic Intervals (Depths in ft/m BGS) From	At	To	Sample Description: Order of descriptors: Soil type symbol(s) - primary component(s), (nature of deposit), secondary components, relative density/consistency, grain size/plasticity, gradation/structure, colour, moisture content, Note: Plasticity determination requires the addition of moisture if the sample is too dry to roll (indicate if moisture was added or not).	Sample Details: Sample Number	Sampling Method	Penetration Record Split Spoon Blows (Record N-Values & Recoveries) 6"	6"	6"	6"	N	R	Sample Interval	PID/FID (ppm)	Chemical Analysis	Grain Size/ Other Analysis
			layered: ¼" / 1-2cm lithics ch brown sand													
		7.5	Silt - fine; dry; moisture tan													
7.5		8.5	—	—	—	—	—	—	—	—	—	—	—	—		
8.5			Cl - Clay w/ silt + trace - fine sand	OSHC 11:30	SS	3	4	7				8.5-10	0.5		
			+ trace Coarse Sand + fine gravel												
			(C/I) water in) H, S of 5cm												
		9.5	Moderate Cl-Clay (dry) mottled (C/I)												
9.5			Cl - Clay w/ silt + trace fine sand;												
		10	Highly silty clay; dark brown												
10		13.5	—	—	—							—	—		
13.5			- fine sandy weathered	OSHC 11:35	SS	50/10					2	13.5-15	1.0		
		14	shale: OSS + SILT; grey; fissile												
14		19.5	—	—	—	—	—	—	—	—		—	—		
19.5		20	SAA	OSHC 11:45	SS	50/2"					2	19.5-20	0.2		

Notes and Comments
Depth of borehole caving _____ Depth of first groundwater encounter _____ Topsoil thickness _____
Water level in open borehole on completion _____ After _____ Hours _____
Notes:

Stratigraphy L verburden)
(Form SP-14)
Page 1 of 2

Project name: LAWRENCE MSD
Project: 112116133
Client:Surface:

(A.M.):Drilling method:

Drilling contractor: RC DRILLING
number:Driller:Date/Time:
elevation:Date/Time: 853.97

(P.M.):GHD supervisor:

Hole designation: BH-23
started: 8/18 @ 12:40
completed: 8/18 @ 13:15
Location:Weather:

Stratigraphic Intervals (Depths in ft/m BGS)			Sample Description	Sample Details											
			Order of descriptors: Soil type symbol(s) - primary component(s), (nature of deposit), secondary components, relative density/consistency, grain size/plasticity, gradation/structure, colour, moisture content,			Penetration Record Split Spoon Blows (Record N-Values & Recoveries)									
From	At	To	Note: Plasticity determination requires the addition of moisture if the sample is too dry to roll (indicate if moisture was added or not).	Sample Number	Sampling Method	6"	6"	6"	6"	N	R	Sample Interval	PID/FID (ppm)	Chemical Analysis	Grain Size/ Other Analysis
0		0.25'	ASPHALT –	—	—							—	—		
0.25'			CL-Clay & silt, fine sand, stiff,	0900 12:45	PA	–	–	–	–			0.25-0.75	0.3		
		0.5"	friem, dry, brown, no plastic		↓							↓			
0.5		1	–		PA							—	—		
1			CL-Clay & silt, trace fine sand,	0900 12:50	SS	2	3	4	–			1-2.5	0.7		
			friem, plastic, layered.		↓							↓			
		2.5	dry, black		↓							↓			
2.5		3.5	–		PA							—	—		
3.5			CL-Clay & silt, trace fine sand	0901 @ 12:55	SS	3	3	3	–			3.5-5	1.2		
			mod soft, blocky, no plastic,		↓							↓			
		5	dry, brown, red.		↓							↓			
5		6	—		PA							—	—		
6			CL-Clay & silt, trace fine sand,	0902 @ 13:00	SS	2	3	4	–			6-7.5	0.3		
			mod friem, blocky, low plastic		↓							↓			

Notes and Comments

Depth of borehole caving _____ Depth of first groundwater encounter _____ Topsoil thickness _____

Water level in open borehole on completion _____ After _____ Hours _____

Notes:

Project name: _____ Drilling contractor: _____ Hole designation: BH-23
Project _____ number:Driller:Date/Time _____ started: _____
Client:Surface _____ elevation:Date/Time _____ completed: _____
_____ Location:Weather _____
(A.M.):Drilling method: _____
(P.M.):GHD supervisor: _____

Stratigraphic Intervals (Depths in ft/m BGS) From	At	To	Sample Description: Order of descriptors: Soil type symbol(s) - primary component(s), (nature of deposit), secondary components, relative density/consistency, grain size/plasticity, gradation/structure, colour, moisture content, Note: Plasticity determination requires the addition of moisture if the sample is too dry to roll (indicate if moisture was added or not).	Sample Details: Sample Number	Sampling Method	Penetration Record Split Spoon Blows (Record N-Values & Recoveries) 6"	6"	6"	6"	N	R	Sample Interval	PID/FID (ppm)	Chemical Analysis	Grain Size/ Other Analysis
		7.5	Fill: damp to dry cinders, brown		↓										
7.5		8.5	—	—	DA			.				—	—		
8.5			CL-Clay & silt, trace fine sand, layered, firm, no plastic,	0630 13/05	SS	5	8	4	—			8.5 to 10	0.7		
					↓							↓			
		10	dry, light grey		↓							↓			
10		13.5	—	—	—	—	—	—	—	—	—	—	—		
13.5			CL-silty clay & fine sand, layered, firm, low plastic	0640 13:10	SS	?	?	?	—			13.5 to 15	1.1	Blow counts not recorded by driller	
					↓							↓			
		14.5	transitions to grey sandy clayey silt, low plastic		↓							↓			
14.5					↓							↓			
		15	layered, damp, grey		↓							↓			
	15		end of borehole		↓										

Notes and Comments
Depth of borehole caving _____ Depth of first groundwater encounter _____ Topsoil thickness _____
Water level in open borehole on completion _____ After _____ Hours _____
Notes:

Stratigraphy L verburden)
orm SP-14)
Page 1 of 2

Project name: LAWRENCE MSO
Project: 112-10033
Client:Surface:
(A.M.):Drilling method:

Drilling contractor: RC DRILLING
number:Driller:Date/Time:
elevation:Date/Time: 843.44
(P.M.):GHD supervisor:

Hole designation: RH-S2
started: 5/18 @ 13:30
completed: 5/18 @ 1400
Location:Weather:

Stratigraphic Intervals (Depths in ft/m BGS)			Sample Description	Sample Details											
			Order of descriptors: Soil type symbol(s) - primary component(s), (nature of deposit), secondary components, relative density/consistency, grain size/plasticity, gradation/structure, colour, moisture content,			Penetration Record Split Spoon Blows (Record N-Values & Recoveries)									
From	At	To	Note: Plasticity determination requires the addition of moisture if the sample is too dry to roll (indicate if moisture was added or not).	Sample Number	Sampling Method	6"	6"	6"	6"	N	R	Sample Interval	PID/FID (ppm)	Chemical Analysis	Grain Size/ Other Analysis
0			GRAVEL DRIVE OVER OLD	0665@1325	PA							0-0.75	0.3		
		0.75	Asphalt ⇒ deteriorating		↓							↓			
0.75			GM-GRAVEL; dirty; well-graded, unsorted silty fine-med grained sand, sub angular, dry, brown	0666@1330	SS/RH	4	2	4	—			0.75-2.5	0.1		Poor through recovery - sample from augers
		2.5			↓							↓			
2.5		3.5	—	—	PA	—	—	—	—			—	—		
3.5		5	SAA; moist	0667@1335	SS	3	12	9	—			3.5-5	6.6		
5		6	—	—	PA	—	—	—	—			—	—		
6			CL- silty clay; trace fine sand; firm; layered; alternating layers of tan and brown silty clay; no odour; dry; grey to	0668@1340	SS	5	11	14	—			6-7.5	53.5		
		7.5	red-brown; NH+ odour		↓							↓			

Notes and Comments

Depth of borehole caving _____ Depth of first groundwater encounter _____ Topsoil thickness _____

Water level in open borehole on completion _____ After _____ Hours _____

Notes:

Project name:
Project
Client:Surface

(A.M.):Drilling method:

Drilling contractor:
number:Driller:Date/Time
elevation:Date/Time

(P.M.):GHD supervisor:

Hole designation: BH-52
started:
completed: 8/15 @ 1400
Location:Weather

Stratigraphic Intervals (Depths in ft/m BGS) From	At	To	Sample Description: Order of descriptors: Soil type symbol(s) - primary component(s), (nature of deposit), secondary components, relative density/consistency, grain size/plasticity, gradation/structure, colour, moisture content, Note: Plasticity determination requires the addition of moisture if the sample is too dry to roll (indicate if moisture was added or not).	Sample Details: Sample Number	Sampling Method	Penetration Record Split Spoon Blows (Record N-Values & Recoveries) 6"	6"	6"	6"	N	R	Sample Interval	PID/FID (ppm)	Chemical Analysis	Grain Size/ Other Analysis
1.5		85		—	PA										
85			CL- silty clay w/ trace fine sand;	0169 @ 1345	SS	4	7	8	—			8.5-10	80.8		
			firm; no plastic; blocky;		↓							↓			
		10	dry; reddish brown; NAPL odour		↓							↓			
10		13.5	—	—	—							—	—		
13.5			CL- silty clay w/ trace fine sand;	0700 @ 1350	SS	6	9	11	—			13.5-15	55.3		
			firm; no plastic; layered; dry;		↓							↓			
		15	grey-tan layers; NAPL odour		↓							↓			
	15		End of Boring @ 15												

Notes and Comments

Depth of borehole caving _____ Depth of first groundwater encounter _____ Topsoil thickness _____

Water level in open borehole on completion _____ After _____ Hours _____

Notes:

Stratigraphy I verburden)
(Form SP-14)
Page 1 of 2

Project name: LAWRENCE NSD
Project: 1121106.23
Client:Surface:
(A.M.):Drilling method:
Drilling contractor: RC DRILLING
number:Driller:Date/Time:
elevation:Date/Time: 844.11
(P.M.):GHD supervisor:
Hole designation: BH-10
started: 5/15@ 1405
completed: 5/15@ 1515
Location:Weather:

Stratigraphic Intervals (Depths in ft/m BGS) From	At	To	Sample Description: Order of descriptors: Soil type symbol(s) - primary component(s), (nature of deposit), secondary components, relative density/consistency, grain size/plasticity, gradation/structure, colour, moisture content, Note: Plasticity determination requires the addition of moisture if the sample is too dry to roll (indicate if moisture was added or not).	Sample Number	Sampling Method	Penetration Record Split Spoon Blows (Record N-Values & Recoveries) 6"	6"	6"	6"	N	R	Sample Interval	PID/FID (ppm)	Chemical Analysis	Grain Size/ Other Analysis
0		0.25	Asphalt -	—	Aug									
0.25			CL- Silty, fine Sandy clay, ms	071@ 1410	Aug							0.25-1	1.6		
		1	plastic, dry, brown		↓							↓			
1			CL - Clay w/ silty fine Sand	072@ 1415	SS	5	6	8	-			1-2.5	17.3		
			stiff, ms plastic, black		↓							↓			
		1.5	dry, tarry, brown (fill)		↓							↓			
2.5		3.5	—	—	PA							—	—		
3.5			CL - Clay w/ silt & fine sand	073@ 1425	SS	1	2	2	-			3.5-5	18.6		
			brown, low plastic, dry		↓							↓			
		5	black, NH+ odour		↓							↓			
3.5		4	wet lense -		↓							↓			
5		6	—	—	—							—			
6			CL - Clay w/ silty, trace fine sand	074@ 1440	SS	4	7	8	-			6-7.5	1.3		
		7.5	firm, ms plastic, dry, dark brown	cm	↓							↓			

Notes and Comments
Depth of borehole caving _____ Depth of first groundwater encounter _____ Topsoil thickness _____
Water level in open borehole on completion _____ After _____ Hours _____
Notes:

Stratigraphy L verburden)
(orm SP-14)

Project name: _____ Drilling contractor: _____ Hole designation: BH-10
Project _____ number:Driller:Date/Time _____ started: 8/18/0 1405
Client:Surface _____ elevation:Date/Time _____ completed: 8/18/0 15:15
_____ Location:Weather _____
(A.M.):Drilling method: _____
(P.M.):GHD supervisor: _____

Stratigraphic Intervals (Depths in ft/m BGS) From	At	To	Sample Description: Order of descriptors: Soil type symbol(s) - primary component(s), (nature of deposit), secondary components, relative density/consistency, grain size/plasticity, gradation/structure, colour, moisture content, Note: Plasticity determination requires the addition of moisture if the sample is too dry to roll (indicate if moisture was added or not).	Sample Details: Sample Number	Sampling Method	Penetration Record Split Spoon Blows (Record N-Values & Recoveries) 6"	6"	6"	6"	N	R	Sample Interval	PID/FID (ppm)	Chemical Analysis	Grain Size/ Other Analysis
1.5		8.5	—	—	PA	—	—	—	—	—	—	—	—	—	—
8.5			CL- Clay & Silty Fine Sand; blocky, stiff, firm, moist;	0755 1500	SS	5	7	—				8.5-10	6.6		
					↓							↓			
		10	plastic; brown & tan		↓							↓			
10		13.5	—	—	PA							—	—		
13.5			CL- Silty Clay & trace fine Sand; blocky, firm, no plastic;	0760 1510	SS	4	5	5	—			13.5-15	32.7		
					↓							↓			
			cracks, brown mixed w/ black		↓							↓			
		15	clay; dry; NH+ odor		↓							↓			
	15		end of borehole												

Notes and Comments
Depth of borehole caving _____ Depth of first groundwater encounter _____ Topsoil thickness _____
Water level in open borehole on completion _____ After _____ Hours _____
Notes:

Stratigraphy L verburden)
(Form SP-14)
Page 1 of 1

Project name: LAWRENCE MS
Project number: 11211623
Client: Surface
(A.M.): Drilling method:
Drilling contractor: RC DRILLING
number: Driller: Date/Time
elevation: Date/Time
RUN-60
(P.M.): GHD supervisor:
Hole designation: SW-60
started:
completed:
Location: Weather

Stratigraphic Intervals (Depths in ft/m BGS) From	At	To	Sample Description: Order of descriptors: Soil type symbol(s) - primary component(s), (nature of deposit), secondary components, relative density/consistency, grain size/plasticity, gradation/structure, colour, moisture content, Note: Plasticity determination requires the addition of moisture if the sample is too dry to roll (indicate if moisture was added or not).	Sample Number	Sampling Method	Penetration Record Split Spoon Blows (Record N-Values & Recoveries) 6"	6"	6"	6"	N	R	Sample Interval	PID/FID (ppm)	Chemical Analysis	Grain Size/ Other Analysis
0		0.5	ASPHALT	—	PA										
Dup → 0.5			CL-Clay w/ silty trace fine sand.	077 0930 / 076 0935	PA	—	—	—	—			0.5-1	0.0		
		1	no plasticity, dry: brown		↓										
1			CL-ISILTY clay w/ trace fine sand:	079@ 0935	SS	4	3	4	-			1-2.5	0.0		
			layered: firm: no plasticity		↓										
		2.5	dry: tan & black & brown		↓										
2.5		3.5	"	—	PA	—	—	—	-	—	—	—	—		
3.5			CL-clay w/ silt & trace fine sand	080 @ 0940	SS	4	6	9	-			3.5-5	0.0		
			Moderately firm, no plastic, light		↓										
		5	layered, dry, black		↓										
	5		End of Borey												

Notes and Comments
Depth of borehole caving _____ Depth of first groundwater encounter _____ Topsoil thickness _____
Water level in open borehole on completion _____ After _____ Hours _____
Notes:

Stratigraphy (Overburden)
(Form SP-14)
Page 1 of 1

Project name: Lawrence MSD
Project: 112-10633
Client:Surface:
(A.M.):Drilling method:

Drilling contractor: RC Drilling
number:Driller:Date/Time:
elevation:Date/Time: 849.45
(P.M.):GHD supervisor:

Hole designation: BH-27
started: 8/9 @ 0830
completed: 8/9 @ 1000
Location:Weather:

Stratigraphic Intervals (Depths in ft/m BGS) From	At	To	Sample Description: Order of descriptors: Soil type symbol(s) - primary component(s), (nature of deposit), secondary components, relative density/consistency, grain size/plasticity, gradation/structure, colour, moisture content, Note: Plasticity determination requires the addition of moisture if the sample is too dry to roll (indicate if moisture was added or not).	Sample Number	Sampling Method	Penetration Record Split Spoon Blows (Record N-Values & Recoveries) 6"	6"	6"	6"	N	R	Sample Interval	PID/FID (ppm)	Chemical Analysis	Grain Size/ Other Analysis
0		0.75	Asphalt		PA										
0.75			CL-Clay w/ silt & trace fine Sand	0815/0945 0825/0945	PA	—	—	—	—	—	—	0.75-1	0.0		
		1	no plastic; dry; brown		↓										
1			CL-Silty clay w/ trace fine Sand	0830 0950	SS	8	12	12	—			1-2.5	2.0		
			Increased firm; no plastic;		↓										
		2.5	dry; tan reddish brown light		↓										
2.5		3.5	—	—	PA	—	—	—	—	—	—	—	—		
3.5			CL-Silty clay w/ trace fine sand	0840 0955	SS	6	4	4	—			3.5-5	1.3		
			Blocky w/ root traces; wet;												
			soft; low plastic; Grey												
		5	black-brown.	↓	↓										
	5		End of boring												

Notes and Comments:
Depth of borehole caving _____ Depth of first groundwater encounter _____ Topsoil thickness _____
Water level in open borehole on completion _____ After _____ Hours _____
Notes:

Stratigraphy l verburden)
(orm SP-14)
Page ___ of ___

Project name: LAWRENCE MSD
Project 112166232
Client:Surface

(A.M.):Drilling method:

Drilling contractor: RC Drilling
number:Driller:Date/Time
elevation:Date/Time

(P.M.):GHD supervisor:

Hole designation: BH-58
started:
completed:
Location:Weather

Stratigraphic Intervals (Depths in ft/m BGS) From	At	To	Sample Description: Order of descriptors: Soil type symbol(s) - primary component(s), (nature of deposit), secondary components, relative density/consistency, grain size/plasticity, gradation/structure, colour, moisture content, Note: Plasticity determination requires the addition of moisture if the sample is too dry to roll (indicate if moisture was added or not).	Sample Number	Sampling Method	Penetration Record Split Spoon Blows (Record N-Values & Recoveries) 6"	6"	6"	6"	N	R	Sample Interval	PID/FID (ppm)	Chemical Analysis	Grain Size/ Other Analysis
0			Vegetation - CL - Gravelly, Silty	0835 0816 1005	PA							0-1	0.2		
			Clay; Organics; no plasticity;	↓	↓							↓			
		1	dry; light brown	↓	↓							↓			
1			CL - Silty clay / fine Sand;	0857 1010	SS	3	3	4	—			1-25	0.4		
			layered by color & varying sand	↓	↓							↓			
			content; med. soft; no plasticity;	↓	↓							↓			
		2.5	dry; tan brown, red-brown	↓	↓							↓			
2.5		5	"	—	PA	—	—	—	—			—	—		
3.5			CL - Clay & silt & trace fine sand;	0856 1015	SS	2	1	2	-			3.5-5	0.5		
			layered; plastic; damp; light	↓	↓							↓			
		5	brown; dark brown lenses	↓	↓							↓			
	5		end of borehole												

Notes and Comments

Depth of borehole caving _____ Depth of first groundwater encounter _____ Topsoil thickness _____

Water level in open borehole on completion _____ After _____ Hours _____

Notes:

Stratigraphy I verburden)
(Form SP-14)
Page 1 of 1

Project name: LAWRENCE HSO
Project number: 1121616633
Client: Surface elevation:
(A.M.):Drilling method:
Drilling contractor: RC DRILLING
Date/Time started: 8/19 @ 1030
Date/Time completed: 8/19 @ 1050
Hole designation: BH-SS
Location:Weather
(P.M.):GHD supervisor: SHZ-SZ

Stratigraphic Intervals (Depths in ft/m BGS) From	At	To	Sample Description: Order of descriptors: Soil type symbol(s) - primary component(s), (nature of deposit), secondary components, relative density/consistency, grain size/plasticity, gradation/structure, colour, moisture content, Note: Plasticity determination requires the addition of moisture if the sample is too dry to roll (indicate if moisture was added or not).	Sample Details: Sample Number	Sampling Method	Penetration Record Split Spoon Blows (Record N-Values & Recoveries) 6"	6"	6"	6"	N	R	Sample Interval	PID/FID (ppm)	Chemical Analysis	Grain Size/ Other Analysis
0			Vegetation — CL-silty clay w/ fine sand, some gravel; MS	0900 1030 1045	PA	1	1	1	-			0-1	0.4		
		1	plasticity: light brown												
1			CL-Clay w/ silt & trace fine sand;	0910 1040	SS	2	3	2	—			1-2.5	1.0		
			blocky; wood fiber; moist;												
		2.5	dry; black-brown												
2.5		3.5	—	—	PA	—	—	—	-			—	—		
3.5			CL-Clay w/ silt & trace fine sand;	0920 1045	SS	2	2	2	—			3.5-5	0.7		Blow counts not provided by driller
			trace coarse sand; gravel;												
			blocky; no plastic; dry; dark												
		5	brown; light brown												
	5		end of boring												

Notes and Comments
Depth of borehole caving _____ Depth of first groundwater encounter _____ Topsoil thickness _____
Water level in open borehole on completion _____ After _____ Hours _____
Notes:

Stratigraphy L verburden)
(Form SP-14)
Page 1 of 2

Project name: LAWRENCE MSO
Project: 11216033
Client:Surface:
(A.M.):Drilling method:
Drilling contractor: RC Drilling
number:Driller:Date/Time:
elevation:Date/Time: 6/19/21
Hole designation: BH-SS
started: 6/19 10:55
completed: 6/19 11:40
Location:Weather:
(P.M.):GHD supervisor:

Stratigraphic Intervals (Depths in ft/m BGS) From	At	To	Sample Description: Order of descriptors: Soil type symbol(s) - primary component(s), (nature of deposit), secondary components, relative density/consistency, grain size/plasticity, gradation/structure, colour, moisture content, Note: Plasticity determination requires the addition of moisture if the sample is too dry to roll (indicate if moisture was added or not).	Sample Details: Sample Number	Sampling Method	Penetration Record Split Spoon Blows (Record N-Values & Recoveries) 6"	6"	6"	6"	N	R	Sample Interval	PID/FID (ppm)	Chemical Analysis	Grain Size/ Other Analysis
0		0.5	Weathered topsoil		PA										
0.5			CL- silty clay & fine sand, no plastic, dry, light brown	0930 1050	PA	-	-	-	-			0.5-1	0-4		
		1			↓										
1			- Silty, sandy gravel, medium cobbles, ungraded, unsorted (dirty), fill;	0940 1055	SS	6	5	5	-			1-2.5	1.1		
					↓										
		2.5	Dry;												
2.5		2.5	—	—	PA										
2.5		5	Same as Above	0950 1100	SS	4	4	4	-			2.5-5	1.2		
5		6	—	—	PA										
6		7.5	Same as Above, slight odour	0957 11:05	PA	-	-	-	-			6-7.5	920		
7.5		8.5	—	1155	PA										
8.5		10	SAA - BH collapse. Use PA to [illegible]	0915 0935 1115 1120	PA							7.5-TC			
10			- Cleaner, silty Gravel, Unsorted		PA								72.8		

Notes and Comments:
Depth of borehole caving _____ Depth of first groundwater encounter _____ Topsoil thickness _____
Water level in open borehole on completion _____ After _____ Hours _____
Notes:

Stratigraphy l verburden)
Form SP-14)
Page ___ of ___

Project name:
Project
Client:Surface

(A.M.):Drilling method:

Drilling contractor:
number:Driller:Date/Time
elevation:Date/Time

(P.M.):GHD supervisor:

Hole designation: BH-BR
started:
completed:
Location:Weather

Stratigraphic Intervals (Depths in ft/m BGS)			Sample Description	Sample Details											
			Order of descriptors: Soil type symbol(s) - primary component(s), (nature of deposit), secondary components, relative density/consistency, grain size/plasticity, gradation/structure, colour, moisture content,			Penetration Record Split Spoon Blows (Record N-Values & Recoveries)									
From	At	To	Note: Plasticity determination requires the addition of moisture if the sample is too dry to roll (indicate if moisture was added or not).	Sample Number	Sampling Method	6"	6"	6"	6"	N	R	Sample Interval	PID/FID (ppm)	Chemical Analysis	Grain Size/ Other Analysis
		3.5	Imported, damp, NH+ odor		↓										
3.5			CL- clay & silt, plastic,	0916 1135	SS	6	6	8				3.5 - 5 ft	88.8		
			brown, damp, firm,												
		5	brown, NH+ odor		↓										
	5		end of borehole												

Notes and Comments

Depth of borehole caving _____ Depth of first groundwater encounter _____ Topsoil thickness _____

Water level in open borehole on completion _____ After _____ Hours _____

Notes:

CONESTOGA-ROVERS & ASSOCIATES

CHAIN OF CUSTODY RECORD

COC NO.: 45741

PAGE 9 OF 9

Address: _____

Phone: _____ Fax: _____

(See Reverse Side for Instructions)

Project No/ Phase/Task Code:	Laboratory Name:	Lab Location:	SSOW ID:
Project Name:	Lab Contact:	Lab Quote No:	Cooler No:
Project Location:			Carrier:
Chemistry Contact:			Airbill No:
Sampler(s):			Date Shipped:

Item	SAMPLE IDENTIFICATION (Containers for each sample may be combined on one line)	DATE (mm/dd//yy)	TIME (hh:mm)	SAMPLE TYPE: Matrix Code (see back of COC)	SAMPLE TYPE: Grab (G) or Comp (C)	CONTAINER QUANTITY & PRESERVATION: Unpreserved	HCl	HNO_3	H_2SO_4	NaOH	Methanol/Water (Soil VOC)	EnCores 3x5-g, 1x25-g	Other:	Total Containers/Sample	ANALYSIS REQUESTED (See Back of COC for Definitions): NH_3/NH_4/NH_4Cl	NO_2/NO_3	MS/MSD Request	COMMENTS/ SPECIAL INSTRUCTIONS:
1	SO-081920-NL-097	8/19	1115	SL	G	X									X			
2	SO-081920-NL-098	"	1120	"	"	X									X			
3	SO-081920-NL-099	"	1135	"	"	X									X			
4	WW-081820-NL-001	8/18	16:45	WW	G	X			X							X	X		SHORT HOLD
5	WW-081920-NL-002	8/19	10:15	"	"	X			X							X	X		
6	WW-081920-NL-003	8/19	12:35	"	"	X			X							X	X		
7																			
8																			
9																			
10																			
11																			
12																			
13																			
14																			
15																			

NO

TAT Required in business days (use separate COCs for different TATs):

☐ 1 Day ☐ 2 Days ☐ 3 Days ☐ 1 Week ☐ 2 Week ☐ Other:

Total Number of Containers:

All Samples in Cooler must be on COC

Notes/ Special Requirements:

RELINQUISHED BY	COMPANY	DATE	TIME	RECEIVED BY	COMPANY	DATE	TIME
1.				1.			
2.				2.			
3.				3.			

THE CHAIN OF CUSTODY IS A LEGAL DOCUMENT – ALL FIELDS MUST BE COMPLETED ACCURATELY

Distribution: WHITE – Fully Executed Copy (CRA) YELLOW – Receiving Laboratory Copy PINK – Shipper GOLDENROD – Sampling Crew

CRA Form: COC-10B (20110804)

112166633 LAWRENCE MSO 08/17/20

0815 - on-site ; met w/ D. STANG

TASK: Env. samples for geotech
PERSONNEL: N. LASKARES - EHS
EQUIP: TRUCK #565. KS-PID-01;
WEATHER: Sunny; 90°F
PPE: LEVEL D + COVID 19 policy

08:20 - Meeting w/ R.C. Drilling ; to discuss scope, TGSM, ; protocols (decon, soil staging etc.)

↳ Soils to be staged in plastic lined piles w/ boom surrounding down near TANK #6 w/in the berm.

↳ IDW water to be collected in 55 gal drum ; staged near soils piles.

↳ Decon Requirements for environmental sampling ~~m~~ ~~be~~

112166633 LAWRENCE MSO 8/17/20

decon of split-spoon sampler between uses. WATER to be collected ; placed in drum.

↳ BACKFILL of bore holy to be done w/ clean soils ~~brought~~ brought in by R.C. Drilling.

09:15 - Begin CALIBRATION of PID. 10.6eV lamp (see OSF-259D for cal. details)

09:30 - Begin drilling ; env. sampling see Overburden logs (SP-14) for drilling details ; sample intervals.

09:40 - Borehole elevations obtained from ~~pre~~ survey markers (see SP-14)

↳ Split-spoon sampler to be decon between uses/Boreholes.

14:25 - BH-17 moved/off-set due to sub-grade obstruction. New

Rite in the Rain

1121666133 LAWRENCE MSO 8/17/20

location to be re-surveyed @ later time.

14:50 - BH-16 OFFset ~25' (~30' NW) to the W due to shallow bedrock encountered (<2' bgs)

15:10 - Same Result. Move to next location

15:15 - Return to BH-17 OFF-set (BH-17A) & complete boring

- Completed Drilling for the day. R.C. Drill to stage equip by next location & backfill Bore holes.

- GHD complete sample storage & demobilization Activities. Samples placed on ice immediately after sampling.

- Housekeeping & off-site (EW)

1121666133 LAWRENCE MSO 8/18/20

0735 - on-site → TGSM w/ crew

TASK: Cont'd env. sampling
Personnel: N-LASKARES - GHD
EQUIP: TRUCK #565; KS-PID-01
WEATHER: Sunny; 93°F
PPE: Level D + noise protection & COVID 19 Policy

07:50 - CALIBRATE PID (see QSF-259)

08:05 - Continue drilling & collecting Env. Samples for NH3; Nitrate; Nitrite

↳ see SP-14 for Overburden logs, Sample intervals & Field Screening readings.

↳ Same decon, sample handling & IDW procedures as before

15:15 - RC Drilling completed drilling for the DAY.

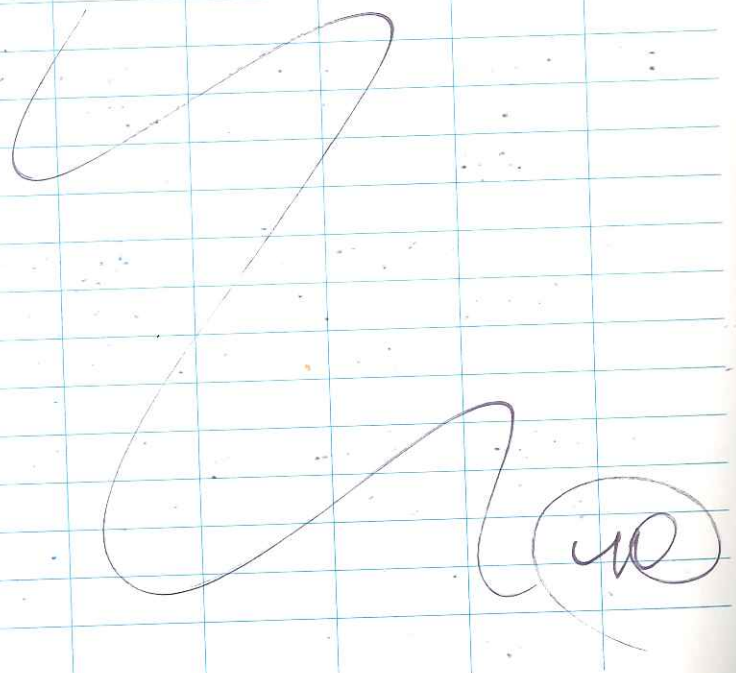
Rite in the Rain

112166633 LAWRENCE MSO 8/18/20

- IDW staged into on-site drums & in spoils pile. BH backfilled w/ clean soils;

16:45 – WW-081820-NL-001; collected rinsate sample from split-spoon.

17:10 – Housekeeping & OFF-site



112166633 LAWRENCE MSO 8/19/20

08:30 – on-site → TRSM

TASK: Cont'd Environmental Sampling
PERSONNEL: N. LASKARES - GHD
EQUIP: KS-PID-01; TRUCK #565
WEATHER: Sunny; 90°F
PPE: LEVEL D + COVID-19 policy + noise protection

09:00 – CALIBRATE PID (see QSF-2590)

09:20 – Continue drilling activities as before. Same IDW & Decon procedures as before.

12:00 – RC drilling completed Env. drilling locations. Backfill w/ clean soils by RC.

12:15 – Rinsate Sample collected: WW-081920-NL-002

12:35 – Composite IDW sample collected

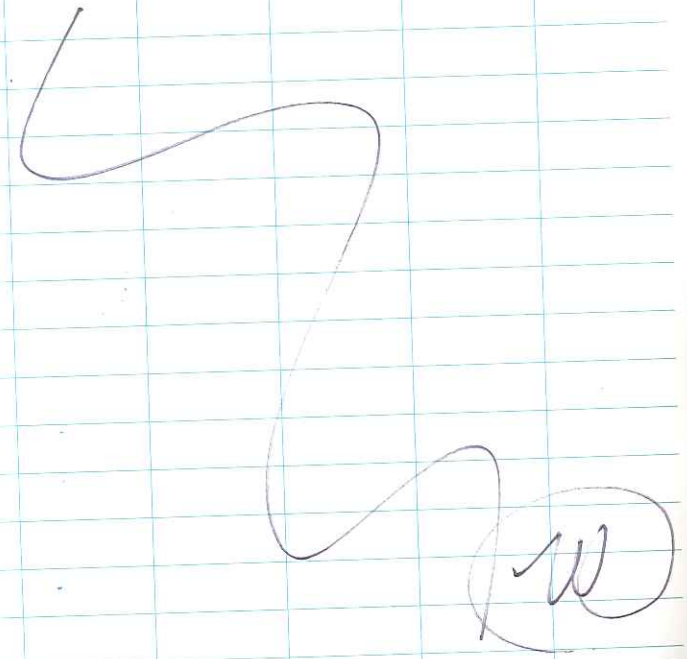
Rite in the Rain

112166633 LAWRENCE MSO 8/19/20

from 2 x 55gal drum of decon water.

13:00 - Housekeeping & off-site

↳ Samples to be collected by PACE courier & delivered to LAB 8/20.



Rite in the Rain

Field Data Record Form
Monitor, PID MiniRae/UltraRae (Gas)
(QSF-259D)

Control number: KS-PID-01
Date (mm/dd/yyyy): 08/19/20
User (print name): N. LASKARIS

Project number: 112166633
Project name: LAWRENCE ~~KS~~ MSD

Location: LAWRENCE

Calibration gas(es): 100ppm Isobutylene
Lot #(s): 18-6426
Supplier(s): FTC
Expiration date(s): 2/2021

Additional information: 9.8 eV

Field procedure before use:

	Check when completed
• Unscrew and remove the probe assembly.	
• Remove the dust filter (steel wool) from the cavity in the probe using a pair of tweezers.	
• Check to ensure the probe is clean.	☒
• Replace the filter back into the probe cavity and replace the probe assembly.	
• Turn on the instrument and allow to warm up and stabilize.	
• Check battery voltage by pressing the down arrow 4 times, until display reads reads bAt X.X.	
• Check battery level and record on the space provided, recharge if below 6.0 V.	5.6V
• Check pump inlet flow using your finger to detect suction. 4.2✓	☑
• Perform zero gas calibration. If calibrating in unclean air attach the charcoal filter (to exclude any organic gas) to the gas inlet tube.	☑
• Press [Menu] key until "CO 0.0" is displayed on LCD.	
• Press [Enter] key to zero the instrument.	☑
• Indicate the use of the charcoal filter by filling in a check box on the side of the filter (if used).	
• Remove the zero gas charcoal filter (if used).	
• Press the [Menu] key until the display reads "Clu 100.0" (or 107.0 depending on the concentration of isobutylene used to previously calibrate the instrument).	
• If the concentration of the calibration gas to be used is the same as the displayed value, press the [Enter] key 4 times to accept the value otherwise use the arrow keys to change the digit value and [Enter] key to confirm the digit. The flashing digit will move to the next digit to its right. Repeat the process until all 4 digits are entered.	☑
• "Gas On" will be displayed on the LCD. Connect the instrument to the calibration gas cylinder.	
• Turn the cylinder on.	
• Press [Enter] key to continue the calibration procedure.	
• Press [Menu] until the instrument is in real time measurement mode.	
• Expose the instrument to calibration gas and record reading on the space provided. The reading must be within ±2 ppm of the cal gas otherwise the instrument must be recalibrated.	
• Turn the instrument off by pressing the [ON] button and then confirming by pressing [Enter].	

Filing: Field file

Signature:

This completed form is a quality record

HH

Field Data Record Form
Monitor, PID MiniRae/UltraRae (Gas)
(QSF-259D)

Control number: KS-PID-01
Date (mm/dd/yyyy): 08/18/2020
User (print name): N. LASBARES

Project number: 112166633
Project name: LAWRENCE HSO

Location: LAWRENCE

Calibration gas(es): 100ppm Isobutylene
Lot #(s): 18-6426
Supplier(s): Field Environmental
Expiration date(s): 02/2021

Additional information: 9.8eV Lamp

Field procedure before use:

	Check when completed
• Unscrew and remove the probe assembly.	
• Remove the dust filter (steel wool) from the cavity in the probe using a pair of tweezers.	
• Check to ensure the probe is clean.	☑
• Replace the filter back into the probe cavity and replace the probe assembly.	
• Turn on the instrument and allow to warm up and stabilize.	
• Check battery voltage by pressing the down arrow 4 times, until display reads reads bAt X.X.	
• Check battery level and record on the space provided, recharge if below ~~3.0~~ 4.2V.	5.3V ☑
• Check pump inlet flow using your finger to detect suction.	☑
• Perform zero gas calibration. If calibrating in unclean air attach the charcoal filter (to exclude any organic gas) to the gas inlet tube.	
• Press [Menu] key until "CO 0.0" is displayed on LCD.	
• Press [Enter] key to zero the instrument.	☑
• Indicate the use of the charcoal filter by filling in a check box on the side of the filter (if used).	
• Remove the zero gas charcoal filter (if used).	
• Press the [Menu] key until the display reads "Clu 100.0" (or 107.0 depending on the concentration of isobutylene used to previously calibrate the instrument).	
• If the concentration of the calibration gas to be used is the same as the displayed value, press the [Enter] key 4 times to accept the value otherwise use the arrow keys to change the digit value and [Enter] key to confirm the digit. The flashing digit will move to the next digit to its right. Repeat the process until all 4 digits are entered.	☑
• "Gas On" will be displayed on the LCD. Connect the instrument to the calibration gas cylinder.	
• Turn the cylinder on.	
• Press [Enter] key to continue the calibration procedure.	
• Press [Menu] until the instrument is in real time measurement mode.	
• Expose the instrument to calibration gas and record reading on the space provided. The reading must be within ±2 ppm of the cal gas otherwise the instrument must be recalibrated.	
• Turn the instrument off by pressing the [ON] button and then confirming by pressing [Enter].	

Filing: Field file

Signature:

This completed form is a quality record

Field Data Record Form
Monitor, PID MiniRae/UltraRae (Gas)
(QSF-259D)

Control number: KS-PID-01
Date (mm/dd/yyyy): 05/17/2020
User (print name): N. CASKARES

Project number: 11216633
Project name: LAWRENCE MSO

Location: LAWRENCE, KS

Calibration gas(es): 100 ppm Isobutylene
Lot #(s): 18-6426
Supplier(s): FIELD ENVIRONMENTAL
Expiration date(s): 02-2021

Additional information: 9.8 eV LAMP

Field procedure before use:

	Check when completed
• Unscrew and remove the probe assembly.	
• Remove the dust filter (steel wool) from the cavity in the probe using a pair of tweezers.	☑
• Check to ensure the probe is clean.	
• Replace the filter back into the probe cavity and replace the probe assembly.	
• Turn on the instrument and allow to warm up and stabilize.	
• Check battery voltage by pressing the down arrow 4 times, until display reads reads bAt X.X.	
• Check battery level and record on the space provided, recharge if below ~~6.0V~~ 4.0V.	5.8 V
• Check pump inlet flow using your finger to detect suction.	☑
• Perform zero gas calibration. If calibrating in unclean air attach the charcoal filter (to exclude any organic gas) to the gas inlet tube.	☑
• Press [Menu] key until "CO 0.0" is displayed on LCD.	
• Press [Enter] key to zero the instrument.	☑
• Indicate the use of the charcoal filter by filling in a check box on the side of the filter (if used).	
• Remove the zero gas charcoal filter (if used).	
• Press the [Menu] key until the display reads "Clu 100.0" (or 107.0 depending on the concentration of isobutylene used to previously calibrate the instrument).	
• If the concentration of the calibration gas to be used is the same as the displayed value, press the [Enter] key 4 times to accept the value otherwise use the arrow keys to change the digit value and [Enter] key to confirm the digit. The flashing digit will move to the next digit to its right. Repeat the process until all 4 digits are entered.	☑
• "Gas On" will be displayed on the LCD. Connect the instrument to the calibration gas cylinder.	
• Turn the cylinder on.	
• Press [Enter] key to continue the calibration procedure.	
• Press [Menu] until the instrument is in real time measurement mode.	
• Expose the instrument to calibration gas and record reading on the space provided. The reading must be within ±2 ppm of the cal gas otherwise the instrument must be recalibrated.	
• Turn the instrument off by pressing the [ON] button and then confirming by pressing [Enter].	

Filing: Field file

Signature:

This completed form is a quality record

Appendix B
Laboratory Analytical Results and Chain-of-Custody

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

September 01, 2020

Jeff Scott
City of Lawrence
6 E. 6th St
PO Box 708
Lawrence, KS 66044

RE: Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Dear Jeff Scott:

Enclosed are the analytical results for sample(s) received by the laboratory on August 20, 2020. The results relate only to the samples included in this report. Results reported herein conform to the applicable TNI/NELAC Standards and the laboratory's Quality Manual, where applicable, unless otherwise noted in the body of the report.

The test results provided in this final report were generated by each of the following laboratories within the Pace Network:

- Pace Analytical Services - Kansas City

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Hank Kapka
hank.kapka@pacelabs.com
(913)599-5665
PM Lab Management

Enclosures

cc: Nick Laskaras, GHD Services, Inc.
Water Quality

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without the written consent of Pace Analytical Services, LLC.

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

CERTIFICATIONS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Pace Analytical Services Kansas
9608 Loiret Boulevard, Lenexa, KS 66219
Missouri Inorganic Drinking Water Certification #: 10090
Arkansas Drinking Water
Arkansas Certification #: 20-020-0
Arkansas Drinking Water
Illinois Certification #: 200030
Iowa Certification #: 118
Kansas/NELAP Certification #: E-10116
Louisiana Certification #: 03055
Nevada Certification #: KS000212020-2
Oklahoma Certification #: 9205/9935
Florida: Cert E871149 SEKS WET
Texas Certification #: T104704407-19-12
Utah Certification #: KS000212019-9
Illinois Certification #: 004592
Kansas Field Laboratory Accreditation: # E-92587
Missouri SEKS Micro Certification: 10070

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Pace Analytical Services, LLC
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Lenexa, KS 66219
(913)599-5665

SAMPLE SUMMARY

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Lab ID	Sample ID	Matrix	Date Collected	Date Received
60346051001	SO-081720-NL-001	Solid	08/17/20 09:50	08/20/20 10:48
60346051002	SO-081720-NL-002	Solid	08/17/20 09:55	08/20/20 10:48
60346051003	SO-081720-NL-003	Solid	08/17/20 10:00	08/20/20 10:48
60346051004	SO-081720-NL-004	Solid	08/17/20 10:05	08/20/20 10:48
60346051005	SO-081720-NL-005	Solid	08/17/20 10:10	08/20/20 10:48
60346051006	SO-081720-NL-006	Solid	08/17/20 10:15	08/20/20 10:48
60346051007	SO-081720-NL-007	Solid	08/17/20 10:25	08/20/20 10:48
60346051008	SO-081720-NL-008	Solid	08/17/20 10:45	08/20/20 10:48
60346051009	SO-081720-NL-009	Solid	08/17/20 10:47	08/20/20 10:48
60346051010	SO-081720-NL-010	Solid	08/17/20 10:50	08/20/20 10:48
60346051011	SO-081720-NL-011	Solid	08/17/20 11:00	08/20/20 10:48
60346051012	SO-081720-NL-012	Solid	08/17/20 11:05	08/20/20 10:48
60346051013	SO-081720-NL-013	Solid	08/17/20 11:10	08/20/20 10:48
60346051014	SO-081720-NL-014	Solid	08/17/20 11:15	08/20/20 10:48
60346051015	SO-081720-NL-015	Solid	08/17/20 11:45	08/20/20 10:48
60346051016	SO-081720-NL-016	Solid	08/17/20 11:45	08/20/20 10:48
60346051017	SO-081720-NL-017	Solid	08/17/20 11:50	08/20/20 10:48
60346051018	SO-081720-NL-018	Solid	08/17/20 11:55	08/20/20 10:48
60346051019	SO-081720-NL-019	Solid	08/17/20 12:05	08/20/20 10:48
60346051020	SO-081270-NL-020	Solid	08/17/20 12:10	08/20/20 10:48
60346051021	SO-081720-NL-021	Solid	08/17/20 13:30	08/20/20 10:48
60346051022	SO-081720-NL-022	Solid	08/17/20 13:35	08/20/20 10:48
60346051023	SO-081720-NL-023	Solid	08/17/20 13:45	08/20/20 10:48
60346051024	SO-081720-NL-024	Solid	08/17/20 13:50	08/20/20 10:48
60346051025	SO-081720-NL-025	Solid	08/17/20 13:55	08/20/20 10:48
60346051026	SO-081720-NL-026	Solid	08/17/20 14:55	08/20/20 10:48
60346051027	SO-081720-NL-027	Solid	08/17/20 15:00	08/20/20 10:48
60346051028	SO-081720-NL-028	Solid	08/17/20 15:20	08/20/20 10:48
60346051029	SO-081720-NL-029	Solid	08/17/20 15:25	08/20/20 10:48
60346051030	SO-081720-NL-030	Solid	08/17/20 15:30	08/20/20 10:48
60346051031	SO-081720-NL-031	Solid	08/17/20 15:35	08/20/20 10:48
60346051032	SO-081720-NL-032	Solid	08/17/20 15:40	08/20/20 10:48
60346051033	SO-081820-NL-033	Solid	08/18/20 08:30	08/20/20 10:48
60346051034	SO-081820-NL-034	Solid	08/18/20 08:35	08/20/20 10:48
60346051035	SO-081820-NL-035	Solid	08/18/20 08:40	08/20/20 10:48
60346051036	SO-081820-NL-036	Solid	08/18/20 08:45	08/20/20 10:48
60346051037	SO-081820-NL-037	Solid	08/18/20 08:50	08/20/20 10:48

REPORT OF LABORATORY ANALYSIS

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Lenexa, KS 66219
(913)599-5665

SAMPLE SUMMARY

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Lab ID	Sample ID	Matrix	Date Collected	Date Received
60346051038	SO-081820-NL-038	Solid	08/18/20 09:00	08/20/20 10:48
60346051039	SO-081820-NL-039	Solid	08/18/20 09:05	08/20/20 10:48
60346051040	SO-081820-NL-040	Solid	08/18/20 09:15	08/20/20 10:48
60346051041	SO-081820-NL-041	Solid	08/18/20 09:20	08/20/20 10:48
60346051042	SO-081820-NL-042	Solid	08/18/20 09:25	08/20/20 10:48
60346051043	SO-081820-NL-043	Solid	08/18/20 09:35	08/20/20 10:48
60346051044	SO-081820-NL-044	Solid	08/18/20 09:45	08/20/20 10:48
60346051045	SO-081820-NL-045	Solid	08/18/20 10:10	08/20/20 10:48
60346051046	SO-081820-NL-046	Solid	08/18/20 10:15	08/20/20 10:48
60346051047	SO-081820-NL-047	Solid	08/18/20 10:20	08/20/20 10:48
60346051048	SO-081820-NL-048	Solid	08/18/20 10:25	08/20/20 10:48
60346051049	SO-081820-NL-049	Solid	08/18/20 10:30	08/20/20 10:48
60346051050	SO-081820-NL-050	Solid	08/18/20 10:40	08/20/20 10:48
60346051051	SO-081820-NL-051	Solid	08/18/20 10:50	08/20/20 10:48
60346051052	SO-081820-NL-052	Solid	08/18/20 11:10	08/20/20 10:48
60346051053	SO-081820-NL-053	Solid	08/18/20 11:15	08/20/20 10:48
60346051054	SO-081820-NL-054	Solid	08/18/20 11:20	08/20/20 10:48
60346051055	SO-081820-NL-055	Solid	08/18/20 11:25	08/20/20 10:48
60346051056	SO-081820-NL-056	Solid	08/18/20 11:30	08/20/20 10:48
60346051057	SO-081820-NL-057	Solid	08/18/20 11:36	08/20/20 10:48
60346051058	SO-081820-NL-058	Solid	08/18/20 11:45	08/20/20 10:48
60346051059	SO-081820-NL-059	Solid	08/18/20 12:45	08/20/20 10:48
60346051060	SO-081820-NL-060	Solid	08/18/20 12:50	08/20/20 10:48
60346051061	SO-081820-NL-061	Solid	08/18/20 12:55	08/20/20 10:48
60346051062	SO-081820-NL-062	Solid	08/18/20 13:00	08/20/20 10:48
60346051063	SO-081820-NL-063	Solid	08/18/20 13:05	08/20/20 10:48
60346051064	SO-081820-NL-064	Solid	08/18/20 13:10	08/20/20 10:48
60346051065	SO-081820-NL-065	Solid	08/18/20 13:25	08/20/20 10:48
60346051066	SO-081820-NL-066	Solid	08/18/20 13:30	08/20/20 10:48
60346051067	SO-081820-NL-067	Solid	08/18/20 13:35	08/20/20 10:48
60346051068	SO-081820-NL-068	Solid	08/18/20 13:40	08/20/20 10:48
60346051069	SO-081820-NL-069	Solid	08/18/20 13:45	08/20/20 10:48
60346051070	SO-081820-NL-070	Solid	08/18/20 13:50	08/20/20 10:48
60346051071	SO-081820-NL-071	Solid	08/18/20 14:10	08/20/20 10:48
60346051072	SO-081820-NL-072	Solid	08/18/20 14:15	08/20/20 10:48
60346051073	SO-081820-NL-073	Solid	08/18/20 14:25	08/20/20 10:48
60346051074	SO-081820-NL-074	Solid	08/18/20 14:40	08/20/20 10:48

REPORT OF LABORATORY ANALYSIS

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Lenexa, KS 66219
(913)599-5665

SAMPLE SUMMARY

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Lab ID	Sample ID	Matrix	Date Collected	Date Received
60346051075	SO-081820-NL-075	Solid	08/18/20 15:00	08/20/20 10:48
60346051076	SO-081820-NL-076	Solid	08/18/20 15:10	08/20/20 10:48
60346051077	SO-081920-NL-077	Solid	08/19/20 09:30	08/20/20 10:48
60346051078	SO-081920-NL-078	Solid	08/19/20 09:32	08/20/20 10:48
60346051079	SO-081920-NL-079	Solid	08/19/20 09:35	08/20/20 10:48
60346051080	SO-081920-NL-080	Solid	08/19/20 09:40	08/20/20 10:48
60346051081	SO-081920-NL-081	Solid	08/19/20 09:45	08/20/20 10:48
60346051082	SO-081920-NL-082	Solid	08/19/20 09:47	08/20/20 10:48
60346051083	SO-081920-NL-083	Solid	08/19/20 09:50	08/20/20 10:48
60346051084	SO-081920-NL-084	Solid	08/19/20 09:55	08/20/20 10:48
60346051085	SO-081920-NL-085	Solid	08/19/20 10:00	08/20/20 10:48
60346051086	SO-081920-NL-086	Solid	08/19/20 10:05	08/20/20 10:48
60346051087	SO-081920-NL-087	Solid	08/19/20 10:10	08/20/20 10:48
60346051088	SO-081920-NL-088	Solid	08/19/20 10:15	08/20/20 10:48
60346051089	SO-081920-NL-089	Solid	08/19/20 10:30	08/20/20 10:48
60346051090	SO-081920-NL-090	Solid	08/19/20 10:35	08/20/20 10:48
60346051091	SO-081920-NL-091	Solid	08/19/20 10:40	08/20/20 10:48
60346051092	SO-081920-NL-092	Solid	08/19/20 10:45	08/20/20 10:48
60346051093	SO-081920-NL-093	Solid	08/19/20 10:50	08/20/20 10:48
60346051094	SO-081920-NL-094	Solid	08/19/20 10:55	08/20/20 10:48
60346051095	SO-081920-NL-095	Solid	08/19/20 11:00	08/20/20 10:48
60346051096	SO-081920-NL-096	Solid	08/19/20 11:05	08/20/20 10:48
60346051097	SO-081920-NL-097	Solid	08/19/20 11:15	08/20/20 10:48
60346051098	SO-081920-NL-098	Solid	08/19/20 11:20	08/20/20 10:48
60346051099	SO-081920-NL-099	Solid	08/19/20 11:35	08/20/20 10:48
60346051100	WW-081820-NL-001	Water	08/18/20 16:45	08/20/20 10:48
60346051101	WW-081920-NL-002	Water	08/19/20 12:15	08/20/20 10:48

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SAMPLE ANALYTE COUNT

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
60346051001	SO-081720-NL-001	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051002	SO-081720-NL-002	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051003	SO-081720-NL-003	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051004	SO-081720-NL-004	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051005	SO-081720-NL-005	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051006	SO-081720-NL-006	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051007	SO-081720-NL-007	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051008	SO-081720-NL-008	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051009	SO-081720-NL-009	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051010	SO-081720-NL-010	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051011	SO-081720-NL-011	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051012	SO-081720-NL-012	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051013	SO-081720-NL-013	ASTM D2974	DWC	1	PASI-K

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SAMPLE ANALYTE COUNT

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051014	**SO-081720-NL-014**	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051015	**SO-081720-NL-015**	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051016	**SO-081720-NL-016**	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051017	**SO-081720-NL-017**	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051018	**SO-081720-NL-018**	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051019	**SO-081720-NL-019**	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051020	**SO-081270-NL-020**	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051021	**SO-081720-NL-021**	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051022	**SO-081720-NL-022**	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051023	**SO-081720-NL-023**	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051024	**SO-081720-NL-024**	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051025	**SO-081720-NL-025**	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K

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SAMPLE ANALYTE COUNT

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
		EPA 353.2	AJS2	3	PASI-K
60346051026	SO-081720-NL-026	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051027	SO-081720-NL-027	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051028	SO-081720-NL-028	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051029	SO-081720-NL-029	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051030	SO-081720-NL-030	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051031	SO-081720-NL-031	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051032	SO-081720-NL-032	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051033	SO-081820-NL-033	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051034	SO-081820-NL-034	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051035	SO-081820-NL-035	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051036	SO-081820-NL-036	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051037	SO-081820-NL-037	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K

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SAMPLE ANALYTE COUNT

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
60346051038	SO-081820-NL-038	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051039	SO-081820-NL-039	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051040	SO-081820-NL-040	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051041	SO-081820-NL-041	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051042	SO-081820-NL-042	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051043	SO-081820-NL-043	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051044	SO-081820-NL-044	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051045	SO-081820-NL-045	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051046	SO-081820-NL-046	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051047	SO-081820-NL-047	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051048	SO-081820-NL-048	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051049	SO-081820-NL-049	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051050	SO-081820-NL-050	ASTM D2974	DWC	1	PASI-K

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SAMPLE ANALYTE COUNT

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051051	**SO-081820-NL-051**	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051052	**SO-081820-NL-052**	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051053	**SO-081820-NL-053**	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051054	**SO-081820-NL-054**	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051055	**SO-081820-NL-055**	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051056	**SO-081820-NL-056**	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051057	**SO-081820-NL-057**	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051058	**SO-081820-NL-058**	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051059	**SO-081820-NL-059**	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051060	**SO-081820-NL-060**	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051061	**SO-081820-NL-061**	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051062	**SO-081820-NL-062**	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K

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SAMPLE ANALYTE COUNT

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
		EPA 353.2	AJS2	3	PASI-K
60346051063	SO-081820-NL-063	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051064	SO-081820-NL-064	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051065	SO-081820-NL-065	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051066	SO-081820-NL-066	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051067	SO-081820-NL-067	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051068	SO-081820-NL-068	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051069	SO-081820-NL-069	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051070	SO-081820-NL-070	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051071	SO-081820-NL-071	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051072	SO-081820-NL-072	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051073	SO-081820-NL-073	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051074	SO-081820-NL-074	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K

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SAMPLE ANALYTE COUNT

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
60346051075	SO-081820-NL-075	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051076	SO-081820-NL-076	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051077	SO-081920-NL-077	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051078	SO-081920-NL-078	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051079	SO-081920-NL-079	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051080	SO-081920-NL-080	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051081	SO-081920-NL-081	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051082	SO-081920-NL-082	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051083	SO-081920-NL-083	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051084	SO-081920-NL-084	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051085	SO-081920-NL-085	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051086	SO-081920-NL-086	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051087	SO-081920-NL-087	ASTM D2974	DWC	1	PASI-K

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SAMPLE ANALYTE COUNT

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051088	**SO-081920-NL-088**	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051089	**SO-081920-NL-089**	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051090	**SO-081920-NL-090**	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051091	**SO-081920-NL-091**	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051092	**SO-081920-NL-092**	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051093	**SO-081920-NL-093**	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051094	**SO-081920-NL-094**	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051095	**SO-081920-NL-095**	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051096	**SO-081920-NL-096**	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051097	**SO-081920-NL-097**	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051098	**SO-081920-NL-098**	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051099	**SO-081920-NL-099**	ASTM D2974	DWC	1	PASI-K
		EPA 350.1	LDB	1	PASI-K

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SAMPLE ANALYTE COUNT

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
		EPA 353.2	AJS2	3	PASI-K
60346051100	**WW-081820-NL-001**	EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K
60346051101	**WW-081920-NL-002**	EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K

PASI-K = Pace Analytical Services - Kansas City

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081720-NL-001 **Lab ID: 60346051001** Collected: 08/17/20 09:50 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**17.9**	%	0.50	1		08/21/20 11:00		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**805**	mg/kg	5.8	5	08/25/20 10:26	08/26/20 12:17	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**458**	mg/kg	24.3	20	08/25/20 09:47	08/25/20 16:09		M1
Nitrogen, Nitrate	**458**	mg/kg	24.3	20	08/25/20 09:47	08/25/20 16:09	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	24.3	20	08/25/20 09:47	08/25/20 16:09	14797-65-0	M1

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081720-NL-002 **Lab ID: 60346051002** Collected: 08/17/20 09:55 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**22.8**	%	0.50	1		08/21/20 11:00		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**2890**	mg/kg	24.9	20	08/25/20 10:26	08/26/20 13:41	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**1950**	mg/kg	65.7	50	08/25/20 09:47	08/25/20 15:47		
Nitrogen, Nitrate	**1950**	mg/kg	65.7	50	08/25/20 09:47	08/25/20 15:47	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	65.7	50	08/25/20 09:47	08/25/20 15:47	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081720-NL-003 **Lab ID: 60346051003** Collected: 08/17/20 10:00 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**17.6**	%	0.50	1		08/21/20 11:00		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**2920**	mg/kg	23.6	20	08/25/20 10:26	08/26/20 13:43	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**716**	mg/kg	59.8	50	08/25/20 09:47	08/25/20 15:48		
Nitrogen, Nitrate	**716**	mg/kg	59.8	50	08/25/20 09:47	08/25/20 15:48	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	59.8	50	08/25/20 09:47	08/25/20 15:48	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081720-NL-004 **Lab ID: 60346051004** Collected: 08/17/20 10:05 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**20.1**	%	0.50	1		08/21/20 11:00		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**2830**	mg/kg	35.7	30	08/25/20 10:26	08/26/20 12:25	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**1370**	mg/kg	61.9	50	08/25/20 09:47	08/25/20 15:50		
Nitrogen, Nitrate	**1370**	mg/kg	61.9	50	08/25/20 09:47	08/25/20 15:50	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	61.9	50	08/25/20 09:47	08/25/20 15:50	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081720-NL-005 **Lab ID: 60346051005** Collected: 08/17/20 10:10 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**18.3**	%	0.50	1		08/21/20 11:00		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**3220**	mg/kg	33.5	30	08/25/20 10:26	08/26/20 12:26	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**2240**	mg/kg	62.4	50	08/25/20 09:47	08/25/20 15:50		
Nitrogen, Nitrate	**2240**	mg/kg	62.4	50	08/25/20 09:47	08/25/20 15:50	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	62.4	50	08/25/20 09:47	08/25/20 15:50	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081720-NL-006 **Lab ID: 60346051006** Collected: 08/17/20 10:15 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**17.6**	%	0.50	1		08/21/20 11:00		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**2210**	mg/kg	28.1	25	08/25/20 10:26	08/26/20 12:28	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**1630**	mg/kg	61.9	50	08/25/20 09:47	08/25/20 15:54		
Nitrogen, Nitrate	**1630**	mg/kg	61.9	50	08/25/20 09:47	08/25/20 15:54	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	61.9	50	08/25/20 09:47	08/25/20 15:54	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081720-NL-007 **Lab ID: 60346051007** Collected: 08/17/20 10:25 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**14.0**	%	0.50	1		08/21/20 11:00		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**1660**	mg/kg	16.0	15	08/25/20 10:26	08/26/20 12:30	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**941**	mg/kg	57.6	50	08/25/20 09:47	08/25/20 15:56		
Nitrogen, Nitrate	**941**	mg/kg	57.6	50	08/25/20 09:47	08/25/20 15:56	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	57.6	50	08/25/20 09:47	08/25/20 15:56	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081720-NL-008 **Lab ID: 60346051008** Collected: 08/17/20 10:45 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**17.9**	%	0.50	1		08/21/20 11:00		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**318**	mg/kg	2.3	2	08/25/20 10:26	08/26/20 10:33	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**672**	mg/kg	62.1	50	08/25/20 09:47	08/25/20 15:56		
Nitrogen, Nitrate	**672**	mg/kg	62.1	50	08/25/20 09:47	08/25/20 15:56	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	62.1	50	08/25/20 09:47	08/25/20 15:56	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081720-NL-009 **Lab ID: 60346051009** Collected: 08/17/20 10:47 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**20.4**	%	0.50	1		08/21/20 11:00		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**759**	mg/kg	6.0	5	08/25/20 10:26	08/26/20 10:38	7664-41-7	M1
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**1210**	mg/kg	61.7	50	08/25/20 09:47	08/25/20 15:57		
Nitrogen, Nitrate	**1210**	mg/kg	61.7	50	08/25/20 09:47	08/25/20 15:57	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	61.7	50	08/25/20 09:47	08/25/20 15:57	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081720-NL-010 **Lab ID: 60346051010** Collected: 08/17/20 10:50 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**16.3**	%	0.50	1		08/21/20 11:00		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**967**	mg/kg	5.9	5	08/25/20 10:26	08/26/20 10:41	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**804**	mg/kg	58.9	50	08/25/20 09:47	08/25/20 15:58		
Nitrogen, Nitrate	**804**	mg/kg	58.9	50	08/25/20 09:47	08/25/20 15:58	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	58.9	50	08/25/20 09:47	08/25/20 15:58	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081720-NL-011 **Lab ID: 60346051011** Collected: 08/17/20 11:00 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**14.0**	%	0.50	1		08/21/20 11:00		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**747**	mg/kg	5.7	5	08/25/20 10:26	08/26/20 10:47	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**537**	mg/kg	23.3	20	08/25/20 09:47	08/25/20 16:10		M1
Nitrogen, Nitrate	**537**	mg/kg	23.3	20	08/25/20 09:47	08/25/20 16:10	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	23.3	20	08/25/20 09:47	08/25/20 16:10	14797-65-0	M1

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081720-NL-012 **Lab ID: 60346051012** Collected: 08/17/20 11:05 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**17.9**	%	0.50	1		08/21/20 11:01		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**602**	mg/kg	6.1	5	08/25/20 10:26	08/26/20 10:49	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**477**	mg/kg	24.0	20	08/25/20 09:47	08/25/20 16:14		
Nitrogen, Nitrate	**477**	mg/kg	24.0	20	08/25/20 09:47	08/25/20 16:14	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	24.0	20	08/25/20 09:47	08/25/20 16:14	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081720-NL-013 **Lab ID: 60346051013** Collected: 08/17/20 11:10 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**18.9**	%	0.50	1		08/21/20 11:01		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**372**	mg/kg	3.7	3	08/25/20 10:26	08/26/20 10:51	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**448**	mg/kg	25.0	20	08/25/20 09:47	08/25/20 16:15		
Nitrogen, Nitrate	**448**	mg/kg	25.0	20	08/25/20 09:47	08/25/20 16:15	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	25.0	20	08/25/20 09:47	08/25/20 16:15	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081720-NL-014 **Lab ID: 60346051014** Collected: 08/17/20 11:15 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**21.4**	%	0.50	1		08/21/20 11:01		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**282**	mg/kg	2.5	2	08/25/20 10:26	08/26/20 10:52	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**660**	mg/kg	62.8	50	08/25/20 09:47	08/25/20 16:04		
Nitrogen, Nitrate	**660**	mg/kg	62.8	50	08/25/20 09:47	08/25/20 16:04	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	62.8	50	08/25/20 09:47	08/25/20 16:04	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081720-NL-015 **Lab ID: 60346051015** Collected: 08/17/20 11:45 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**21.8**	%	0.50	1		08/21/20 11:01		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**247**	mg/kg	1.3	1	08/25/20 10:26	08/26/20 10:20	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**484**	mg/kg	25.9	20	08/25/20 09:47	08/25/20 16:15		
Nitrogen, Nitrate	**484**	mg/kg	25.9	20	08/25/20 09:47	08/25/20 16:15	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	25.9	20	08/25/20 09:47	08/25/20 16:15	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081720-NL-016 **Lab ID: 60346051016** Collected: 08/17/20 11:45 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**19.5**	%	0.50	1		08/21/20 11:27		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**1050**	mg/kg	11.8	10	08/25/20 10:26	08/26/20 10:54	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**757**	mg/kg	61.2	50	08/25/20 09:47	08/25/20 16:06		
Nitrogen, Nitrate	**757**	mg/kg	61.2	50	08/25/20 09:47	08/25/20 16:06	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	61.2	50	08/25/20 09:47	08/25/20 16:06	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081720-NL-017 **Lab ID: 60346051017** Collected: 08/17/20 11:50 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**19.2**	%	0.50	1		08/21/20 11:27		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**716**	mg/kg	6.2	5	08/25/20 10:26	08/26/20 12:31	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**544**	mg/kg	24.3	20	08/25/20 09:47	08/25/20 16:16		
Nitrogen, Nitrate	**544**	mg/kg	24.3	20	08/25/20 09:47	08/25/20 16:16	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	24.3	20	08/25/20 09:47	08/25/20 16:16	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081720-NL-018 **Lab ID: 60346051018** Collected: 08/17/20 11:55 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**19.9**	%	0.50	1		08/21/20 11:27		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**174**	mg/kg	1.2	1	08/25/20 10:26	08/26/20 10:57	7664-41-7	M1
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**190**	mg/kg	6.2	5	08/25/20 09:47	08/25/20 16:08		
Nitrogen, Nitrate	**190**	mg/kg	6.2	5	08/25/20 09:47	08/25/20 16:08	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	6.2	5	08/25/20 09:47	08/25/20 16:08	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081720-NL-019 **Lab ID: 60346051019** Collected: 08/17/20 12:05 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**20.8**	%	0.50	1		08/21/20 11:27		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**189**	mg/kg	1.2	1	08/25/20 10:26	08/26/20 11:00	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**93.9**	mg/kg	2.5	2	08/25/20 09:47	08/25/20 16:09		
Nitrogen, Nitrate	**93.9**	mg/kg	2.5	2	08/25/20 09:47	08/25/20 16:09	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	2.5	2	08/25/20 09:47	08/25/20 16:09	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081270-NL-020 **Lab ID: 60346051020** Collected: 08/17/20 12:10 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**16.7**	%	0.50	1		08/21/20 11:27		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**177**	mg/kg	1.2	1	08/25/20 10:26	08/26/20 11:05	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**49.0**	mg/kg	1.2	1	08/25/20 09:47	08/25/20 15:44		
Nitrogen, Nitrate	**49.0**	mg/kg	1.2	1	08/25/20 09:47	08/25/20 15:44	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	1.2	1	08/25/20 09:47	08/25/20 15:44	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081720-NL-021 **Lab ID: 60346051021** Collected: 08/17/20 13:30 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**18.1**	%	0.50	1		08/21/20 11:27		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**72.6**	mg/kg	1.2	1	08/25/20 10:26	08/26/20 11:07	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**971**	mg/kg	61.9	50	08/25/20 15:17	08/26/20 10:11		M1
Nitrogen, Nitrate	**971**	mg/kg	61.9	50	08/25/20 15:17	08/26/20 10:11	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	61.9	50	08/25/20 15:17	08/26/20 10:11	14797-65-0	M1

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081720-NL-022 **Lab ID: 60346051022** Collected: 08/17/20 13:35 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**20.9**	%	0.50	1		08/21/20 11:27		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**894**	mg/kg	6.0	5	08/25/20 10:26	08/26/20 12:33	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**805**	mg/kg	62.4	50	08/25/20 15:17	08/26/20 10:12		
Nitrogen, Nitrate	**805**	mg/kg	62.4	50	08/25/20 15:17	08/26/20 10:12	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	62.4	50	08/25/20 15:17	08/26/20 10:12	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081720-NL-023 **Lab ID: 60346051023** Collected: 08/17/20 13:45 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**15.1**	%	0.50	1		08/21/20 11:27		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**633**	mg/kg	5.8	5	08/25/20 10:26	08/26/20 12:35	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**156**	mg/kg	5.8	5	08/25/20 15:17	08/26/20 10:13		
Nitrogen, Nitrate	**156**	mg/kg	5.8	5	08/25/20 15:17	08/26/20 10:13	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	5.8	5	08/25/20 15:17	08/26/20 10:13	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081720-NL-024 **Lab ID: 60346051024** Collected: 08/17/20 13:50 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**12.8**	%	0.50	1		08/21/20 11:27		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**381**	mg/kg	3.4	3	08/25/20 10:26	08/26/20 12:36	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**192**	mg/kg	5.7	5	08/25/20 15:17	08/26/20 10:15		
Nitrogen, Nitrate	**192**	mg/kg	5.7	5	08/25/20 15:17	08/26/20 10:15	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	5.7	5	08/25/20 15:17	08/26/20 10:15	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081720-NL-025 **Lab ID: 60346051025** Collected: 08/17/20 13:55 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**14.3**	%	0.50	1		08/21/20 11:27		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**161**	mg/kg	1.1	1	08/25/20 10:26	08/26/20 11:13	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**86.6**	mg/kg	2.3	2	08/25/20 15:17	08/26/20 10:16		
Nitrogen, Nitrate	**86.6**	mg/kg	2.3	2	08/25/20 15:17	08/26/20 10:16	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	2.3	2	08/25/20 15:17	08/26/20 10:16	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081720-NL-026 **Lab ID: 60346051026** Collected: 08/17/20 14:55 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**9.1**	%	0.50	1		08/21/20 11:27		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	ND	mg/kg	1.0	1	08/25/20 10:26	08/26/20 11:15	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**27.0**	mg/kg	1.1	1	08/25/20 15:17	08/26/20 09:52		
Nitrogen, Nitrate	**27.0**	mg/kg	1.1	1	08/25/20 15:17	08/26/20 09:52	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	1.1	1	08/25/20 15:17	08/26/20 09:52	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081720-NL-027 **Lab ID: 60346051027** Collected: 08/17/20 15:00 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**9.9**	%	0.50	1		08/21/20 11:27		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	ND	mg/kg	1.1	1	08/25/20 10:26	08/26/20 11:17	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**79.1**	mg/kg	2.2	2	08/25/20 15:17	08/26/20 10:17		
Nitrogen, Nitrate	**79.1**	mg/kg	2.2	2	08/25/20 15:17	08/26/20 10:17	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	2.2	2	08/25/20 15:17	08/26/20 10:17	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081720-NL-028 **Lab ID: 60346051028** Collected: 08/17/20 15:20 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**19.3**	%	0.50	1		08/21/20 11:27		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**79.8**	mg/kg	1.2	1	08/25/20 10:26	08/26/20 11:18	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**32.4**	mg/kg	1.3	1	08/25/20 15:17	08/26/20 09:54		
Nitrogen, Nitrate	**32.4**	mg/kg	1.3	1	08/25/20 15:17	08/26/20 09:54	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	1.3	1	08/25/20 15:17	08/26/20 09:54	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081720-NL-029 **Lab ID: 60346051029** Collected: 08/17/20 15:25 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**20.5**	%	0.50	1		08/21/20 11:28		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**189**	mg/kg	1.2	1	08/25/20 10:26	08/26/20 12:51	7664-41-7	M1
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**55.4**	mg/kg	1.3	1	08/25/20 15:17	08/26/20 09:54		
Nitrogen, Nitrate	**55.4**	mg/kg	1.3	1	08/25/20 15:17	08/26/20 09:54	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	1.3	1	08/25/20 15:17	08/26/20 09:54	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081720-NL-030 **Lab ID: 60346051030** Collected: 08/17/20 15:30 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**12.2**	%	0.50	1		08/21/20 11:28		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**147**	mg/kg	1.1	1	08/25/20 10:26	08/26/20 12:54	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**53.8**	mg/kg	1.2	1	08/25/20 15:17	08/26/20 09:55		
Nitrogen, Nitrate	**52.5**	mg/kg	1.2	1	08/25/20 15:17	08/26/20 09:55	14797-55-8	
Nitrogen, Nitrite	**1.2**	mg/kg	1.2	1	08/25/20 15:17	08/26/20 09:55	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081720-NL-031 **Lab ID: 60346051031** Collected: 08/17/20 15:35 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**12.9**	%	0.50	1		08/21/20 11:28		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**260**	mg/kg	2.3	2	08/25/20 10:26	08/26/20 13:46	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**116**	mg/kg	5.8	5	08/25/20 15:17	08/26/20 10:18		M1
Nitrogen, Nitrate	**116**	mg/kg	5.8	5	08/25/20 15:17	08/26/20 10:18	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	5.8	5	08/25/20 15:17	08/26/20 10:18	14797-65-0	M1

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081720-NL-032 **Lab ID: 60346051032** Collected: 08/17/20 15:40 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**12.4**	%	0.50	1		08/21/20 11:28		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**379**	mg/kg	3.3	3	08/25/20 10:26	08/26/20 13:48	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**169**	mg/kg	5.6	5	08/25/20 15:17	08/26/20 10:21		
Nitrogen, Nitrate	**169**	mg/kg	5.6	5	08/25/20 15:17	08/26/20 10:21	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	5.6	5	08/25/20 15:17	08/26/20 10:21	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-033 **Lab ID: 60346051033** Collected: 08/18/20 08:30 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**15.6**	%	0.50	1		08/21/20 11:28		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**8.5**	mg/kg	1.2	1	08/25/20 10:26	08/26/20 13:04	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**4.8**	mg/kg	1.2	1	08/25/20 15:17	08/26/20 10:00		
Nitrogen, Nitrate	**4.8**	mg/kg	1.2	1	08/25/20 15:17	08/26/20 10:00	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	1.2	1	08/25/20 15:17	08/26/20 10:00	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-034 **Lab ID: 60346051034** Collected: 08/18/20 08:35 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**17.7**	%	0.50	1		08/21/20 11:28		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**22.7**	mg/kg	1.1	1	08/25/20 10:26	08/26/20 13:05	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**9.2**	mg/kg	1.2	1	08/25/20 15:17	08/26/20 10:01		
Nitrogen, Nitrate	**9.2**	mg/kg	1.2	1	08/25/20 15:17	08/26/20 10:01	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	1.2	1	08/25/20 15:17	08/26/20 10:01	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-035 **Lab ID: 60346051035** Collected: 08/18/20 08:40 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**11.0**	%	0.50	1		08/21/20 11:28		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**42.7**	mg/kg	1.1	1	08/25/20 10:26	08/26/20 13:07	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**51.2**	mg/kg	1.1	1	08/25/20 15:17	08/26/20 10:02		
Nitrogen, Nitrate	**51.2**	mg/kg	1.1	1	08/25/20 15:17	08/26/20 10:02	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	1.1	1	08/25/20 15:17	08/26/20 10:02	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-036 **Lab ID: 60346051036** Collected: 08/18/20 08:45 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**11.3**	%	0.50	1		08/21/20 11:55		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**43.7**	mg/kg	1.1	1	08/25/20 10:26	08/26/20 13:09	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**14.4**	mg/kg	1.1	1	08/25/20 15:17	08/26/20 10:03		
Nitrogen, Nitrate	**14.4**	mg/kg	1.1	1	08/25/20 15:17	08/26/20 10:03	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	1.1	1	08/25/20 15:17	08/26/20 10:03	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-037 **Lab ID: 60346051037** Collected: 08/18/20 08:50 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**12.5**	%	0.50	1		08/21/20 11:55		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**47.1**	mg/kg	1.1	1	08/25/20 10:26	08/26/20 13:10	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**33.6**	mg/kg	1.1	1	08/25/20 15:17	08/26/20 10:04		
Nitrogen, Nitrate	**33.6**	mg/kg	1.1	1	08/25/20 15:17	08/26/20 10:04	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	1.1	1	08/25/20 15:17	08/26/20 10:04	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-038 **Lab ID: 60346051038** Collected: 08/18/20 09:00 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**16.2**	%	0.50	1		08/21/20 11:55		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**17.4**	mg/kg	1.1	1	08/25/20 10:26	08/26/20 13:12	7664-41-7	M1
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**21.4**	mg/kg	1.2	1	08/25/20 15:17	08/26/20 10:05		
Nitrogen, Nitrate	**21.4**	mg/kg	1.2	1	08/25/20 15:17	08/26/20 10:05	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	1.2	1	08/25/20 15:17	08/26/20 10:05	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-039 **Lab ID: 60346051039** Collected: 08/18/20 09:05 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**18.0**	%	0.50	1		08/21/20 11:56		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**493**	mg/kg	5.5	5	08/25/20 10:26	08/26/20 13:49	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**182**	mg/kg	6.1	5	08/25/20 15:17	08/26/20 10:22		
Nitrogen, Nitrate	**182**	mg/kg	6.1	5	08/25/20 15:17	08/26/20 10:22	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	6.1	5	08/25/20 15:17	08/26/20 10:22	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-040 **Lab ID: 60346051040** Collected: 08/18/20 09:15 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**20.1**	%	0.50	1		08/21/20 11:56		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**453**	mg/kg	3.7	3	08/25/20 10:26	08/26/20 13:51	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**300**	mg/kg	12.6	10	08/25/20 15:17	08/26/20 10:23		
Nitrogen, Nitrate	**300**	mg/kg	12.6	10	08/25/20 15:17	08/26/20 10:23	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	12.6	10	08/25/20 15:17	08/26/20 10:23	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-041 **Lab ID: 60346051041** Collected: 08/18/20 09:20 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**12.9**	%	0.50	1		08/21/20 11:56		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**104**	mg/kg	1.1	1	08/25/20 10:26	08/26/20 13:22	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**116**	mg/kg	5.8	5	08/25/20 15:24	08/26/20 14:39		M1
Nitrogen, Nitrate	**116**	mg/kg	5.8	5	08/25/20 15:24	08/26/20 14:39	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	5.8	5	08/25/20 15:24	08/26/20 14:39	14797-65-0	M1

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-042 **Lab ID: 60346051042** Collected: 08/18/20 09:25 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**12.2**	%	0.50	1		08/21/20 11:56		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**109**	mg/kg	1.1	1	08/25/20 10:26	08/26/20 13:23	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**56.1**	mg/kg	1.1	1	08/25/20 15:24	08/26/20 14:17		
Nitrogen, Nitrate	**56.1**	mg/kg	1.1	1	08/25/20 15:24	08/26/20 14:17	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	1.1	1	08/25/20 15:24	08/26/20 14:17	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-043 **Lab ID: 60346051043** Collected: 08/18/20 09:35 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**14.0**	%	0.50	1		08/21/20 11:56		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**207**	mg/kg	1.1	1	08/25/20 10:26	08/26/20 13:25	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**79.4**	mg/kg	2.3	2	08/25/20 15:24	08/26/20 14:41		
Nitrogen, Nitrate	**79.4**	mg/kg	2.3	2	08/25/20 15:24	08/26/20 14:41	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	2.3	2	08/25/20 15:24	08/26/20 14:41	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-044 **Lab ID: 60346051044** Collected: 08/18/20 09:45 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**19.1**	%	0.50	1		08/21/20 11:56		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**241**	mg/kg	1.2	1	08/25/20 10:26	08/26/20 13:27	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**65.2**	mg/kg	2.5	2	08/25/20 15:24	08/26/20 14:44		
Nitrogen, Nitrate	**65.2**	mg/kg	2.5	2	08/25/20 15:24	08/26/20 14:44	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	2.5	2	08/25/20 15:24	08/26/20 14:44	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-045 **Lab ID: 60346051045** Collected: 08/18/20 10:10 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**13.6**	%	0.50	1		08/21/20 11:56		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**18.3**	mg/kg	1.1	1	08/25/20 10:26	08/26/20 13:28	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**44.6**	mg/kg	1.2	1	08/25/20 15:24	08/26/20 14:20		
Nitrogen, Nitrate	**44.6**	mg/kg	1.2	1	08/25/20 15:24	08/26/20 14:20	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	1.2	1	08/25/20 15:24	08/26/20 14:20	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-046 **Lab ID: 60346051046** Collected: 08/18/20 10:15 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**15.6**	%	0.50	1		08/21/20 11:56		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**12.0**	mg/kg	1.2	1	08/25/20 10:26	08/26/20 13:30	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**67.7**	mg/kg	2.3	2	08/25/20 15:24	08/26/20 14:45		
Nitrogen, Nitrate	**67.7**	mg/kg	2.3	2	08/25/20 15:24	08/26/20 14:45	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	2.3	2	08/25/20 15:24	08/26/20 14:45	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-047 **Lab ID: 60346051047** Collected: 08/18/20 10:20 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**17.4**	%	0.50	1		08/21/20 11:56		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**631**	mg/kg	5.7	5	08/25/20 10:26	08/26/20 13:53	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**358**	mg/kg	24.6	20	08/25/20 15:24	08/26/20 14:50		
Nitrogen, Nitrate	**358**	mg/kg	24.6	20	08/25/20 15:24	08/26/20 14:50	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	24.6	20	08/25/20 15:24	08/26/20 14:50	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-048 **Lab ID: 60346051048** Collected: 08/18/20 10:25 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**14.8**	%	0.50	1		08/21/20 11:56		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**357**	mg/kg	3.5	3	08/25/20 10:26	08/26/20 13:54	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**547**	mg/kg	23.2	20	08/25/20 15:24	08/26/20 14:51		
Nitrogen, Nitrate	**547**	mg/kg	23.2	20	08/25/20 15:24	08/26/20 14:51	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	23.2	20	08/25/20 15:24	08/26/20 14:51	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-049 **Lab ID: 60346051049** Collected: 08/18/20 10:30 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**14.2**	%	0.50	1		08/21/20 11:56		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**48.1**	mg/kg	1.1	1	08/31/20 08:14	08/31/20 13:42	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**687**	mg/kg	58.0	50	08/25/20 15:24	08/26/20 14:48		
Nitrogen, Nitrate	**687**	mg/kg	58.0	50	08/25/20 15:24	08/26/20 14:48	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	58.0	50	08/25/20 15:24	08/26/20 14:48	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-050 **Lab ID: 60346051050** Collected: 08/18/20 10:40 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**12.3**	%	0.50	1		08/21/20 11:56		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**82.8**	mg/kg	1.1	1	08/31/20 08:14	08/31/20 13:46	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**176**	mg/kg	5.8	5	08/25/20 15:24	08/26/20 14:49		
Nitrogen, Nitrate	**176**	mg/kg	5.8	5	08/25/20 15:24	08/26/20 14:49	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	5.8	5	08/25/20 15:24	08/26/20 14:49	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-051 **Lab ID: 60346051051** Collected: 08/18/20 10:50 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**11.9**	%	0.50	1		08/21/20 11:56		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**32.5**	mg/kg	1.1	1	08/31/20 08:14	08/31/20 13:49	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**50.7**	mg/kg	1.1	1	08/25/20 15:24	08/26/20 14:27		M1
Nitrogen, Nitrate	**50.7**	mg/kg	1.1	1	08/25/20 15:24	08/26/20 14:27	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	1.1	1	08/25/20 15:24	08/26/20 14:27	14797-65-0	M1

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-052 **Lab ID: 60346051052** Collected: 08/18/20 11:10 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**12.6**	%	0.50	1		08/21/20 11:56		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**10.2**	mg/kg	1.1	1	08/31/20 08:14	08/31/20 13:50	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**24.2**	mg/kg	1.1	1	08/25/20 15:24	08/26/20 14:29		
Nitrogen, Nitrate	**24.2**	mg/kg	1.1	1	08/25/20 15:24	08/26/20 14:29	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	1.1	1	08/25/20 15:24	08/26/20 14:29	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-053 **Lab ID: 60346051053** Collected: 08/18/20 11:15 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**9.6**	%	0.50	1		08/21/20 11:56		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	ND	mg/kg	1.1	1	08/31/20 08:14	08/31/20 13:52	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**2.9**	mg/kg	1.1	1	08/25/20 15:24	08/26/20 14:30		
Nitrogen, Nitrate	**2.9**	mg/kg	1.1	1	08/25/20 15:24	08/26/20 14:30	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	1.1	1	08/25/20 15:24	08/26/20 14:30	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-054 **Lab ID: 60346051054** Collected: 08/18/20 11:20 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**20.3**	%	0.50	1		08/21/20 11:57		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	ND	mg/kg	1.2	1	08/31/20 08:14	08/31/20 13:54	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**41.2**	mg/kg	1.2	1	08/25/20 15:24	08/26/20 14:30		
Nitrogen, Nitrate	**41.2**	mg/kg	1.2	1	08/25/20 15:24	08/26/20 14:30	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	1.2	1	08/25/20 15:24	08/26/20 14:30	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-055 **Lab ID: 60346051055** Collected: 08/18/20 11:25 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**16.9**	%	0.50	1		08/21/20 11:57		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**145**	mg/kg	1.2	1	08/31/20 08:14	08/31/20 13:59	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**43.3**	mg/kg	1.2	1	08/25/20 15:24	08/26/20 14:33		
Nitrogen, Nitrate	**43.3**	mg/kg	1.2	1	08/25/20 15:24	08/26/20 14:33	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	1.2	1	08/25/20 15:24	08/26/20 14:33	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-056 **Lab ID: 60346051056** Collected: 08/18/20 11:30 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**19.0**	%	0.50	1		08/24/20 14:06		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**326**	mg/kg	2.4	2	08/31/20 08:14	08/31/20 17:22	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**53.0**	mg/kg	1.2	1	08/25/20 15:24	08/26/20 14:34		
Nitrogen, Nitrate	**53.0**	mg/kg	1.2	1	08/25/20 15:24	08/26/20 14:34	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	1.2	1	08/25/20 15:24	08/26/20 14:34	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-057 **Lab ID: 60346051057** Collected: 08/18/20 11:36 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**13.4**	%	0.50	1		08/24/20 14:06		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**337**	mg/kg	2.3	2	08/31/20 08:14	08/31/20 17:23	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**31.6**	mg/kg	1.2	1	08/25/20 15:24	08/26/20 14:35		
Nitrogen, Nitrate	**31.6**	mg/kg	1.2	1	08/25/20 15:24	08/26/20 14:35	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	1.2	1	08/25/20 15:24	08/26/20 14:35	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-058 **Lab ID: 60346051058** Collected: 08/18/20 11:45 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**14.5**	%	0.50	1		08/24/20 14:06		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**137**	mg/kg	1.1	1	08/31/20 08:14	08/31/20 14:04	7664-41-7	M1
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**39.2**	mg/kg	1.2	1	08/25/20 15:24	08/26/20 14:36		
Nitrogen, Nitrate	**39.2**	mg/kg	1.2	1	08/25/20 15:24	08/26/20 14:36	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	1.2	1	08/25/20 15:24	08/26/20 14:36	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-059 **Lab ID: 60346051059** Collected: 08/18/20 12:45 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**12.4**	%	0.50	1		08/24/20 14:06		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**24.2**	mg/kg	1.1	1	08/31/20 08:14	08/31/20 14:07	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	ND	mg/kg	1.2	1	08/25/20 15:24	08/26/20 14:36		
Nitrogen, Nitrate	ND	mg/kg	1.2	1	08/25/20 15:24	08/26/20 14:36	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	1.2	1	08/25/20 15:24	08/26/20 14:36	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-060 **Lab ID: 60346051060** Collected: 08/18/20 12:50 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**20.1**	%	0.50	1		08/24/20 15:01		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**188**	mg/kg	1.2	1	08/31/20 08:14	08/31/20 14:08	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	ND	mg/kg	1.2	1	08/25/20 15:24	08/26/20 14:37		
Nitrogen, Nitrate	ND	mg/kg	1.2	1	08/25/20 15:24	08/26/20 14:37	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	1.2	1	08/25/20 15:24	08/26/20 14:37	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-061 **Lab ID: 60346051061** Collected: 08/18/20 12:55 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**21.1**	%	0.50	1		08/24/20 15:01		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**791**	mg/kg	6.3	5	08/31/20 08:14	08/31/20 17:25	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**1.7**	mg/kg	1.2	1	08/26/20 14:38	08/27/20 17:51		M1
Nitrogen, Nitrate	ND	mg/kg	1.2	1	08/26/20 14:38	08/27/20 17:51	14797-55-8	
Nitrogen, Nitrite	**2.2**	mg/kg	1.2	1	08/26/20 14:38	08/27/20 17:51	14797-65-0	M1

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-062 **Lab ID: 60346051062** Collected: 08/18/20 13:00 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**20.5**	%	0.50	1		08/24/20 15:01		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**1040**	mg/kg	6.1	5	08/31/20 08:14	08/31/20 17:26	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**30.1**	mg/kg	1.3	1	08/26/20 14:38	08/27/20 17:53		
Nitrogen, Nitrate	**27.9**	mg/kg	1.3	1	08/26/20 14:38	08/27/20 17:53	14797-55-8	
Nitrogen, Nitrite	**2.2**	mg/kg	1.3	1	08/26/20 14:38	08/27/20 17:53	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-063 **Lab ID: 60346051063** Collected: 08/18/20 13:05 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**17.9**	%	0.50	1		08/24/20 15:01		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**1520**	mg/kg	10.7	9	08/31/20 08:14	09/01/20 12:16	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**60.4**	mg/kg	1.2	1	08/26/20 14:38	08/27/20 17:53		
Nitrogen, Nitrate	**58.2**	mg/kg	1.2	1	08/26/20 14:38	08/27/20 17:53	14797-55-8	
Nitrogen, Nitrite	**2.2**	mg/kg	1.2	1	08/26/20 14:38	08/27/20 17:53	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-064 **Lab ID: 60346051064** Collected: 08/18/20 13:10 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**19.5**	%	0.50	1		08/24/20 15:01		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**1180**	mg/kg	6.1	5	08/31/20 08:14	08/31/20 17:30	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**161**	mg/kg	6.3	5	08/26/20 14:38	08/27/20 18:15		
Nitrogen, Nitrate	**161**	mg/kg	6.3	5	08/26/20 14:38	08/27/20 18:15	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	6.3	5	08/26/20 14:38	08/27/20 18:15	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-065 **Lab ID: 60346051065** Collected: 08/18/20 13:25 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**11.7**	%	0.50	1		08/24/20 15:01		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**372**	mg/kg	2.2	2	08/31/20 08:14	08/31/20 17:31	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**35.4**	mg/kg	1.2	1	08/26/20 14:38	08/27/20 17:56		
Nitrogen, Nitrate	**35.4**	mg/kg	1.2	1	08/26/20 14:38	08/27/20 17:56	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	1.2	1	08/26/20 14:38	08/27/20 17:56	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-066 **Lab ID: 60346051066** Collected: 08/18/20 13:30 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**16.8**	%	0.50	1		08/24/20 15:01		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**8.0**	mg/kg	1.2	1	08/31/20 08:14	08/31/20 14:22	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**43.5**	mg/kg	1.2	1	08/26/20 14:38	08/27/20 17:57		
Nitrogen, Nitrate	**41.9**	mg/kg	1.2	1	08/26/20 14:38	08/27/20 17:57	14797-55-8	
Nitrogen, Nitrite	**1.7**	mg/kg	1.2	1	08/26/20 14:38	08/27/20 17:57	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-067 **Lab ID: 60346051067** Collected: 08/18/20 13:35 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**4.7**	%	0.50	1		08/24/20 15:01		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**39.5**	mg/kg	1.0	1	08/31/20 08:14	08/31/20 14:23	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**20.7**	mg/kg	1.0	1	08/26/20 14:38	08/27/20 18:00		
Nitrogen, Nitrate	**19.0**	mg/kg	1.0	1	08/26/20 14:38	08/27/20 18:00	14797-55-8	
Nitrogen, Nitrite	**1.7**	mg/kg	1.0	1	08/26/20 14:38	08/27/20 18:00	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-068 **Lab ID: 60346051068** Collected: 08/18/20 13:40 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**19.5**	%	0.50	1		08/24/20 15:01		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**3560**	mg/kg	24.8	20	08/31/20 08:14	08/31/20 17:33	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**410**	mg/kg	25.4	20	08/26/20 14:38	08/27/20 18:27		
Nitrogen, Nitrate	**410**	mg/kg	25.4	20	08/26/20 14:38	08/27/20 18:27	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	25.4	20	08/26/20 14:38	08/27/20 18:27	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-069 **Lab ID: 60346051069** Collected: 08/18/20 13:45 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**18.9**	%	0.50	1		08/24/20 15:01		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**4130**	mg/kg	24.3	20	08/31/20 08:14	08/31/20 17:35	7664-41-7	M1
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**916**	mg/kg	61.9	50	08/26/20 14:38	08/27/20 18:17		
Nitrogen, Nitrate	**916**	mg/kg	61.9	50	08/26/20 14:38	08/27/20 18:17	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	61.9	50	08/26/20 14:38	08/27/20 18:17	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-070 **Lab ID: 60346051070** Collected: 08/18/20 13:50 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**19.1**	%	0.50	1		08/24/20 15:01		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**5380**	mg/kg	60.0	50	08/31/20 08:14	09/01/20 11:19	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**1410**	mg/kg	61.7	50	08/26/20 14:38	08/27/20 18:18		
Nitrogen, Nitrate	**1410**	mg/kg	61.7	50	08/26/20 14:38	08/27/20 18:18	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	61.7	50	08/26/20 14:38	08/27/20 18:18	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-071 **Lab ID: 60346051071** Collected: 08/18/20 14:10 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**6.7**	%	0.50	1		08/24/20 15:01		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**137**	mg/kg	1.0	1	08/31/20 08:14	08/31/20 14:39	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**643**	mg/kg	52.9	50	08/26/20 14:38	08/27/20 18:20		M1
Nitrogen, Nitrate	**643**	mg/kg	52.9	50	08/26/20 14:38	08/27/20 18:20	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	52.9	50	08/26/20 14:38	08/27/20 18:20	14797-65-0	M1

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-072 **Lab ID: 60346051072** Collected: 08/18/20 14:15 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**14.1**	%	0.50	1		08/24/20 15:01		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**2070**	mg/kg	17.0	15	08/31/20 08:14	09/01/20 12:18	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**556**	mg/kg	23.4	20	08/26/20 14:38	08/27/20 18:28		
Nitrogen, Nitrate	**556**	mg/kg	23.4	20	08/26/20 14:38	08/27/20 18:28	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	23.4	20	08/26/20 14:38	08/27/20 18:28	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-073 **Lab ID: 60346051073** Collected: 08/18/20 14:25 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**21.8**	%	0.50	1		08/24/20 15:01		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**2150**	mg/kg	18.6	15	08/31/20 08:14	09/01/20 12:20	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**128**	mg/kg	6.3	5	08/26/20 14:38	08/27/20 18:23		
Nitrogen, Nitrate	**128**	mg/kg	6.3	5	08/26/20 14:38	08/27/20 18:23	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	6.3	5	08/26/20 14:38	08/27/20 18:23	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-074 **Lab ID: 60346051074** Collected: 08/18/20 14:40 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**18.2**	%	0.50	1		08/24/20 15:01		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**2140**	mg/kg	18.0	15	08/31/20 08:14	09/01/20 12:21	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**173**	mg/kg	6.1	5	08/26/20 14:38	08/27/20 18:24		
Nitrogen, Nitrate	**173**	mg/kg	6.1	5	08/26/20 14:38	08/27/20 18:24	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	6.1	5	08/26/20 14:38	08/27/20 18:24	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-075 **Lab ID: 60346051075** Collected: 08/18/20 15:00 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**19.9**	%	0.50	1		08/24/20 15:01		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**2800**	mg/kg	18.6	15	08/31/20 08:14	09/01/20 12:23	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**332**	mg/kg	24.5	20	08/26/20 14:38	08/27/20 18:31		
Nitrogen, Nitrate	**332**	mg/kg	24.5	20	08/26/20 14:38	08/27/20 18:31	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	24.5	20	08/26/20 14:38	08/27/20 18:31	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081820-NL-076 **Lab ID: 60346051076** Collected: 08/18/20 15:10 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**18.8**	%	0.50	1		08/24/20 15:02		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**5160**	mg/kg	59.3	50	08/31/20 08:14	09/01/20 11:32	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**2710**	mg/kg	60.8	50	08/26/20 14:38	08/27/20 18:25		
Nitrogen, Nitrate	**2710**	mg/kg	60.8	50	08/26/20 14:38	08/27/20 18:25	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	60.8	50	08/26/20 14:38	08/27/20 18:25	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081920-NL-077 **Lab ID: 60346051077** Collected: 08/19/20 09:30 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**9.9**	%	0.50	1		08/24/20 15:02		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**94.9**	mg/kg	1.1	1	08/31/20 08:14	08/31/20 14:49	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**8.0**	mg/kg	1.1	1	08/26/20 14:38	08/27/20 18:12		
Nitrogen, Nitrate	**8.0**	mg/kg	1.1	1	08/26/20 14:38	08/27/20 18:12	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	1.1	1	08/26/20 14:38	08/27/20 18:12	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081920-NL-078 **Lab ID: 60346051078** Collected: 08/19/20 09:32 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**10.6**	%	0.50	1		08/24/20 15:02		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**91.5**	mg/kg	1.1	1	08/31/20 08:14	08/31/20 14:51	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**7.1**	mg/kg	1.1	1	08/26/20 14:38	08/27/20 18:12		
Nitrogen, Nitrate	**7.1**	mg/kg	1.1	1	08/26/20 14:38	08/27/20 18:12	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	1.1	1	08/26/20 14:38	08/27/20 18:12	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081920-NL-079 **Lab ID: 60346051079** Collected: 08/19/20 09:35 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**15.0**	%	0.50	1		08/24/20 15:02		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**191**	mg/kg	1.2	1	08/31/20 08:14	08/31/20 14:57	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**40.1**	mg/kg	1.2	1	08/26/20 14:38	08/27/20 18:13		
Nitrogen, Nitrate	**38.5**	mg/kg	1.2	1	08/26/20 14:38	08/27/20 18:13	14797-55-8	
Nitrogen, Nitrite	**1.6**	mg/kg	1.2	1	08/26/20 14:38	08/27/20 18:13	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081920-NL-080 **Lab ID: 60346051080** Collected: 08/19/20 09:40 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**18.8**	%	0.50	1		08/24/20 15:59		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**769**	mg/kg	6.1	5	08/31/20 08:14	09/01/20 11:34	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**387**	mg/kg	24.7	20	08/26/20 14:38	08/27/20 18:31		
Nitrogen, Nitrate	**387**	mg/kg	24.7	20	08/26/20 14:38	08/27/20 18:31	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	24.7	20	08/26/20 14:38	08/27/20 18:31	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081920-NL-081 **Lab ID: 60346051081** Collected: 08/19/20 09:45 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**11.9**	%	0.50	1		08/24/20 15:59		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**1120**	mg/kg	5.7	5	08/31/20 08:14	09/01/20 12:24	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**701**	mg/kg	55.8	50	08/27/20 14:44	08/28/20 12:36		M1
Nitrogen, Nitrate	**701**	mg/kg	55.8	50	08/27/20 14:44	08/28/20 12:36	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	55.8	50	08/27/20 14:44	08/28/20 12:36	14797-65-0	M1

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081920-NL-082 **Lab ID: 60346051082** Collected: 08/19/20 09:47 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**11.9**	%	0.50	1		08/24/20 15:59		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**809**	mg/kg	5.6	5	08/31/20 08:14	09/01/20 11:37	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**677**	mg/kg	55.7	50	08/27/20 14:44	08/28/20 12:38		
Nitrogen, Nitrate	**677**	mg/kg	55.7	50	08/27/20 14:44	08/28/20 12:38	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	55.7	50	08/27/20 14:44	08/28/20 12:38	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081920-NL-083 **Lab ID: 60346051083** Collected: 08/19/20 09:50 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**16.1**	%	0.50	1		08/24/20 15:59		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**1520**	mg/kg	11.6	10	08/31/20 08:14	09/01/20 12:26	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**999**	mg/kg	58.7	50	08/27/20 14:44	08/28/20 12:39		
Nitrogen, Nitrate	**999**	mg/kg	58.7	50	08/27/20 14:44	08/28/20 12:39	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	58.7	50	08/27/20 14:44	08/28/20 12:39	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081920-NL-084 **Lab ID: 60346051084** Collected: 08/19/20 09:55 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**22.0**	%	0.50	1		08/24/20 15:59		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**2740**	mg/kg	25.0	20	08/31/20 08:14	09/01/20 11:41	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**992**	mg/kg	65.4	50	08/27/20 14:44	08/28/20 12:42		
Nitrogen, Nitrate	**992**	mg/kg	65.4	50	08/27/20 14:44	08/28/20 12:42	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	65.4	50	08/27/20 14:44	08/28/20 12:42	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081920-NL-085 **Lab ID: 60346051085** Collected: 08/19/20 10:00 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**11.0**	%	0.50	1		08/24/20 15:59		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**60.5**	mg/kg	1.1	1	08/31/20 08:14	08/31/20 15:07	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**73.2**	mg/kg	2.2	2	08/27/20 14:44	08/28/20 12:43		
Nitrogen, Nitrate	**73.2**	mg/kg	2.2	2	08/27/20 14:44	08/28/20 12:43	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	2.2	2	08/27/20 14:44	08/28/20 12:43	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081920-NL-086 **Lab ID: 60346051086** Collected: 08/19/20 10:05 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**11.0**	%	0.50	1		08/24/20 15:59		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**70.3**	mg/kg	1.1	1	08/31/20 08:14	08/31/20 15:09	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**62.2**	mg/kg	2.3	2	08/27/20 14:44	08/28/20 12:44		
Nitrogen, Nitrate	**62.2**	mg/kg	2.3	2	08/27/20 14:44	08/28/20 12:44	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	2.3	2	08/27/20 14:44	08/28/20 12:44	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081920-NL-087 **Lab ID: 60346051087** Collected: 08/19/20 10:10 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**18.6**	%	0.50	1		08/24/20 15:59		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	ND	mg/kg	1.2	1	08/31/20 08:14	08/31/20 15:11	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**2.4**	mg/kg	1.2	1	08/27/20 14:44	08/28/20 12:00		
Nitrogen, Nitrate	**2.4**	mg/kg	1.2	1	08/27/20 14:44	08/28/20 12:00	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	1.2	1	08/27/20 14:44	08/28/20 12:00	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081920-NL-088 **Lab ID: 60346051088** Collected: 08/19/20 10:15 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**18.4**	%	0.50	1		08/24/20 15:59		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	ND	mg/kg	1.2	1	08/31/20 08:14	08/31/20 15:12	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**12.0**	mg/kg	1.2	1	08/27/20 14:44	08/28/20 12:01		
Nitrogen, Nitrate	**10.2**	mg/kg	1.2	1	08/27/20 14:44	08/28/20 12:01	14797-55-8	
Nitrogen, Nitrite	**1.8**	mg/kg	1.2	1	08/27/20 14:44	08/28/20 12:01	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081920-NL-089 **Lab ID: 60346051089** Collected: 08/19/20 10:30 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**13.1**	%	0.50	1		08/24/20 15:59		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**1.8**	mg/kg	1.1	1	08/31/20 08:14	08/31/20 15:47	7664-41-7	M1
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**4.7**	mg/kg	1.2	1	08/27/20 14:44	08/28/20 12:02		
Nitrogen, Nitrate	**4.7**	mg/kg	1.2	1	08/27/20 14:44	08/28/20 12:02	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	1.2	1	08/27/20 14:44	08/28/20 12:02	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081920-NL-090 **Lab ID: 60346051090** Collected: 08/19/20 10:35 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**13.1**	%	0.50	1		08/24/20 16:00		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**2.1**	mg/kg	1.1	1	08/31/20 08:14	08/31/20 15:50	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**4.4**	mg/kg	1.1	1	08/27/20 14:44	08/28/20 12:03		
Nitrogen, Nitrate	**4.4**	mg/kg	1.1	1	08/27/20 14:44	08/28/20 12:03	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	1.1	1	08/27/20 14:44	08/28/20 12:03	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081920-NL-091 **Lab ID: 60346051091** Collected: 08/19/20 10:40 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**16.5**	%	0.50	1		08/24/20 16:00		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**1.2**	mg/kg	1.2	1	08/31/20 08:14	08/31/20 15:54	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**1.4**	mg/kg	1.2	1	08/27/20 14:44	08/28/20 12:04		
Nitrogen, Nitrate	**1.4**	mg/kg	1.2	1	08/27/20 14:44	08/28/20 12:04	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	1.2	1	08/27/20 14:44	08/28/20 12:04	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081920-NL-092 **Lab ID: 60346051092** Collected: 08/19/20 10:45 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**23.1**	%	0.50	1		08/24/20 16:00		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**4.5**	mg/kg	1.3	1	08/31/20 08:14	08/31/20 15:55	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**1.3**	mg/kg	1.3	1	08/27/20 14:44	08/28/20 12:05		
Nitrogen, Nitrate	**1.3**	mg/kg	1.3	1	08/27/20 14:44	08/28/20 12:05	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	1.3	1	08/27/20 14:44	08/28/20 12:05	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081920-NL-093 **Lab ID: 60346051093** Collected: 08/19/20 10:50 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**7.0**	%	0.50	1		08/24/20 16:00		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	ND	mg/kg	1.1	1	08/31/20 08:14	08/31/20 15:57	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**1.3**	mg/kg	1.1	1	08/27/20 14:44	08/28/20 12:06		
Nitrogen, Nitrate	**1.3**	mg/kg	1.1	1	08/27/20 14:44	08/28/20 12:06	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	1.1	1	08/27/20 14:44	08/28/20 12:06	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081920-NL-094 **Lab ID: 60346051094** Collected: 08/19/20 10:55 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**5.2**	%	0.50	1		08/24/20 16:00		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**1.7**	mg/kg	1.0	1	08/31/20 08:14	08/31/20 15:58	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	ND	mg/kg	1.1	1	08/27/20 14:44	08/28/20 12:07		
Nitrogen, Nitrate	ND	mg/kg	1.1	1	08/27/20 14:44	08/28/20 12:07	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	1.1	1	08/27/20 14:44	08/28/20 12:07	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081920-NL-095 **Lab ID: 60346051095** Collected: 08/19/20 11:00 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**4.6**	%	0.50	1		08/24/20 16:00		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**2.5**	mg/kg	1.0	1	08/31/20 08:14	08/31/20 16:05	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**1.4**	mg/kg	1.1	1	08/27/20 14:44	08/28/20 12:08		
Nitrogen, Nitrate	**1.4**	mg/kg	1.1	1	08/27/20 14:44	08/28/20 12:08	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	1.1	1	08/27/20 14:44	08/28/20 12:08	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081920-NL-096 **Lab ID: 60346051096** Collected: 08/19/20 11:05 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**18.2**	%	0.50	1		08/24/20 16:00		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**2040**	mg/kg	18.2	15	08/31/20 08:14	09/01/20 12:31	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**245**	mg/kg	6.1	5	08/27/20 14:44	08/28/20 12:45		
Nitrogen, Nitrate	**245**	mg/kg	6.1	5	08/27/20 14:44	08/28/20 12:45	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	6.1	5	08/27/20 14:44	08/28/20 12:45	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081920-NL-097 **Lab ID: 60346051097** Collected: 08/19/20 11:15 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**24.5**	%	0.50	1		08/24/20 16:00		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**3890**	mg/kg	32.5	25	08/31/20 08:14	09/01/20 12:33	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**843**	mg/kg	66.2	50	08/27/20 14:44	08/28/20 12:46		
Nitrogen, Nitrate	**843**	mg/kg	66.2	50	08/27/20 14:44	08/28/20 12:46	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	66.2	50	08/27/20 14:44	08/28/20 12:46	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081920-NL-098 **Lab ID: 60346051098** Collected: 08/19/20 11:20 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**29.1**	%	0.50	1		08/24/20 16:00		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**4380**	mg/kg	70.0	50	08/31/20 08:14	09/01/20 12:34	7664-41-7	M1
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**1250**	mg/kg	71.1	50	08/27/20 14:44	08/28/20 12:47		
Nitrogen, Nitrate	**1250**	mg/kg	71.1	50	08/27/20 14:44	08/28/20 12:47	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	71.1	50	08/27/20 14:44	08/28/20 12:47	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: SO-081920-NL-099 **Lab ID: 60346051099** Collected: 08/19/20 11:35 Received: 08/20/20 10:48 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974 Pace Analytical Services - Kansas City							
Percent Moisture	**22.4**	%	0.50	1		08/24/20 16:00		
350.1 Ammonia	Analytical Method: EPA 350.1 Preparation Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**5510**	mg/kg	62.8	50	08/31/20 08:14	09/01/20 11:52	7664-41-7	
353.2 Nitrogen, NO2/NO3	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**2140**	mg/kg	64.3	50	08/27/20 14:44	08/28/20 12:48		
Nitrogen, Nitrate	**2140**	mg/kg	64.3	50	08/27/20 14:44	08/28/20 12:48	14797-55-8	
Nitrogen, Nitrite	ND	mg/kg	64.3	50	08/27/20 14:44	08/28/20 12:48	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: WW-081820-NL-001 **Lab ID: 60346051100** Collected: 08/18/20 16:45 Received: 08/20/20 10:48 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	ND	mg/L	0.10	1		08/25/20 09:41	7664-41-7	
353.2 Nitrogen, NO2/NO3 unpres	Analytical Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	ND	mg/L	0.10	1		08/20/20 13:44		
Nitrogen, Nitrate	ND	mg/L	0.10	1		08/20/20 13:44	14797-55-8	
Nitrogen, Nitrite	ND	mg/L	0.10	1		08/20/20 13:44	14797-65-0	

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ANALYTICAL RESULTS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Sample: WW-081920-NL-002 **Lab ID: 60346051101** Collected: 08/19/20 12:15 Received: 08/20/20 10:48 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	ND	mg/L	0.10	1		08/25/20 09:43	7664-41-7	
353.2 Nitrogen, NO2/NO3 unpres	Analytical Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	ND	mg/L	0.10	1		08/20/20 13:45		
Nitrogen, Nitrate	ND	mg/L	0.10	1		08/20/20 13:45	14797-55-8	
Nitrogen, Nitrite	ND	mg/L	0.10	1		08/20/20 13:45	14797-65-0	

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QUALITY CONTROL DATA

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

QC Batch: 672560
QC Batch Method: ASTM D2974
Analysis Method: ASTM D2974
Analysis Description: Dry Weight/Percent Moisture
Laboratory: Pace Analytical Services - Kansas City
Associated Lab Samples: 60346051001, 60346051002, 60346051003, 60346051004, 60346051005, 60346051006, 60346051007, 60346051008, 60346051009, 60346051010, 60346051011, 60346051012, 60346051013, 60346051014, 60346051015

METHOD BLANK: 2721057 Matrix: Solid
Associated Lab Samples: 60346051001, 60346051002, 60346051003, 60346051004, 60346051005, 60346051006, 60346051007, 60346051008, 60346051009, 60346051010, 60346051011, 60346051012, 60346051013, 60346051014, 60346051015

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Percent Moisture	%	ND	0.50	08/21/20 10:59	

SAMPLE DUPLICATE: 2721058

Parameter	Units	60345647001 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	27.4	26.8	2	20	

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QUALITY CONTROL DATA

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

QC Batch: 672562
QC Batch Method: ASTM D2974
Analysis Method: ASTM D2974
Analysis Description: Dry Weight/Percent Moisture
Laboratory: Pace Analytical Services - Kansas City
Associated Lab Samples: 60346051016, 60346051017, 60346051018, 60346051019, 60346051020, 60346051021, 60346051022, 60346051023, 60346051024, 60346051025, 60346051026, 60346051027, 60346051028, 60346051029, 60346051030, 60346051031, 60346051032, 60346051033, 60346051034, 60346051035

METHOD BLANK: 2721059
Matrix: Solid
Associated Lab Samples: 60346051016, 60346051017, 60346051018, 60346051019, 60346051020, 60346051021, 60346051022, 60346051023, 60346051024, 60346051025, 60346051026, 60346051027, 60346051028, 60346051029, 60346051030, 60346051031, 60346051032, 60346051033, 60346051034, 60346051035

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Percent Moisture	%	ND	0.50	08/21/20 11:27	

SAMPLE DUPLICATE: 2721060

Parameter	Units	60346051016 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	19.5	19.4	0	20	

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QUALITY CONTROL DATA

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

QC Batch: 672564
QC Batch Method: ASTM D2974
Analysis Method: ASTM D2974
Analysis Description: Dry Weight/Percent Moisture
Laboratory: Pace Analytical Services - Kansas City
Associated Lab Samples: 60346051036, 60346051037, 60346051038, 60346051039, 60346051040, 60346051041, 60346051042, 60346051043, 60346051044, 60346051045, 60346051046, 60346051047, 60346051048, 60346051049, 60346051050, 60346051051, 60346051052, 60346051053, 60346051054, 60346051055

METHOD BLANK: 2721062
Matrix: Solid
Associated Lab Samples: 60346051036, 60346051037, 60346051038, 60346051039, 60346051040, 60346051041, 60346051042, 60346051043, 60346051044, 60346051045, 60346051046, 60346051047, 60346051048, 60346051049, 60346051050, 60346051051, 60346051052, 60346051053, 60346051054, 60346051055

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Percent Moisture	%	ND	0.50	08/21/20 11:55	

SAMPLE DUPLICATE: 2721063

Parameter	Units	60346051036 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	11.3	11.1	1	20	

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QUALITY CONTROL DATA

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

QC Batch: 672912 | Analysis Method: ASTM D2974
QC Batch Method: ASTM D2974 | Analysis Description: Dry Weight/Percent Moisture
Laboratory: Pace Analytical Services - Kansas City
Associated Lab Samples: 60346051056, 60346051057, 60346051058, 60346051059

METHOD BLANK: 2722595 Matrix: Solid
Associated Lab Samples: 60346051056, 60346051057, 60346051058, 60346051059

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Percent Moisture	%	ND	0.50	08/24/20 14:05	

SAMPLE DUPLICATE: 2722596

Parameter	Units	60345838032 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	24.3	23.8	2	20	

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QUALITY CONTROL DATA

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

QC Batch: 672913
QC Batch Method: ASTM D2974
Analysis Method: ASTM D2974
Analysis Description: Dry Weight/Percent Moisture
Laboratory: Pace Analytical Services - Kansas City
Associated Lab Samples: 60346051060, 60346051061, 60346051062, 60346051063, 60346051064, 60346051065, 60346051066, 60346051067, 60346051068, 60346051069, 60346051070, 60346051071, 60346051072, 60346051073, 60346051074, 60346051075, 60346051076, 60346051077, 60346051078, 60346051079

METHOD BLANK: 2722599
Matrix: Solid
Associated Lab Samples: 60346051060, 60346051061, 60346051062, 60346051063, 60346051064, 60346051065, 60346051066, 60346051067, 60346051068, 60346051069, 60346051070, 60346051071, 60346051072, 60346051073, 60346051074, 60346051075, 60346051076, 60346051077, 60346051078, 60346051079

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Percent Moisture	%	ND	0.50	08/24/20 15:00	

SAMPLE DUPLICATE: 2722600

Parameter	Units	60346051060 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	20.1	20.4	1	20	

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QUALITY CONTROL DATA

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

QC Batch: 672915
QC Batch Method: ASTM D2974
Analysis Method: ASTM D2974
Analysis Description: Dry Weight/Percent Moisture
Laboratory: Pace Analytical Services - Kansas City
Associated Lab Samples: 60346051080, 60346051081, 60346051082, 60346051083, 60346051084, 60346051085, 60346051086, 60346051087, 60346051088, 60346051089, 60346051090, 60346051091, 60346051092, 60346051093, 60346051094, 60346051095, 60346051096, 60346051097, 60346051098, 60346051099

METHOD BLANK: 2722606
Matrix: Solid
Associated Lab Samples: 60346051080, 60346051081, 60346051082, 60346051083, 60346051084, 60346051085, 60346051086, 60346051087, 60346051088, 60346051089, 60346051090, 60346051091, 60346051092, 60346051093, 60346051094, 60346051095, 60346051096, 60346051097, 60346051098, 60346051099

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Percent Moisture	%	ND	0.50	08/24/20 15:59	

SAMPLE DUPLICATE: 2722607

Parameter	Units	60346051080 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	18.8	19.6	4	20	

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QUALITY CONTROL DATA

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

QC Batch: 673180 — Analysis Method: EPA 350.1
QC Batch Method: EPA 350.1 — Analysis Description: 350.1 Ammonia
Laboratory: Pace Analytical Services - Kansas City
Associated Lab Samples: 60346051001, 60346051002, 60346051003, 60346051004, 60346051005, 60346051006, 60346051007, 60346051008

METHOD BLANK: 2723332 — Matrix: Solid
Associated Lab Samples: 60346051001, 60346051002, 60346051003, 60346051004, 60346051005, 60346051006, 60346051007, 60346051008

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, Ammonia	mg/kg	ND	1.0	08/26/20 09:08	

LABORATORY CONTROL SAMPLE: 2723333

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/kg	50	52.2	104	90-110	

MATRIX SPIKE SAMPLE: 2723334

Parameter	Units	60346196017 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/kg	ND	51.7	53.5	103	80-120	

MATRIX SPIKE SAMPLE: 2723336

Parameter	Units	60346032003 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/kg	19.2	316	370	111	80-120	

SAMPLE DUPLICATE: 2723335

Parameter	Units	60346196018 Result	Dup Result	RPD	Max RPD	Qualifiers
Nitrogen, Ammonia	mg/kg	ND	.9J		20	

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QUALITY CONTROL DATA

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

QC Batch: 673182
QC Batch Method: EPA 350.1
Analysis Method: EPA 350.1
Analysis Description: 350.1 Ammonia
Laboratory: Pace Analytical Services - Kansas City
Associated Lab Samples: 60346051009, 60346051010, 60346051011, 60346051012, 60346051013, 60346051014, 60346051015, 60346051016, 60346051017, 60346051018, 60346051019, 60346051020, 60346051021, 60346051022, 60346051023, 60346051024, 60346051025, 60346051026, 60346051027, 60346051028

METHOD BLANK: 2723337 Matrix: Solid
Associated Lab Samples: 60346051009, 60346051010, 60346051011, 60346051012, 60346051013, 60346051014, 60346051015, 60346051016, 60346051017, 60346051018, 60346051019, 60346051020, 60346051021, 60346051022, 60346051023, 60346051024, 60346051025, 60346051026, 60346051027, 60346051028

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, Ammonia	mg/kg	ND	1.0	08/26/20 10:34	

LABORATORY CONTROL SAMPLE: 2723338

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/kg	50	52.1	104	90-110	

MATRIX SPIKE SAMPLE: 2723339

Parameter	Units	60346051009 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/kg	759	62.3	933	279	80-120	M1

MATRIX SPIKE SAMPLE: 2723341

Parameter	Units	60346051018 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/kg	174	57.4	219	79	80-120	M1

SAMPLE DUPLICATE: 2723340

Parameter	Units	60346051010 Result	Dup Result	RPD	Max RPD	Qualifiers
Nitrogen, Ammonia	mg/kg	967	1180	20	20	

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QUALITY CONTROL DATA

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

QC Batch: 673326
QC Batch Method: EPA 350.1
Analysis Method: EPA 350.1
Analysis Description: 350.1 Ammonia
Laboratory: Pace Analytical Services - Kansas City
Associated Lab Samples: 60346051029, 60346051030, 60346051031, 60346051032, 60346051033, 60346051034, 60346051035, 60346051036, 60346051037, 60346051038, 60346051039, 60346051040, 60346051041, 60346051042, 60346051043, 60346051044, 60346051045, 60346051046, 60346051047, 60346051048

METHOD BLANK: 2723812 Matrix: Solid
Associated Lab Samples: 60346051029, 60346051030, 60346051031, 60346051032, 60346051033, 60346051034, 60346051035, 60346051036, 60346051037, 60346051038, 60346051039, 60346051040, 60346051041, 60346051042, 60346051043, 60346051044, 60346051045, 60346051046, 60346051047, 60346051048

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, Ammonia	mg/kg	ND	1.0	08/26/20 12:48	

LABORATORY CONTROL SAMPLE: 2723813

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/kg	50	51.7	103	90-110	

MATRIX SPIKE SAMPLE: 2723814

Parameter	Units	60346051029 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/kg	189	60.4	193	7	80-120	M1

MATRIX SPIKE SAMPLE: 2723816

Parameter	Units	60346051038 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/kg	17.4	57.8	48.2	53	80-120	M1

SAMPLE DUPLICATE: 2723815

Parameter	Units	60346051030 Result	Dup Result	RPD	Max RPD	Qualifiers
Nitrogen, Ammonia	mg/kg	147	158	7	20	

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QUALITY CONTROL DATA

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

QC Batch: 674180
QC Batch Method: EPA 350.1
Analysis Method: EPA 350.1
Analysis Description: 350.1 Ammonia
Laboratory: Pace Analytical Services - Kansas City
Associated Lab Samples: 60346051049, 60346051050, 60346051051, 60346051052, 60346051053, 60346051054, 60346051055, 60346051056, 60346051057, 60346051058, 60346051059, 60346051060, 60346051061, 60346051062, 60346051063, 60346051064, 60346051065, 60346051066, 60346051067, 60346051068

METHOD BLANK: 2727302 Matrix: Solid
Associated Lab Samples: 60346051049, 60346051050, 60346051051, 60346051052, 60346051053, 60346051054, 60346051055, 60346051056, 60346051057, 60346051058, 60346051059, 60346051060, 60346051061, 60346051062, 60346051063, 60346051064, 60346051065, 60346051066, 60346051067, 60346051068

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, Ammonia	mg/kg	ND	1.0	08/31/20 13:39	

LABORATORY CONTROL SAMPLE: 2727303

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/kg	50	49.0	98	90-110	

MATRIX SPIKE SAMPLE: 2727304

Parameter	Units	60346051049 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/kg	48.1	56.3	99.0	91	80-120	

MATRIX SPIKE SAMPLE: 2727306

Parameter	Units	60346051058 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/kg	137	57.3	178	71	80-120	M1

SAMPLE DUPLICATE: 2727305

Parameter	Units	60346051050 Result	Dup Result	RPD	Max RPD	Qualifiers
Nitrogen, Ammonia	mg/kg	82.8	77.8	6	20	

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QUALITY CONTROL DATA

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

QC Batch: 674182
QC Batch Method: EPA 350.1
Analysis Method: EPA 350.1
Analysis Description: 350.1 Ammonia
Laboratory: Pace Analytical Services - Kansas City
Associated Lab Samples: 60346051069, 60346051070, 60346051071, 60346051072, 60346051073, 60346051074, 60346051075, 60346051076, 60346051077, 60346051078, 60346051079, 60346051080, 60346051081, 60346051082, 60346051083, 60346051084, 60346051085, 60346051086, 60346051087, 60346051088

METHOD BLANK: 2727311 Matrix: Solid
Associated Lab Samples: 60346051069, 60346051070, 60346051071, 60346051072, 60346051073, 60346051074, 60346051075, 60346051076, 60346051077, 60346051078, 60346051079, 60346051080, 60346051081, 60346051082, 60346051083, 60346051084, 60346051085, 60346051086, 60346051087, 60346051088

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, Ammonia	mg/kg	ND	1.0	08/31/20 14:26	

LABORATORY CONTROL SAMPLE: 2727312

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/kg	50	49.7	99	90-110	

MATRIX SPIKE SAMPLE: 2727313

Parameter	Units	60346051069 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/kg	4130	61.4	4040	-147	80-120	M1

MATRIX SPIKE SAMPLE: 2727315

Parameter	Units	60346051078 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/kg	91.5	54.5	144	96	80-120	

SAMPLE DUPLICATE: 2727314

Parameter	Units	60346051070 Result	Dup Result	RPD	Max RPD	Qualifiers
Nitrogen, Ammonia	mg/kg	5380	5050	6	20	

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QUALITY CONTROL DATA

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

QC Batch: 674184 — Analysis Method: EPA 350.1
QC Batch Method: EPA 350.1 — Analysis Description: 350.1 Ammonia
Laboratory: Pace Analytical Services - Kansas City
Associated Lab Samples: 60346051089, 60346051090, 60346051091, 60346051092, 60346051093, 60346051094, 60346051095, 60346051096, 60346051097, 60346051098, 60346051099

METHOD BLANK: 2727320 — Matrix: Solid
Associated Lab Samples: 60346051089, 60346051090, 60346051091, 60346051092, 60346051093, 60346051094, 60346051095, 60346051096, 60346051097, 60346051098, 60346051099

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, Ammonia	mg/kg	ND	1.0	08/31/20 15:44	

LABORATORY CONTROL SAMPLE: 2727321

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/kg	50	54.6	109	90-110	

MATRIX SPIKE SAMPLE: 2727322

Parameter	Units	60346051089 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/kg	1.8	56.9	44.3	75	80-120	M1

MATRIX SPIKE SAMPLE: 2727324

Parameter	Units	60346051098 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/kg	4380	69.4	4150	-330	80-120	M1

SAMPLE DUPLICATE: 2727323

Parameter	Units	60346051090 Result	Dup Result	RPD	Max RPD	Qualifiers
Nitrogen, Ammonia	mg/kg	2.1	2.2	3	20	

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QUALITY CONTROL DATA

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

QC Batch: 673017
QC Batch Method: EPA 350.1
Analysis Method: EPA 350.1
Analysis Description: 350.1 Ammonia
Laboratory: Pace Analytical Services - Kansas City
Associated Lab Samples: 60346051100, 60346051101

METHOD BLANK: 2722825 Matrix: Water
Associated Lab Samples: 60346051100, 60346051101

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, Ammonia	mg/L	ND	0.10	08/25/20 09:06	

LABORATORY CONTROL SAMPLE: 2722826

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/L	5	5.2	103	90-110	

MATRIX SPIKE SAMPLE: 2722827

Parameter	Units	60346036003 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/L	182	50	219	75	90-110	E,M1

MATRIX SPIKE SAMPLE: 2722829

Parameter	Units	60346148001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/L	138	75	204	88	90-110	M1

SAMPLE DUPLICATE: 2722828

Parameter	Units	60346067001 Result	Dup Result	RPD	Max RPD	Qualifiers
Nitrogen, Ammonia	mg/L	11.8	12.0	1	18	

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QUALITY CONTROL DATA

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

QC Batch: 672595
QC Batch Method: EPA 353.2
Analysis Method: EPA 353.2
Analysis Description: 353.2 Nitrate + Nitrite
Laboratory: Pace Analytical Services - Kansas City
Associated Lab Samples: 60346051001, 60346051002, 60346051003, 60346051004, 60346051005, 60346051006, 60346051007, 60346051008, 60346051009, 60346051010, 60346051011, 60346051012, 60346051013, 60346051014, 60346051015, 60346051016, 60346051017, 60346051018, 60346051019, 60346051020

METHOD BLANK: 2721163 Matrix: Solid
Associated Lab Samples: 60346051001, 60346051002, 60346051003, 60346051004, 60346051005, 60346051006, 60346051007, 60346051008, 60346051009, 60346051010, 60346051011, 60346051012, 60346051013, 60346051014, 60346051015, 60346051016, 60346051017, 60346051018, 60346051019, 60346051020

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, Nitrate	mg/kg	ND	1.0	08/25/20 15:19	
Nitrogen, Nitrite	mg/kg	ND	1.0	08/25/20 15:19	
Nitrogen, NO2 plus NO3	mg/kg	ND	1.0	08/25/20 15:19	

LABORATORY CONTROL SAMPLE: 2721164

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Nitrate	mg/kg	10	9.6	96	85-115	
Nitrogen, Nitrite	mg/kg	10	10.7	107	90-110	
Nitrogen, NO2 plus NO3	mg/kg	20	20.3	101	90-110	

MATRIX SPIKE SAMPLE: 2721165

Parameter	Units	60346051001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Nitrogen, Nitrate	mg/kg	458	12.3	383	-605	85-115	
Nitrogen, Nitrite	mg/kg	ND	12.3	251	2040	90-110	M1
Nitrogen, NO2 plus NO3	mg/kg	458	24.6	634	717	90-110	M1

MATRIX SPIKE SAMPLE: 2721167

Parameter	Units	60346051011 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Nitrogen, Nitrate	mg/kg	537	11.6	716	1530	85-115	
Nitrogen, Nitrite	mg/kg	ND	11.6	240	2060	90-110	M1
Nitrogen, NO2 plus NO3	mg/kg	537	23.3	955	1790	90-110	M1

SAMPLE DUPLICATE: 2721166

Parameter	Units	60346051003 Result	Dup Result	RPD	Max RPD	Qualifiers
Nitrogen, Nitrate	mg/kg	716	712	1	20	
Nitrogen, Nitrite	mg/kg	ND	ND		20	
Nitrogen, NO2 plus NO3	mg/kg	716	712	1	20	

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QUALITY CONTROL DATA

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

QC Batch: 672597
QC Batch Method: EPA 353.2
Analysis Method: EPA 353.2
Analysis Description: 353.2 Nitrate + Nitrite
Laboratory: Pace Analytical Services - Kansas City
Associated Lab Samples: 60346051021, 60346051022, 60346051023, 60346051024, 60346051025, 60346051026, 60346051027, 60346051028, 60346051029, 60346051030, 60346051031, 60346051032, 60346051033, 60346051034, 60346051035, 60346051036, 60346051037, 60346051038, 60346051039, 60346051040

METHOD BLANK: 2721168 Matrix: Solid
Associated Lab Samples: 60346051021, 60346051022, 60346051023, 60346051024, 60346051025, 60346051026, 60346051027, 60346051028, 60346051029, 60346051030, 60346051031, 60346051032, 60346051033, 60346051034, 60346051035, 60346051036, 60346051037, 60346051038, 60346051039, 60346051040

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, Nitrate	mg/kg	ND	1.0	08/26/20 09:42	
Nitrogen, Nitrite	mg/kg	ND	1.0	08/26/20 09:42	
Nitrogen, NO2 plus NO3	mg/kg	ND	1.0	08/26/20 09:42	

LABORATORY CONTROL SAMPLE: 2721169

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Nitrate	mg/kg	10	9.8	98	85-115	
Nitrogen, Nitrite	mg/kg	10	11.0	110	90-110	
Nitrogen, NO2 plus NO3	mg/kg	20	20.8	104	90-110	

MATRIX SPIKE SAMPLE: 2721170

Parameter	Units	60346051021 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Nitrogen, Nitrate	mg/kg	971	12.2	1450	3940	85-115	
Nitrogen, Nitrite	mg/kg	ND	12.2	619	5070	90-110	M1
Nitrogen, NO2 plus NO3	mg/kg	971	24.4	2070	4510	90-110	M1

MATRIX SPIKE SAMPLE: 2721172

Parameter	Units	60346051031 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Nitrogen, Nitrate	mg/kg	116	11.5	157	354	85-115	
Nitrogen, Nitrite	mg/kg	ND	11.5	59.9	524	90-110	M1
Nitrogen, NO2 plus NO3	mg/kg	116	22.8	217	439	90-110	M1

SAMPLE DUPLICATE: 2721171

Parameter	Units	60346051023 Result	Dup Result	RPD	Max RPD	Qualifiers
Nitrogen, Nitrate	mg/kg	156	161	3	20	
Nitrogen, Nitrite	mg/kg	ND	ND		20	
Nitrogen, NO2 plus NO3	mg/kg	156	161	3	20	

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QUALITY CONTROL DATA

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

QC Batch: 672598
QC Batch Method: EPA 353.2
Analysis Method: EPA 353.2
Analysis Description: 353.2 Nitrate + Nitrite
Laboratory: Pace Analytical Services - Kansas City
Associated Lab Samples: 60346051041, 60346051042, 60346051043, 60346051044, 60346051045, 60346051046, 60346051047, 60346051048, 60346051049, 60346051050, 60346051051, 60346051052, 60346051053, 60346051054, 60346051055, 60346051056, 60346051057, 60346051058, 60346051059, 60346051060

METHOD BLANK: 2721174 Matrix: Solid
Associated Lab Samples: 60346051041, 60346051042, 60346051043, 60346051044, 60346051045, 60346051046, 60346051047, 60346051048, 60346051049, 60346051050, 60346051051, 60346051052, 60346051053, 60346051054, 60346051055, 60346051056, 60346051057, 60346051058, 60346051059, 60346051060

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, Nitrate	mg/kg	ND	1.0	08/26/20 14:13	
Nitrogen, Nitrite	mg/kg	ND	1.0	08/26/20 14:13	
Nitrogen, NO2 plus NO3	mg/kg	ND	1.0	08/26/20 14:13	

LABORATORY CONTROL SAMPLE: 2721175

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Nitrate	mg/kg	10	9.2	92	85-115	
Nitrogen, Nitrite	mg/kg	10	11.0	110	90-110	
Nitrogen, NO2 plus NO3	mg/kg	20	20.1	101	90-110	

MATRIX SPIKE SAMPLE: 2721176

Parameter	Units	60346051041 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Nitrogen, Nitrate	mg/kg	116	11.4	153	328	85-115	
Nitrogen, Nitrite	mg/kg	ND	11.4	57.8	508	90-110	M1
Nitrogen, NO2 plus NO3	mg/kg	116	22.7	211	418	90-110	M1

MATRIX SPIKE SAMPLE: 2721178

Parameter	Units	60346051051 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Nitrogen, Nitrate	mg/kg	50.7	11.1	51.8	10	85-115	
Nitrogen, Nitrite	mg/kg	ND	11.1	13.2	115	90-110	M1
Nitrogen, NO2 plus NO3	mg/kg	50.7	22.2	65.0	64	90-110	M1

SAMPLE DUPLICATE: 2721177

Parameter	Units	60346051043 Result	Dup Result	RPD	Max RPD	Qualifiers
Nitrogen, Nitrate	mg/kg	79.4	84.5	6	20	
Nitrogen, Nitrite	mg/kg	ND	ND		20	
Nitrogen, NO2 plus NO3	mg/kg	79.4	84.5	6	20	

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QUALITY CONTROL DATA

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

QC Batch: 672599
QC Batch Method: EPA 353.2
Analysis Method: EPA 353.2
Analysis Description: 353.2 Nitrate + Nitrite
Laboratory: Pace Analytical Services - Kansas City
Associated Lab Samples: 60346051061, 60346051062, 60346051063, 60346051064, 60346051065, 60346051066, 60346051067, 60346051068, 60346051069, 60346051070, 60346051071, 60346051072, 60346051073, 60346051074, 60346051075, 60346051076, 60346051077, 60346051078, 60346051079, 60346051080

METHOD BLANK: 2721179 Matrix: Solid
Associated Lab Samples: 60346051061, 60346051062, 60346051063, 60346051064, 60346051065, 60346051066, 60346051067, 60346051068, 60346051069, 60346051070, 60346051071, 60346051072, 60346051073, 60346051074, 60346051075, 60346051076, 60346051077, 60346051078, 60346051079, 60346051080

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, Nitrate	mg/kg	ND	1.0	08/27/20 17:49	
Nitrogen, Nitrite	mg/kg	ND	1.0	08/27/20 17:49	
Nitrogen, NO2 plus NO3	mg/kg	ND	1.0	08/27/20 17:49	

LABORATORY CONTROL SAMPLE: 2721180

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Nitrate	mg/kg	10	10.7	107	85-115	
Nitrogen, Nitrite	mg/kg	10	10.7	107	90-110	
Nitrogen, NO2 plus NO3	mg/kg	20	21.3	107	90-110	

MATRIX SPIKE SAMPLE: 2721181

Parameter	Units	60346051061 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Nitrogen, Nitrate	mg/kg	ND	12.8	ND	0	85-115	
Nitrogen, Nitrite	mg/kg	2.2	12.8	1.7	-4	90-110	M1
Nitrogen, NO2 plus NO3	mg/kg	1.7	25.5	1.5	-1	90-110	M1

MATRIX SPIKE SAMPLE: 2721183

Parameter	Units	60346051071 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Nitrogen, Nitrate	mg/kg	643	10.6	601	-398	85-115	
Nitrogen, Nitrite	mg/kg	ND	10.6	ND	1	90-110	M1
Nitrogen, NO2 plus NO3	mg/kg	643	21.2	601	-199	90-110	M1

SAMPLE DUPLICATE: 2721182

Parameter	Units	60346051063 Result	Dup Result	RPD	Max RPD	Qualifiers
Nitrogen, Nitrate	mg/kg	58.2	58.2	0	20	
Nitrogen, Nitrite	mg/kg	2.2	2.0	10	20	
Nitrogen, NO2 plus NO3	mg/kg	60.4	60.2	0	20	

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QUALITY CONTROL DATA

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

QC Batch: 672603
QC Batch Method: EPA 353.2
Analysis Method: EPA 353.2
Analysis Description: 353.2 Nitrate + Nitrite
Laboratory: Pace Analytical Services - Kansas City
Associated Lab Samples: 60346051081, 60346051082, 60346051083, 60346051084, 60346051085, 60346051086, 60346051087, 60346051088, 60346051089, 60346051090, 60346051091, 60346051092, 60346051093, 60346051094, 60346051095, 60346051096, 60346051097, 60346051098, 60346051099

METHOD BLANK: 2721187 Matrix: Solid
Associated Lab Samples: 60346051081, 60346051082, 60346051083, 60346051084, 60346051085, 60346051086, 60346051087, 60346051088, 60346051089, 60346051090, 60346051091, 60346051092, 60346051093, 60346051094, 60346051095, 60346051096, 60346051097, 60346051098, 60346051099

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, Nitrate	mg/kg	ND	1.0	08/28/20 11:50	
Nitrogen, Nitrite	mg/kg	ND	1.0	08/28/20 11:50	
Nitrogen, NO2 plus NO3	mg/kg	ND	1.0	08/28/20 11:50	

LABORATORY CONTROL SAMPLE: 2721188

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Nitrate	mg/kg	10	9.7	97	85-115	
Nitrogen, Nitrite	mg/kg	10	9.8	98	90-110	
Nitrogen, NO2 plus NO3	mg/kg	20	19.5	97	90-110	

MATRIX SPIKE SAMPLE: 2721189

Parameter	Units	60346051081 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Nitrogen, Nitrate	mg/kg	701	11.1	1170	4240	85-115	
Nitrogen, Nitrite	mg/kg	ND	11.1	585	5110	90-110	M1
Nitrogen, NO2 plus NO3	mg/kg	701	22.2	1760	4740	90-110	M1

MATRIX SPIKE SAMPLE: 2721191

Parameter	Units	60346051091 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Nitrogen, Nitrate	mg/kg	1.4	12	14.4	108	85-115	
Nitrogen, Nitrite	mg/kg	ND	12	13.4	107	90-110	
Nitrogen, NO2 plus NO3	mg/kg	1.4	23.9	27.8	110	90-110	

SAMPLE DUPLICATE: 2721190

Parameter	Units	60346051083 Result	Dup Result	RPD	Max RPD	Qualifiers
Nitrogen, Nitrate	mg/kg	999	970	3	20	
Nitrogen, Nitrite	mg/kg	ND	ND		20	
Nitrogen, NO2 plus NO3	mg/kg	999	970	3	20	

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QUALITY CONTROL DATA

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

QC Batch: 672378
QC Batch Method: EPA 353.2
Analysis Method: EPA 353.2
Analysis Description: 353.2 Nitrate + Nitrite, Unpres.
Laboratory: Pace Analytical Services - Kansas City
Associated Lab Samples: 60346051100, 60346051101

METHOD BLANK: 2720296 Matrix: Water
Associated Lab Samples: 60346051100, 60346051101

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, Nitrate	mg/L	ND	0.10	08/20/20 13:32	
Nitrogen, Nitrite	mg/L	ND	0.10	08/20/20 13:32	
Nitrogen, NO2 plus NO3	mg/L	ND	0.10	08/20/20 13:32	

LABORATORY CONTROL SAMPLE: 2720297

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Nitrate	mg/L	1	0.95	95	70-130	
Nitrogen, Nitrite	mg/L	1	1.1	110	90-110	
Nitrogen, NO2 plus NO3	mg/L	2	2.0	102	90-110	

MATRIX SPIKE SAMPLE: 2720298

Parameter	Units	60346048001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Nitrogen, Nitrate	mg/L	ND	1	0.77	77	70-130	
Nitrogen, Nitrite	mg/L	ND	1	0.95	95	90-110	
Nitrogen, NO2 plus NO3	mg/L	ND	2	1.7	83	90-110	M1

SAMPLE DUPLICATE: 2720299

Parameter	Units	60346048001 Result	Dup Result	RPD	Max RPD	Qualifiers
Nitrogen, Nitrate	mg/L	ND	ND		20	
Nitrogen, Nitrite	mg/L	ND	ND		20	
Nitrogen, NO2 plus NO3	mg/L	ND	ND		20	

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QUALIFIERS

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

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TNI - The NELAC Institute.

ANALYTE QUALIFIERS

E	Analyte concentration exceeded the calibration range. The reported result is estimated.
M1	Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
60346051001	SO-081720-NL-001	ASTM D2974	672560		
60346051002	SO-081720-NL-002	ASTM D2974	672560		
60346051003	SO-081720-NL-003	ASTM D2974	672560		
60346051004	SO-081720-NL-004	ASTM D2974	672560		
60346051005	SO-081720-NL-005	ASTM D2974	672560		
60346051006	SO-081720-NL-006	ASTM D2974	672560		
60346051007	SO-081720-NL-007	ASTM D2974	672560		
60346051008	SO-081720-NL-008	ASTM D2974	672560		
60346051009	SO-081720-NL-009	ASTM D2974	672560		
60346051010	SO-081720-NL-010	ASTM D2974	672560		
60346051011	SO-081720-NL-011	ASTM D2974	672560		
60346051012	SO-081720-NL-012	ASTM D2974	672560		
60346051013	SO-081720-NL-013	ASTM D2974	672560		
60346051014	SO-081720-NL-014	ASTM D2974	672560		
60346051015	SO-081720-NL-015	ASTM D2974	672560		
60346051016	SO-081720-NL-016	ASTM D2974	672562		
60346051017	SO-081720-NL-017	ASTM D2974	672562		
60346051018	SO-081720-NL-018	ASTM D2974	672562		
60346051019	SO-081720-NL-019	ASTM D2974	672562		
60346051020	SO-081270-NL-020	ASTM D2974	672562		
60346051021	SO-081720-NL-021	ASTM D2974	672562		
60346051022	SO-081720-NL-022	ASTM D2974	672562		
60346051023	SO-081720-NL-023	ASTM D2974	672562		
60346051024	SO-081720-NL-024	ASTM D2974	672562		
60346051025	SO-081720-NL-025	ASTM D2974	672562		
60346051026	SO-081720-NL-026	ASTM D2974	672562		
60346051027	SO-081720-NL-027	ASTM D2974	672562		
60346051028	SO-081720-NL-028	ASTM D2974	672562		
60346051029	SO-081720-NL-029	ASTM D2974	672562		
60346051030	SO-081720-NL-030	ASTM D2974	672562		
60346051031	SO-081720-NL-031	ASTM D2974	672562		
60346051032	SO-081720-NL-032	ASTM D2974	672562		
60346051033	SO-081820-NL-033	ASTM D2974	672562		
60346051034	SO-081820-NL-034	ASTM D2974	672562		
60346051035	SO-081820-NL-035	ASTM D2974	672562		
60346051036	SO-081820-NL-036	ASTM D2974	672564		
60346051037	SO-081820-NL-037	ASTM D2974	672564		
60346051038	SO-081820-NL-038	ASTM D2974	672564		
60346051039	SO-081820-NL-039	ASTM D2974	672564		
60346051040	SO-081820-NL-040	ASTM D2974	672564		
60346051041	SO-081820-NL-041	ASTM D2974	672564		
60346051042	SO-081820-NL-042	ASTM D2974	672564		
60346051043	SO-081820-NL-043	ASTM D2974	672564		
60346051044	SO-081820-NL-044	ASTM D2974	672564		
60346051045	SO-081820-NL-045	ASTM D2974	672564		
60346051046	SO-081820-NL-046	ASTM D2974	672564		
60346051047	SO-081820-NL-047	ASTM D2974	672564		
60346051048	SO-081820-NL-048	ASTM D2974	672564		

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(913)599-5665

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
60346051049	SO-081820-NL-049	ASTM D2974	672564		
60346051050	SO-081820-NL-050	ASTM D2974	672564		
60346051051	SO-081820-NL-051	ASTM D2974	672564		
60346051052	SO-081820-NL-052	ASTM D2974	672564		
60346051053	SO-081820-NL-053	ASTM D2974	672564		
60346051054	SO-081820-NL-054	ASTM D2974	672564		
60346051055	SO-081820-NL-055	ASTM D2974	672564		
60346051056	SO-081820-NL-056	ASTM D2974	672912		
60346051057	SO-081820-NL-057	ASTM D2974	672912		
60346051058	SO-081820-NL-058	ASTM D2974	672912		
60346051059	SO-081820-NL-059	ASTM D2974	672912		
60346051060	SO-081820-NL-060	ASTM D2974	672913		
60346051061	SO-081820-NL-061	ASTM D2974	672913		
60346051062	SO-081820-NL-062	ASTM D2974	672913		
60346051063	SO-081820-NL-063	ASTM D2974	672913		
60346051064	SO-081820-NL-064	ASTM D2974	672913		
60346051065	SO-081820-NL-065	ASTM D2974	672913		
60346051066	SO-081820-NL-066	ASTM D2974	672913		
60346051067	SO-081820-NL-067	ASTM D2974	672913		
60346051068	SO-081820-NL-068	ASTM D2974	672913		
60346051069	SO-081820-NL-069	ASTM D2974	672913		
60346051070	SO-081820-NL-070	ASTM D2974	672913		
60346051071	SO-081820-NL-071	ASTM D2974	672913		
60346051072	SO-081820-NL-072	ASTM D2974	672913		
60346051073	SO-081820-NL-073	ASTM D2974	672913		
60346051074	SO-081820-NL-074	ASTM D2974	672913		
60346051075	SO-081820-NL-075	ASTM D2974	672913		
60346051076	SO-081820-NL-076	ASTM D2974	672913		
60346051077	SO-081920-NL-077	ASTM D2974	672913		
60346051078	SO-081920-NL-078	ASTM D2974	672913		
60346051079	SO-081920-NL-079	ASTM D2974	672913		
60346051080	SO-081920-NL-080	ASTM D2974	672915		
60346051081	SO-081920-NL-081	ASTM D2974	672915		
60346051082	SO-081920-NL-082	ASTM D2974	672915		
60346051083	SO-081920-NL-083	ASTM D2974	672915		
60346051084	SO-081920-NL-084	ASTM D2974	672915		
60346051085	SO-081920-NL-085	ASTM D2974	672915		
60346051086	SO-081920-NL-086	ASTM D2974	672915		
60346051087	SO-081920-NL-087	ASTM D2974	672915		
60346051088	SO-081920-NL-088	ASTM D2974	672915		
60346051089	SO-081920-NL-089	ASTM D2974	672915		
60346051090	SO-081920-NL-090	ASTM D2974	672915		
60346051091	SO-081920-NL-091	ASTM D2974	672915		
60346051092	SO-081920-NL-092	ASTM D2974	672915		
60346051093	SO-081920-NL-093	ASTM D2974	672915		
60346051094	SO-081920-NL-094	ASTM D2974	672915		
60346051095	SO-081920-NL-095	ASTM D2974	672915		

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(913)599-5665

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
60346051096	SO-081920-NL-096	ASTM D2974	672915		
60346051097	SO-081920-NL-097	ASTM D2974	672915		
60346051098	SO-081920-NL-098	ASTM D2974	672915		
60346051099	SO-081920-NL-099	ASTM D2974	672915		
60346051001	SO-081720-NL-001	EPA 350.1	673180	EPA 350.1	673557
60346051002	SO-081720-NL-002	EPA 350.1	673180	EPA 350.1	673557
60346051003	SO-081720-NL-003	EPA 350.1	673180	EPA 350.1	673557
60346051004	SO-081720-NL-004	EPA 350.1	673180	EPA 350.1	673557
60346051005	SO-081720-NL-005	EPA 350.1	673180	EPA 350.1	673557
60346051006	SO-081720-NL-006	EPA 350.1	673180	EPA 350.1	673557
60346051007	SO-081720-NL-007	EPA 350.1	673180	EPA 350.1	673557
60346051008	SO-081720-NL-008	EPA 350.1	673180	EPA 350.1	673557
60346051009	SO-081720-NL-009	EPA 350.1	673182	EPA 350.1	673558
60346051010	SO-081720-NL-010	EPA 350.1	673182	EPA 350.1	673558
60346051011	SO-081720-NL-011	EPA 350.1	673182	EPA 350.1	673558
60346051012	SO-081720-NL-012	EPA 350.1	673182	EPA 350.1	673558
60346051013	SO-081720-NL-013	EPA 350.1	673182	EPA 350.1	673558
60346051014	SO-081720-NL-014	EPA 350.1	673182	EPA 350.1	673558
60346051015	SO-081720-NL-015	EPA 350.1	673182	EPA 350.1	673558
60346051016	SO-081720-NL-016	EPA 350.1	673182	EPA 350.1	673558
60346051017	SO-081720-NL-017	EPA 350.1	673182	EPA 350.1	673558
60346051018	SO-081720-NL-018	EPA 350.1	673182	EPA 350.1	673558
60346051019	SO-081720-NL-019	EPA 350.1	673182	EPA 350.1	673558
60346051020	SO-081270-NL-020	EPA 350.1	673182	EPA 350.1	673558
60346051021	SO-081720-NL-021	EPA 350.1	673182	EPA 350.1	673558
60346051022	SO-081720-NL-022	EPA 350.1	673182	EPA 350.1	673558
60346051023	SO-081720-NL-023	EPA 350.1	673182	EPA 350.1	673558
60346051024	SO-081720-NL-024	EPA 350.1	673182	EPA 350.1	673558
60346051025	SO-081720-NL-025	EPA 350.1	673182	EPA 350.1	673558
60346051026	SO-081720-NL-026	EPA 350.1	673182	EPA 350.1	673558
60346051027	SO-081720-NL-027	EPA 350.1	673182	EPA 350.1	673558
60346051028	SO-081720-NL-028	EPA 350.1	673182	EPA 350.1	673558
60346051029	SO-081720-NL-029	EPA 350.1	673326	EPA 350.1	673560
60346051030	SO-081720-NL-030	EPA 350.1	673326	EPA 350.1	673560
60346051031	SO-081720-NL-031	EPA 350.1	673326	EPA 350.1	673560
60346051032	SO-081720-NL-032	EPA 350.1	673326	EPA 350.1	673560
60346051033	SO-081820-NL-033	EPA 350.1	673326	EPA 350.1	673560
60346051034	SO-081820-NL-034	EPA 350.1	673326	EPA 350.1	673560
60346051035	SO-081820-NL-035	EPA 350.1	673326	EPA 350.1	673560
60346051036	SO-081820-NL-036	EPA 350.1	673326	EPA 350.1	673560
60346051037	SO-081820-NL-037	EPA 350.1	673326	EPA 350.1	673560
60346051038	SO-081820-NL-038	EPA 350.1	673326	EPA 350.1	673560
60346051039	SO-081820-NL-039	EPA 350.1	673326	EPA 350.1	673560
60346051040	SO-081820-NL-040	EPA 350.1	673326	EPA 350.1	673560
60346051041	SO-081820-NL-041	EPA 350.1	673326	EPA 350.1	673560
60346051042	SO-081820-NL-042	EPA 350.1	673326	EPA 350.1	673560
60346051043	SO-081820-NL-043	EPA 350.1	673326	EPA 350.1	673560

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
60346051044	SO-081820-NL-044	EPA 350.1	673326	EPA 350.1	673560
60346051045	SO-081820-NL-045	EPA 350.1	673326	EPA 350.1	673560
60346051046	SO-081820-NL-046	EPA 350.1	673326	EPA 350.1	673560
60346051047	SO-081820-NL-047	EPA 350.1	673326	EPA 350.1	673560
60346051048	SO-081820-NL-048	EPA 350.1	673326	EPA 350.1	673560
60346051049	SO-081820-NL-049	EPA 350.1	674180	EPA 350.1	674430
60346051050	SO-081820-NL-050	EPA 350.1	674180	EPA 350.1	674430
60346051051	SO-081820-NL-051	EPA 350.1	674180	EPA 350.1	674430
60346051052	SO-081820-NL-052	EPA 350.1	674180	EPA 350.1	674430
60346051053	SO-081820-NL-053	EPA 350.1	674180	EPA 350.1	674430
60346051054	SO-081820-NL-054	EPA 350.1	674180	EPA 350.1	674430
60346051055	SO-081820-NL-055	EPA 350.1	674180	EPA 350.1	674430
60346051056	SO-081820-NL-056	EPA 350.1	674180	EPA 350.1	674430
60346051057	SO-081820-NL-057	EPA 350.1	674180	EPA 350.1	674430
60346051058	SO-081820-NL-058	EPA 350.1	674180	EPA 350.1	674430
60346051059	SO-081820-NL-059	EPA 350.1	674180	EPA 350.1	674430
60346051060	SO-081820-NL-060	EPA 350.1	674180	EPA 350.1	674430
60346051061	SO-081820-NL-061	EPA 350.1	674180	EPA 350.1	674430
60346051062	SO-081820-NL-062	EPA 350.1	674180	EPA 350.1	674430
60346051063	SO-081820-NL-063	EPA 350.1	674180	EPA 350.1	674430
60346051064	SO-081820-NL-064	EPA 350.1	674180	EPA 350.1	674430
60346051065	SO-081820-NL-065	EPA 350.1	674180	EPA 350.1	674430
60346051066	SO-081820-NL-066	EPA 350.1	674180	EPA 350.1	674430
60346051067	SO-081820-NL-067	EPA 350.1	674180	EPA 350.1	674430
60346051068	SO-081820-NL-068	EPA 350.1	674180	EPA 350.1	674430
60346051069	SO-081820-NL-069	EPA 350.1	674182	EPA 350.1	674431
60346051070	SO-081820-NL-070	EPA 350.1	674182	EPA 350.1	674431
60346051071	SO-081820-NL-071	EPA 350.1	674182	EPA 350.1	674431
60346051072	SO-081820-NL-072	EPA 350.1	674182	EPA 350.1	674431
60346051073	SO-081820-NL-073	EPA 350.1	674182	EPA 350.1	674431
60346051074	SO-081820-NL-074	EPA 350.1	674182	EPA 350.1	674431
60346051075	SO-081820-NL-075	EPA 350.1	674182	EPA 350.1	674431
60346051076	SO-081820-NL-076	EPA 350.1	674182	EPA 350.1	674431
60346051077	SO-081920-NL-077	EPA 350.1	674182	EPA 350.1	674431
60346051078	SO-081920-NL-078	EPA 350.1	674182	EPA 350.1	674431
60346051079	SO-081920-NL-079	EPA 350.1	674182	EPA 350.1	674431
60346051080	SO-081920-NL-080	EPA 350.1	674182	EPA 350.1	674431
60346051081	SO-081920-NL-081	EPA 350.1	674182	EPA 350.1	674431
60346051082	SO-081920-NL-082	EPA 350.1	674182	EPA 350.1	674431
60346051083	SO-081920-NL-083	EPA 350.1	674182	EPA 350.1	674431
60346051084	SO-081920-NL-084	EPA 350.1	674182	EPA 350.1	674431
60346051085	SO-081920-NL-085	EPA 350.1	674182	EPA 350.1	674431
60346051086	SO-081920-NL-086	EPA 350.1	674182	EPA 350.1	674431
60346051087	SO-081920-NL-087	EPA 350.1	674182	EPA 350.1	674431
60346051088	SO-081920-NL-088	EPA 350.1	674182	EPA 350.1	674431
60346051089	SO-081920-NL-089	EPA 350.1	674184	EPA 350.1	674432
60346051090	SO-081920-NL-090	EPA 350.1	674184	EPA 350.1	674432

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
60346051091	SO-081920-NL-091	EPA 350.1	674184	EPA 350.1	674432
60346051092	SO-081920-NL-092	EPA 350.1	674184	EPA 350.1	674432
60346051093	SO-081920-NL-093	EPA 350.1	674184	EPA 350.1	674432
60346051094	SO-081920-NL-094	EPA 350.1	674184	EPA 350.1	674432
60346051095	SO-081920-NL-095	EPA 350.1	674184	EPA 350.1	674432
60346051096	SO-081920-NL-096	EPA 350.1	674184	EPA 350.1	674432
60346051097	SO-081920-NL-097	EPA 350.1	674184	EPA 350.1	674432
60346051098	SO-081920-NL-098	EPA 350.1	674184	EPA 350.1	674432
60346051099	SO-081920-NL-099	EPA 350.1	674184	EPA 350.1	674432
60346051100	WW-081820-NL-001	EPA 350.1	673017		
60346051101	WW-081920-NL-002	EPA 350.1	673017		
60346051001	SO-081720-NL-001	EPA 353.2	672595	EPA 353.2	673344
60346051002	SO-081720-NL-002	EPA 353.2	672595	EPA 353.2	673344
60346051003	SO-081720-NL-003	EPA 353.2	672595	EPA 353.2	673344
60346051004	SO-081720-NL-004	EPA 353.2	672595	EPA 353.2	673344
60346051005	SO-081720-NL-005	EPA 353.2	672595	EPA 353.2	673344
60346051006	SO-081720-NL-006	EPA 353.2	672595	EPA 353.2	673344
60346051007	SO-081720-NL-007	EPA 353.2	672595	EPA 353.2	673344
60346051008	SO-081720-NL-008	EPA 353.2	672595	EPA 353.2	673344
60346051009	SO-081720-NL-009	EPA 353.2	672595	EPA 353.2	673344
60346051010	SO-081720-NL-010	EPA 353.2	672595	EPA 353.2	673344
60346051011	SO-081720-NL-011	EPA 353.2	672595	EPA 353.2	673344
60346051012	SO-081720-NL-012	EPA 353.2	672595	EPA 353.2	673344
60346051013	SO-081720-NL-013	EPA 353.2	672595	EPA 353.2	673344
60346051014	SO-081720-NL-014	EPA 353.2	672595	EPA 353.2	673344
60346051015	SO-081720-NL-015	EPA 353.2	672595	EPA 353.2	673344
60346051016	SO-081720-NL-016	EPA 353.2	672595	EPA 353.2	673344
60346051017	SO-081720-NL-017	EPA 353.2	672595	EPA 353.2	673344
60346051018	SO-081720-NL-018	EPA 353.2	672595	EPA 353.2	673344
60346051019	SO-081720-NL-019	EPA 353.2	672595	EPA 353.2	673344
60346051020	SO-081270-NL-020	EPA 353.2	672595	EPA 353.2	673344
60346051021	SO-081720-NL-021	EPA 353.2	672597	EPA 353.2	673450
60346051022	SO-081720-NL-022	EPA 353.2	672597	EPA 353.2	673450
60346051023	SO-081720-NL-023	EPA 353.2	672597	EPA 353.2	673450
60346051024	SO-081720-NL-024	EPA 353.2	672597	EPA 353.2	673450
60346051025	SO-081720-NL-025	EPA 353.2	672597	EPA 353.2	673450
60346051026	SO-081720-NL-026	EPA 353.2	672597	EPA 353.2	673450
60346051027	SO-081720-NL-027	EPA 353.2	672597	EPA 353.2	673450
60346051028	SO-081720-NL-028	EPA 353.2	672597	EPA 353.2	673450
60346051029	SO-081720-NL-029	EPA 353.2	672597	EPA 353.2	673450
60346051030	SO-081720-NL-030	EPA 353.2	672597	EPA 353.2	673450
60346051031	SO-081720-NL-031	EPA 353.2	672597	EPA 353.2	673450
60346051032	SO-081720-NL-032	EPA 353.2	672597	EPA 353.2	673450
60346051033	SO-081820-NL-033	EPA 353.2	672597	EPA 353.2	673450
60346051034	SO-081820-NL-034	EPA 353.2	672597	EPA 353.2	673450
60346051035	SO-081820-NL-035	EPA 353.2	672597	EPA 353.2	673450
60346051036	SO-081820-NL-036	EPA 353.2	672597	EPA 353.2	673450

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
60346051037	SO-081820-NL-037	EPA 353.2	672597	EPA 353.2	673450
60346051038	SO-081820-NL-038	EPA 353.2	672597	EPA 353.2	673450
60346051039	SO-081820-NL-039	EPA 353.2	672597	EPA 353.2	673450
60346051040	SO-081820-NL-040	EPA 353.2	672597	EPA 353.2	673450
60346051041	SO-081820-NL-041	EPA 353.2	672598	EPA 353.2	673576
60346051042	SO-081820-NL-042	EPA 353.2	672598	EPA 353.2	673576
60346051043	SO-081820-NL-043	EPA 353.2	672598	EPA 353.2	673576
60346051044	SO-081820-NL-044	EPA 353.2	672598	EPA 353.2	673576
60346051045	SO-081820-NL-045	EPA 353.2	672598	EPA 353.2	673576
60346051046	SO-081820-NL-046	EPA 353.2	672598	EPA 353.2	673576
60346051047	SO-081820-NL-047	EPA 353.2	672598	EPA 353.2	673576
60346051048	SO-081820-NL-048	EPA 353.2	672598	EPA 353.2	673576
60346051049	SO-081820-NL-049	EPA 353.2	672598	EPA 353.2	673576
60346051050	SO-081820-NL-050	EPA 353.2	672598	EPA 353.2	673576
60346051051	SO-081820-NL-051	EPA 353.2	672598	EPA 353.2	673576
60346051052	SO-081820-NL-052	EPA 353.2	672598	EPA 353.2	673576
60346051053	SO-081820-NL-053	EPA 353.2	672598	EPA 353.2	673576
60346051054	SO-081820-NL-054	EPA 353.2	672598	EPA 353.2	673576
60346051055	SO-081820-NL-055	EPA 353.2	672598	EPA 353.2	673576
60346051056	SO-081820-NL-056	EPA 353.2	672598	EPA 353.2	673576
60346051057	SO-081820-NL-057	EPA 353.2	672598	EPA 353.2	673576
60346051058	SO-081820-NL-058	EPA 353.2	672598	EPA 353.2	673576
60346051059	SO-081820-NL-059	EPA 353.2	672598	EPA 353.2	673576
60346051060	SO-081820-NL-060	EPA 353.2	672598	EPA 353.2	673576
60346051061	SO-081820-NL-061	EPA 353.2	672599	EPA 353.2	673899
60346051062	SO-081820-NL-062	EPA 353.2	672599	EPA 353.2	673899
60346051063	SO-081820-NL-063	EPA 353.2	672599	EPA 353.2	673899
60346051064	SO-081820-NL-064	EPA 353.2	672599	EPA 353.2	673899
60346051065	SO-081820-NL-065	EPA 353.2	672599	EPA 353.2	673899
60346051066	SO-081820-NL-066	EPA 353.2	672599	EPA 353.2	673899
60346051067	SO-081820-NL-067	EPA 353.2	672599	EPA 353.2	673899
60346051068	SO-081820-NL-068	EPA 353.2	672599	EPA 353.2	673899
60346051069	SO-081820-NL-069	EPA 353.2	672599	EPA 353.2	673899
60346051070	SO-081820-NL-070	EPA 353.2	672599	EPA 353.2	673899
60346051071	SO-081820-NL-071	EPA 353.2	672599	EPA 353.2	673899
60346051072	SO-081820-NL-072	EPA 353.2	672599	EPA 353.2	673899
60346051073	SO-081820-NL-073	EPA 353.2	672599	EPA 353.2	673899
60346051074	SO-081820-NL-074	EPA 353.2	672599	EPA 353.2	673899
60346051075	SO-081820-NL-075	EPA 353.2	672599	EPA 353.2	673899
60346051076	SO-081820-NL-076	EPA 353.2	672599	EPA 353.2	673899
60346051077	SO-081920-NL-077	EPA 353.2	672599	EPA 353.2	673899
60346051078	SO-081920-NL-078	EPA 353.2	672599	EPA 353.2	673899
60346051079	SO-081920-NL-079	EPA 353.2	672599	EPA 353.2	673899
60346051080	SO-081920-NL-080	EPA 353.2	672599	EPA 353.2	673899
60346051081	SO-081920-NL-081	EPA 353.2	672603	EPA 353.2	674031
60346051082	SO-081920-NL-082	EPA 353.2	672603	EPA 353.2	674031
60346051083	SO-081920-NL-083	EPA 353.2	672603	EPA 353.2	674031

REPORT OF LABORATORY ANALYSIS

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Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: FARMLAND GROUNDWATER
Pace Project No.: 60346051

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
60346051084	**SO-081920-NL-084**	EPA 353.2	672603	EPA 353.2	674031
60346051085	**SO-081920-NL-085**	EPA 353.2	672603	EPA 353.2	674031
60346051086	**SO-081920-NL-086**	EPA 353.2	672603	EPA 353.2	674031
60346051087	**SO-081920-NL-087**	EPA 353.2	672603	EPA 353.2	674031
60346051088	**SO-081920-NL-088**	EPA 353.2	672603	EPA 353.2	674031
60346051089	**SO-081920-NL-089**	EPA 353.2	672603	EPA 353.2	674031
60346051090	**SO-081920-NL-090**	EPA 353.2	672603	EPA 353.2	674031
60346051091	**SO-081920-NL-091**	EPA 353.2	672603	EPA 353.2	674031
60346051092	**SO-081920-NL-092**	EPA 353.2	672603	EPA 353.2	674031
60346051093	**SO-081920-NL-093**	EPA 353.2	672603	EPA 353.2	674031
60346051094	**SO-081920-NL-094**	EPA 353.2	672603	EPA 353.2	674031
60346051095	**SO-081920-NL-095**	EPA 353.2	672603	EPA 353.2	674031
60346051096	**SO-081920-NL-096**	EPA 353.2	672603	EPA 353.2	674031
60346051097	**SO-081920-NL-097**	EPA 353.2	672603	EPA 353.2	674031
60346051098	**SO-081920-NL-098**	EPA 353.2	672603	EPA 353.2	674031
60346051099	**SO-081920-NL-099**	EPA 353.2	672603	EPA 353.2	674031
60346051100	**WW-081820-NL-001**	EPA 353.2	672378		
60346051101	**WW-081920-NL-002**	EPA 353.2	672378		

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Sample Condition Upon Receipt

WO# : 60346051

60346051

Client Name: GHD / City of Lawrence

Courier: FedEx ☐ UPS ☐ VIA ☐ Clay ☐ PEX ☐ ECI ☐ Pace ☐ Xroads ☐ Client ☑ Other ☐

Tracking #: _____ Pace Shipping Label Used? Yes ☐ No ☐

Custody Seal on Cooler/Box Present: Yes ☑ No ☐ Seals intact: Yes ☑ No ☐

Packing Material: Bubble Wrap ☑ Bubble Bags ☐ Foam ☐ None ☐ Other ☐

Thermometer Used: T299 **Type of Ice:** (Wet) Blue None

Cooler Temperature (°C): **As-read** 0.7, 0.3, 1.2 **Corr. Factor** +0.2 **Corrected** 0.9, 0.5, 1.4 **Date and initials of person examining contents:** 08202021 LK

Temperature should be above freezing to 6°C

Chain of Custody present:	☑Yes ☐No ☐N/A	
Chain of Custody relinquished:	☑Yes ☐No ☐N/A	
Samples arrived within holding time:	☑Yes ☐No ☐N/A	
Short Hold Time analyses (<72hr):	☑Yes ☐No ☐N/A	NDX
Rush Turn Around Time requested:	☐Yes ☑No ☐N/A	
Sufficient volume:	☑Yes ☐No ☐N/A	
Correct containers used:	☑Yes ☐No ☐N/A	
Pace containers used:	☑Yes ☐No ☐N/A	
Containers intact:	☑Yes ☐No ☐N/A	
Unpreserved 5035A / TX1005/1006 soils frozen in 48hrs?	☐Yes ☐No ☑N/A	
Filtered volume received for dissolved tests?	☐Yes ☐No ☑N/A	
Sample labels match COC: Date / time / ID / analyses	☑Yes ☑No ☐N/A	Label for -022 says sampled @ 1355
Samples contain multiple phases? Matrix: SL, WT	☐Yes ☑No ☐N/A	
Containers requiring pH preservation in compliance? (HNO3, H2SO4, HCl<2; NaOH>9 Sulfide, NaOH>10 Cyanide) (Exceptions: VOA, Micro, O&G, KS TPH, OK-DRO) LOT# 1003173	☑Yes ☐No ☐N/A	List sample IDs, volumes, lot #'s of preservative and the date/time added.
Cyanide water sample checks: Lead acetate strip turns dark? (Record only)	☐Yes ☐No	
Potassium iodide test strip turns blue/purple? (Preserve)	☐Yes ☐No	
Trip Blank present:	☐Yes ☐No ☑N/A	
Headspace in VOA vials (>6mm):	☐Yes ☐No ☑N/A	
Samples from USDA Regulated Area: State: KS	☐Yes ☑No ☐N/A	
Additional labels attached to 5035A / TX1005 vials in the field?	☐Yes ☐No ☑N/A	

Client Notification/ Resolution: Copy COC to Client? Y / N Field Data Required? Y / N

Person Contacted: _____ Date/Time: _____

Comments/ Resolution: _____

Project Manager Review: _____ Date: _____

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CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Section A Required Client Information:		Section B Required Project Information:		Section C Invoice Information:	
Company:	GHD / City of Lawrence	Report To:	Laskares, Nick / Joshua Toevs	Attention:	Jeff Scott
Address:	~~1502 SW 41st St~~ PO Box x708	Copy To:		Company Name:	City of Lawrence
	~~Topeka, KS 66609~~ Lawrence KS 66044			Address:	1400 E 19th Lawrence, KS 66044
Email:	nick.laskares@ghd.com / wq-orquality@lawrenceks.org	Purchase Order #:	FARMland Groundwater	Pace Quote:	
Phone:	(785)783-8982 Fax:	Project Name:	~~Geotech~~ Farmland Groundwater	Pace Project Manager:	hank.kapka@pacelabs.com,
Requested Due Date:		Project #:		Pace Profile #:	14184

Regulatory Agency	State / Location
	KS

ITEM #	SAMPLE ID (One Character per box. (A-Z, 0-9 / , -) Sample Ids must be unique)	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED START DATE	COLLECTED START TIME	COLLECTED END DATE	COLLECTED END TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Requested Analysis Filtered (Y/N): Analyses Test Y/N	Ammonia / NO2, NO3, %M	ammonia	NO3 / NO2	Residual Chlorine (Y/N)	605460051
1	SO-081720-NL-001	SL	GR			8/17	0950		1	X									X				
2	SO-081720-NL-002						0955		1	X									X				
3	SO-081720-NL-003						1000		1	X									X				
4	SO-081720-NL-004						1005		1	X									X				
5	SO-081720-NL-005						1010		1	X									X				
6	SO-081720-NL-006						1015		1	X									X				
7	SO-081720-NL-007						1025		1	X									X				
8	SO-081720-NL-008						1045		1	X									X				
9	SO-081720-NL-009						1047		1	X									X				
10	SO-081720-NL-010						1050		1	X									X				
11	SO-081720-NL-011						1100		1	X									X				
12	SO-081720-NL-012	SL	GR				1105		1	X									X				

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS: TEMP in C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
		8/20	1048		8/20/20	1048	0.9	Y	Y	Y
							0.5	Y		
							1.4	Y		

SAMPLER NAME AND SIGNATURE	
PRINT Name of SAMPLER:	
SIGNATURE of SAMPLER:	DATE Signed: 20 20/08/20

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CHAIN-OF-CUSTODY / Analytical Request Document

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Page : 2 Of 9

Section A – Required Client Information:		Section B – Required Project Information:		Section C – Invoice Information:	
Company:	GHD / City of Lawrence	Report To:	Laskares, Nick	Attention:	
Address:	1502 SW 41st St	Copy To:	SEE PG 1	Company Name:	
	Topeka, KS 66609			Address:	
Email:	nick.laskares@ghd.com	Purchase Order #:		Pace Quote:	
Phone:	(785)783-8982 Fax:	Project Name:	Geotech Farmland	Pace Project Manager:	hank.kapka@pacelabs.com,
Requested Due Date:		Project #:		Pace Profile #:	14184

Regulatory Agency

State / Location: KS

ITEM #	SAMPLE ID (One Character per box. (A-Z, 0-9 / , -) Sample Ids must be unique)	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED START DATE	COLLECTED START TIME	COLLECTED END DATE	COLLECTED END TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Requested Analysis Filtered (Y/N) Y/N	Analyses Test: Ammonia / NO2, NO3, %M	ammonia	NO3 / NO2	Residual Chlorine (Y/N)	60346051
1	SO-081720-NL-013	SL	G			8/17	1110		1	X									X				
2	SO-081720-NL-014						1115		1	X									X				
3	SO-081720-NL-015						1145		1	X									X				
4	SO-081720-NL-016						1145		1	X									X				
5	SO-081720-NL-017						1150		1	X									X				
6	SO-081720-NL-018						1155		1	X									X				
7	SO-081720-NL-019						1205		1	X									X				
8	SO-081720-NL-020						1210		1	X									X				
9	SO-081720-NL-021						1330		1	X									X				
10	SO-081720-NL-022						1335		1	X									X				
11	SO-081720-NL-023						1345		1	X									X				
12	SO-081720-NL-024						1350		1	X									X				

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
	[signature] / GHD	8/20	1045	MKeller / PACE	8/20/20	1048	0.9	Y	Y	Y
							0.5			
							1.4			

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: [signature]

SIGNATURE of SAMPLER: [signature] DATE Signed: 2020/08/20

TEMP in C | Received on Ice (Y/N) | Custody Sealed Cooler (Y/N) | Samples Intact (Y/N)

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CHAIN-OF-CUSTODY / Analytical Request Document

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Section A Required Client Information:	Section B Required Project Information:	Section C Invoice Information:	
Company: GHD / City of Lawrence	Report To: Laskares, Nick	Attention:	
Address: 1502 SW 41st St	Copy To:	Company Name:	
Topeka, KS 66609	see pg 1	Address:	Regulatory Agency
Email: nick.laskares@ghd.com	Purchase Order #:	Pace Quote:	
Phone: (785)783-8982 Fax:	Project Name: Geotech Farmland	Pace Project Manager: hank.kapka@pacelabs.com,	State / Location
Requested Due Date:	Project #:	Pace Profile #: 14184	KS

MATRIX CODE: Drinking Water DW; Water WT; Waste Water WW; Product P; Soil/Solid SL; Oil OL; Wipe WP; Air AR; Other OT; Tissue TS

ITEM #	SAMPLE ID (One Character per box. (A-Z, 0-9 / , -) Sample Ids must be unique)	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED START DATE	COLLECTED START TIME	COLLECTED END DATE	COLLECTED END TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Requested Analysis Filtered (Y/N)	Analyses Test	Ammonia / NO2, NO3, %M	ammonia	NO3 / NO2	Residual Chlorine (Y/N)	6034 605
1	SO-081720-NL-025	SL	G			8/17	1355		1	N									X					
2	SO-081720-NL-026						1455		1	N									X					
3	SO-081720-NL-027						1500		1	N									X					
4	SO-081720-NL-028						1520		1	N									X					
5	SO-081720-NL-029						1525		1	N									X					
6	SO-081720-NL-030						1530		1	N									X					
7	SO-081720-NL-031						1535		1	N									X					
8	SO-081720-NL-032						1540		1	N									X					
9	SO-081820-NL-033					8/18	0830		1	N									X					
10	SO-081820-NL-034						0835		1	N									X					
11	SO-081820-NL-035						0840		1	N									X					
12	SO-081820-NL-036	SL	G				0845		1	N									X					

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS: TEMP in C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
		8/20	1045	MKellev/PACE	8/20/20	1048	0.9	Y	Y	Y
							0.5			
							1.4	-	-	-

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER:

SIGNATURE of SAMPLER: DATE Signed: 2020/08/20

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CHAIN-OF-CUSTODY / Analytical Request Document

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Section A Required Client Information:		Section B Required Project Information:		Section C Invoice Information:	
Company:	GHD / City of Lawrence	Report To:	Laskares, Nick	Attention:	
Address:	1502 SW 41st St	Copy To:		Company Name:	
	Topeka, KS 66609	Purchase Order #:		Address:	
Email:	nick.laskares@ghd.com	Project Name:	Geotech-Farmland	Pace Quote:	
Phone:	(785)783-8982 Fax:	Project #:		Pace Project Manager:	hank.kapka@pacelabs.com,
Requested Due Date:				Pace Profile #:	14184

Regulatory Agency	
State / Location	KS

ITEM #	SAMPLE ID (One Character per box. (A-Z, 0-9 / , -) Sample Ids must be unique)	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED START DATE	COLLECTED START TIME	COLLECTED END DATE	COLLECTED END TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Requested Analysis Filtered (Y/N) Y/N	Analyses Test: Ammonia / NO2, NO3, %M	ammonia	NO3 / NO2	Residual Chlorine (Y/N)	6034 6051
1	SO-081820-NL-037	SO	G			8/18	0850		1	X									X				
2	SO-081820-NL-038						0900		1	X									X				
3	SO-081820-NL-039						0905		1	X									X				
4	SO-081820-NL-040						0915		1	X									X				
5	SO-081820-NL-041						0920		1	X									X				
6	SO-081820-NL-042						0925		1	X									X				
7	SO-081820-NL-043						0935		1	X									X				
8	SO-081820-NL-044						0945		1	X									X				
9	SO-081820-NL-045						1010		1	X									X				
10	SO-081820-NL-046						1015		1	X									X				
11	SO-081820-NL-047						1020		1	X									X				
12	SO-081820-NL-048						1025		1	X									X				

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS
		8/20	1045	MKeller/PACE	8/20/20	1048	0.7
							0.5
							1.4

SAMPLER NAME AND SIGNATURE					
PRINT Name of SAMPLER:		DATE Signed:	2020/08/20		
SIGNATURE of SAMPLER:					

TEMP in C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
	Y	Y	Y
	1	1	1
	1	1	1

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CHAIN-OF-CUSTODY / Analytical Request Document

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Company:	GHD / City of Lawrence	Report To:	Laskares, Nick	Attention:	
Address:	1502 SW 41st St	Copy To:	see pg 1	Company Name:	
Topeka, KS 66609				Address:	
Email:	nick.laskares@ghd.com	Purchase Order #:		Pace Quote:	
Phone:	(785)783-8982 Fax	Project Name:	Geotech Farmland	Pace Project Manager:	hank.kapka@pacelabs.com,
Requested Due Date:		Project #:		Pace Profile #:	14184

Regulatory Agency	
State / Location	KS

ITEM #	SAMPLE ID (One Character per box. (A-Z, 0-9 / , -) Sample Ids must be unique)	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED START DATE	COLLECTED START TIME	COLLECTED END DATE	COLLECTED END TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Requested Analysis Filtered (Y/N) Y/N	Analyses Test: Ammonia / NO2, NO3, %M	ammonia	NO3 / NO2	Residual Chlorine (Y/N)	60346051
1	SO-081820-NL-049	S	G			8/18	1030		1	X									X				
2	SO-081820-NL-050						1040		1	X									X				
3	SO-081820-NL-051						1050		1	X									X				
4	SO-081820-NL-052						11:10		1	X									X				
5	SO-081820-NL-053						11:15		1	X									X				
6	SO-081820-NL-054						11:20		1	X									X				
7	SO-081820-NL-055						11:25		1	X									X				
8	SO-081820-NL-056						1130		1	X									X				
9	SO-081820-NL-057						11:35		1	X									X				
10	SO-081820-NL-058						11:45		1	X									X				
11	SO-081820-NL-059						1245		1	X									X				
12	SO-081820-NL-060						1250		1	X									X				

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
	[signature] GHD	8/20	1045	Miller/Pace	8/20/20	1048	0.9	Y	Y	Y
							0.5	1	1	1
							1.4			

SAMPLER NAME AND SIGNATURE			TEMP in C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
PRINT Name of SAMPLER:						
SIGNATURE of SAMPLER:	[signature]	DATE Signed: 2020/08/20				

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CHAIN-OF-CUSTODY / Analytical Request Document

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Page : 6 Of 9

Section A Required Client Information:		Section B Required Project Information:		Section C Invoice Information:	
Company:	GHD / City of Lawrence	Report To:	Laskares, Nick	Attention:	
Address:	1502 SW 41st St	Copy To:		Company Name:	
Topeka, KS 66609		Purchase Order #:		Address:	
Email:	nick.laskares@ghd.com	Project Name:	Geotech Farmland	Pace Quote:	
Phone:	(785)783-8982 Fax:	Project #:		Pace Project Manager:	hank.kapka@pacelabs.com,
Requested Due Date:				Pace Profile #:	14184

Regulatory Agency	
State / Location	KS

ITEM #	SAMPLE ID (One Character per box. (A-Z, 0-9 / , -) Sample Ids must be unique)	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED START DATE	COLLECTED START TIME	COLLECTED END DATE	COLLECTED END TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Analyses Test Y/N	Ammonia / NO2, NO3, %M	ammonia	NO3 / NO2	Residual Chlorine (Y/N)	6034 6051
1	SO-081820-NL-061	SL	G			8/18	1255		1	X									Y					
2	SO-081820-NL-062						1300		1	X									X					
3	SO-081820-NL-063						1305		1	X									X					
4	SO-081820-NL-064						1310		1	X									X					
5	SO-081820-NL-065						1325		1	X									X					
6	SO-081820-NL-066						1330		1	X									X					
7	SO-081820-NL-067						1335		1	X									X					
8	SO-081820-NL-068						1340		1	X									X					
9	SO-081820-NL-069						1345		1	X									X					
10	SO-081820-NL-070						1350		1	X									X					
11	SO-081820-NL-071						1410		1	X									X					
12	SO-081820-NL-072						1415		1	X									X					

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS: TEMP in C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
		8/20	1048	MV Keller/Pace	8/20/20	1048	0.9	Y	Y	Y
							0.5			
							1.4			

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER:

SIGNATURE of SAMPLER: DATE Signed: 2020/08/20

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CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Section A Required Client Information:		Section B Required Project Information:		Section C Invoice Information:	
Company:	GHD / City of Lawrence	Report To:	Laskares, Nick	Attention:	
Address:	1502 SW 41st St	Copy To:		Company Name:	
	Topeka, KS 66609			Address:	
Email:	nick.laskares@ghd.com	Purchase Order #:		Pace Quote:	
Phone:	(785)783-8982 Fax:	Project Name:	Geotech Farmland	Pace Project Manager:	hank.kapka@pacelabs.com
Requested Due Date:		Project #:		Pace Profile #:	14184

Regulatory Agency

State / Location: KS

ITEM #	SAMPLE ID (One Character per box. (A-Z, 0-9 / , -) Sample Ids must be unique)	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED START DATE	COLLECTED START TIME	COLLECTED END DATE	COLLECTED END TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Analyses Test Y/N	Ammonia / NO2, NO3, %M	ammonia	NO3 / NO2	Residual Chlorine (Y/N)	60346051
1	SO-081820-NL-073	S	G			8/18	1425		1	X									X				
2	SO-081820-NL-074						1440		1	X									X				
3	SO-081820-NL-075						1500		1	X									X				
4	SO-081820-NL-076						1510		1	X									X				
5	SO-081920-NL-077					8/19	0930		1	X									X				
6	SO-081920-NL-078						0932		1	X									X				
7	SO-081920-NL-079						0935		1	X									X				
8	SO-081920-NL-080						0940		1	X									X				
9	SO-081920-NL-081						0945		1	X									X				
10	SO-081920-NL-082						0947		1	X									X				
11	SO-081920-NL-083						0950		1	X									X				
12	SO-081920-NL-084						0955		1	X									X				

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
	[signature] GHD	8/20	1045	[signature] Pace	8/20/20	1048	0.9	Y	Y	Y
							0.5			
							1.4			

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER:

SIGNATURE of SAMPLER: [signature] DATE Signed: 2020/08/20

TEMP in C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page : 8 Of 9

Section A Required Client Information:		Section B Required Project Information:		Section C Invoice Information:	
Company:	GHD / City of Lawrence	Report To:	Laskares, Nick	Attention:	
Address:	~~1502 SW 41st St~~	Copy To:	~~see~~	Company Name:	
	Topeka, KS 66609			Address:	
Email:	nick.laskares@ghd.com	Purchase Order #:		Pace Quote:	
Phone:	(785)783-8982 Fax:	Project Name:	Geotech Farmland	~~Pace Project Manager:~~	hank.kapka@pacelabs.com,
Requested Due Date:		Project #:		Pace Profile #:	14184

Regulatory Agency
State / Location
KS

ITEM #	SAMPLE ID One Character per box. (A-Z, 0-9 / , -) Sample Ids must be unique	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED START DATE	COLLECTED START TIME	COLLECTED END DATE	COLLECTED END TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Analyses Test Y/N	Ammonia / NO2, NO3, %M	ammonia	NO3 / NO2	Residual Chlorine (Y/N)	6034 6051
1	SO-081920-NL-085	W	G		1000	8/19			1	X								X					
2	SO-081920-NL-086				1005				1	X								X					
3	SO-081920-NL-087				1010				1	X								X					
4	SO-081920-NL-088				1015				1	X								X					
5	SO-081920-NL-089				1030				1	X								X					
6	SO-081920-NL-090				1035				1	X								X					
7	SO-081920-NL-091				1040				1	X								X					
8	SO-081920-NL-092				1045				1	X								X					
9	SO-081920-NL-093				1050				1	X								X					
10	SO-081920-NL-094				1055				1	X								X					
11	SO-081920-NL-095				1100				1	X								X					
12	SO-081920-NL-096	↓	↓		1105	↓			1	X								X					

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
	[signature]	8/20	1045	MKeller/PACE	8/20/20	1048

SAMPLE CONDITIONS				
TEMP in C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
0.9	Y	Y	Y
0.5			
1.4			

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: [signature]

SIGNATURE of SAMPLER: [signature] DATE Signed: 2020/08/20

CHAIN OF CUSTODY RECORD

CONESTOGA-ROVERS & ASSOCIATES

Address: _____

Phone: _____ Fax: _____

COC NO.: 45741

PAGE 9 OF 9

(See Reverse Side for Instructions)

60346051

Project No/ Phase/Task Code:	Laboratory Name:	Lab Location:	SSOW ID:
Project Name:	Lab Contact:	Lab Quote No:	Cooler No:
Project Location:			Carrier:
Chemistry Contact:			Airbill No:
Sampler(s):			Date Shipped:

Item	Sample Identification (Containers for each sample may be combined on one line)	Date (mm/dd/yy)	Time (hh:mm)	Sample Type: Matrix Code (see back of COC)	Sample Type: Grab (G) or Comp (C)	Container Quantity & Preservation: Unpreserved	Hydrochloric Acid (HCl)	Nitric Acid (HNO_3)	Sulfuric Acid (H_2SO_4)	Sodium Hydroxide (NaOH)	Methanol/Water (Soil VOC)	EnCores 3x5-g, 1x25-g	Other:	Total Containers/Sample	Analysis Requested: NH_4^+/NO_2/NO_3/ortho N	Analysis Requested: NH_4^+	Analysis Requested: NO_3/NO_2 as N	MS/MSD Request	Comments/ Special Instructions:
1	SD-081920-NL-097	8/19	1115	SL	G	X									X				
2	SD-081920-NL-098	"	1120	"	"	X									X				
3	SD-081920-NL-099	"	1135	"	"	X									X				
4	MW-081820-NL-001	8/18	16:45	NW	G	X			X							X	X		SHORT HOLD
5	MW-081920-NL-002	8/19	12:15	"	"	X			X							X	X		
6	MW-081920-NL-003	8/19	12:35	"	"	X			X							X	X		
7																			
8																			
9																			
10																			
11																			
12																			
13																			
14																			
15																			

NO

TAT Required in business days (use separate COCs for different TATs):

☐ 1 Day ☐ 2 Days ☐ 3 Days ☐ 1 Week ☐ 2 Week ☐ Other:

Total Number of Containers:

All Samples in Cooler must be on COC

Notes/ Special Requirements:

Relinquished By	Company	Date	Time	Received By	Company	Date	Time
1.				1.	GHD	8/20/20	1048
2.				2.	Pace	8/20/20	1048
3.				3.			0.9, 0.5, 1.4

THE CHAIN OF CUSTODY IS A LEGAL DOCUMENT – ALL FIELDS MUST BE COMPLETED ACCURATELY

Distribution: WHITE – Fully Executed Copy (CRA) YELLOW – Receiving Laboratory Copy PINK – Shipper GOLDENROD – Sampling Crew

CRA Form: COC-10B (20110804)

Appendix C
Laboratory Analytical Results and Chain-of-Custody (Investigation-Derived Waste)

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

August 31, 2020

Jeff Scott
City of Lawrence
6 E. 6th St
PO Box 708
Lawrence, KS 66044

RE: Project: Farmland GW WW-081920-NL-003
Pace Project No.: 60346985

Dear Jeff Scott:

Enclosed are the analytical results for sample(s) received by the laboratory on August 20, 2020. The results relate only to the samples included in this report. Results reported herein conform to the applicable TNI/NELAC Standards and the laboratory's Quality Manual, where applicable, unless otherwise noted in the body of the report.

The test results provided in this final report were generated by each of the following laboratories within the Pace Network:

- Pace Analytical Services - Kansas City

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Hank Kapka
hank.kapka@pacelabs.com
(913)599-5665
PM Lab Management

Enclosures

cc: Nick Laskaras, GHD Services, Inc.
Water Quality

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Lenexa, KS 66219
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CERTIFICATIONS

Project: Farmland GW WW-081920-NL-003
Pace Project No.: 60346985

Pace Analytical Services Kansas
9608 Loiret Boulevard, Lenexa, KS 66219
Missouri Inorganic Drinking Water Certification #: 10090
Arkansas Drinking Water
Arkansas Certification #: 20-020-0
Arkansas Drinking Water
Illinois Certification #: 200030
Iowa Certification #: 118
Kansas/NELAP Certification #: E-10116
Louisiana Certification #: 03055
Nevada Certification #: KS000212020-2
Oklahoma Certification #: 9205/9935
Florida: Cert E871149 SEKS WET
Texas Certification #: T104704407-19-12
Utah Certification #: KS000212019-9
Illinois Certification #: 004592
Kansas Field Laboratory Accreditation: # E-92587
Missouri SEKS Micro Certification: 10070

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SAMPLE SUMMARY

Project: Farmland GW WW-081920-NL-003
Pace Project No.: 60346985

Lab ID	Sample ID	Matrix	Date Collected	Date Received
60346051102	**WW-081920-NL-003**	Water	08/19/20 12:35	08/20/20 10:48

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SAMPLE ANALYTE COUNT

Project: Farmland GW WW-081920-NL-003
Pace Project No.: 60346985

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
60346051102	**WW-081920-NL-003**	EPA 350.1	LDB	1	PASI-K
		EPA 353.2	AJS2	3	PASI-K

PASI-K = Pace Analytical Services - Kansas City

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ANALYTICAL RESULTS

Project: Farmland GW WW-081920-NL-003
Pace Project No.: 60346985

Sample: WW-081920-NL-003 **Lab ID: 60346051102** Collected: 08/19/20 12:35 Received: 08/20/20 10:48 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
350.1 Ammonia	Analytical Method: EPA 350.1 Pace Analytical Services - Kansas City							
Nitrogen, Ammonia	**70.5**	mg/L	0.50	5		08/25/20 12:40	7664-41-7	
353.2 Nitrogen, NO2/NO3 unpres	Analytical Method: EPA 353.2 Pace Analytical Services - Kansas City							
Nitrogen, NO2 plus NO3	**31.0**	mg/L	1.0	10		08/20/20 14:04		
Nitrogen, Nitrate	**28.9**	mg/L	1.0	10		08/20/20 14:04	14797-55-8	
Nitrogen, Nitrite	**2.1**	mg/L	1.0	10		08/20/20 14:04	14797-65-0	

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: Farmland GW WW-081920-NL-003
Pace Project No.: 60346985

QC Batch: 673017
QC Batch Method: EPA 350.1
Analysis Method: EPA 350.1
Analysis Description: 350.1 Ammonia
Laboratory: Pace Analytical Services - Kansas City

Associated Lab Samples: 60346051102

METHOD BLANK: 2722825 Matrix: Water
Associated Lab Samples: 60346051102

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, Ammonia	mg/L	ND	0.10	08/25/20 09:06	

LABORATORY CONTROL SAMPLE: 2722826

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/L	5	5.2	103	90-110	

MATRIX SPIKE SAMPLE: 2722827

Parameter	Units	60346036003 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/L	182	50	219	75	90-110	E,M1

MATRIX SPIKE SAMPLE: 2722829

Parameter	Units	60346148001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/L	138	75	204	88	90-110	M1

SAMPLE DUPLICATE: 2722828

Parameter	Units	60346067001 Result	Dup Result	RPD	Max RPD	Qualifiers
Nitrogen, Ammonia	mg/L	11.8	12.0	1	18	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: Farmland GW WW-081920-NL-003
Pace Project No.: 60346985

QC Batch: 672378
QC Batch Method: EPA 353.2
Analysis Method: EPA 353.2
Analysis Description: 353.2 Nitrate + Nitrite, Unpres.
Laboratory: Pace Analytical Services - Kansas City
Associated Lab Samples: 60346051102

METHOD BLANK: 2720296 Matrix: Water
Associated Lab Samples: 60346051102

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, Nitrate	mg/L	ND	0.10	08/20/20 13:32	
Nitrogen, Nitrite	mg/L	ND	0.10	08/20/20 13:32	
Nitrogen, NO2 plus NO3	mg/L	ND	0.10	08/20/20 13:32	

LABORATORY CONTROL SAMPLE: 2720297

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Nitrate	mg/L	1	0.95	95	70-130	
Nitrogen, Nitrite	mg/L	1	1.1	110	90-110	
Nitrogen, NO2 plus NO3	mg/L	2	2.0	102	90-110	

MATRIX SPIKE SAMPLE: 2720298

Parameter	Units	60346048001 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Nitrogen, Nitrate	mg/L	ND	1	0.77	77	70-130	
Nitrogen, Nitrite	mg/L	ND	1	0.95	95	90-110	
Nitrogen, NO2 plus NO3	mg/L	ND	2	1.7	83	90-110	M1

SAMPLE DUPLICATE: 2720299

Parameter	Units	60346048001 Result	Dup Result	RPD	Max RPD	Qualifiers
Nitrogen, Nitrate	mg/L	ND	ND		20	
Nitrogen, Nitrite	mg/L	ND	ND		20	
Nitrogen, NO2 plus NO3	mg/L	ND	ND		20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

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Lenexa, KS 66219
(913)599-5665

QUALIFIERS

Project: Farmland GW WW-081920-NL-003
Pace Project No.: 60346985

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

WORKORDER QUALIFIERS

WO: 60346985

[1] Samples recieved on COC with additional samples reported on WO 60346051

ANALYTE QUALIFIERS

E Analyte concentration exceeded the calibration range. The reported result is estimated.

M1 Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

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Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: Farmland GW WW-081920-NL-003
Pace Project No.: 60346985

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
60346051102	**WW-081920-NL-003**	EPA 350.1	673017		
60346051102	**WW-081920-NL-003**	EPA 353.2	672378		

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Sample Condition Upon Receipt

WO# : 60346051

60346051

Client Name: GHD / City of Lawrence

Courier: FedEx ☐ UPS ☐ VIA ☐ Clay ☐ PEX ☐ ECI ☐ Pace ☐ Xroads ☐ Client ☑ Other ☐

Tracking #: _____ Pace Shipping Label Used? Yes ☐ No ☐

Custody Seal on Cooler/Box Present: Yes ☑ No ☐ Seals intact: Yes ☑ No ☐

Packing Material: Bubble Wrap ☑ Bubble Bags ☐ Foam ☐ None ☐ Other ☐

Thermometer Used: T299 **Type of Ice:** (Wet) Blue None

Cooler Temperature (°C): **As-read** 0.7, 0.3, 1.2 **Corr. Factor** +0.2 **Corrected** 0.9, 0.5, 1.4 **Date and initials of person examining contents:** 08202021 LK

Temperature should be above freezing to 6°C

Chain of Custody present:	☑Yes ☐No ☐N/A	
Chain of Custody relinquished:	☑Yes ☐No ☐N/A	
Samples arrived within holding time:	☑Yes ☐No ☐N/A	
Short Hold Time analyses (<72hr):	☑Yes ☐No ☐N/A	NDX
Rush Turn Around Time requested:	☐Yes ☑No ☐N/A	
Sufficient volume:	☑Yes ☐No ☐N/A	
Correct containers used:	☑Yes ☐No ☐N/A	
Pace containers used:	☑Yes ☐No ☐N/A	
Containers intact:	☑Yes ☐No ☐N/A	
Unpreserved 5035A / TX1005/1006 soils frozen in 48hrs?	☐Yes ☐No ☑N/A	
Filtered volume received for dissolved tests?	☐Yes ☐No ☑N/A	
Sample labels match COC: Date / time / ID / analyses	☑Yes ☑No ☐N/A	Label for -022 says sampled @ 1355
Samples contain multiple phases? Matrix: SL, WT	☐Yes ☑No ☐N/A	
Containers requiring pH preservation in compliance? (HNO3, H2SO4, HCl<2; NaOH>9 Sulfide, NaOH>10 Cyanide) (Exceptions: VOA, Micro, O&G, KS TPH, OK-DRO) LOT# 003173	☑Yes ☐No ☐N/A	List sample IDs, volumes, lot #'s of preservative and the date/time added.
Cyanide water sample checks: Lead acetate strip turns dark? (Record only)	☐Yes ☐No	
Potassium iodide test strip turns blue/purple? (Preserve)	☐Yes ☐No	
Trip Blank present:	☐Yes ☐No ☑N/A	
Headspace in VOA vials (>6mm):	☐Yes ☐No ☑N/A	
Samples from USDA Regulated Area: State: KS	☐Yes ☑No ☐N/A	
Additional labels attached to 5035A / TX1005 vials in the field?	☐Yes ☐No ☑N/A	

Client Notification/ Resolution: Copy COC to Client? Y / N Field Data Required? Y / N

Person Contacted: _____ Date/Time: _____

Comments/ Resolution: _____

Project Manager Review: _____ Date: _____

Pace Analytical
WWW.PACELABS.COM

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Section A Required Client Information:		Section B Required Project Information:		Section C Invoice Information:	
Company:	GHD / City of Lawrence	Report To:	Laskares, Nick / Joshua Toevs	Attention:	Jeff Scott
Address:	~~1502 SW 41st St~~ PO Box x708	Copy To:		Company Name:	City of Lawrence
	~~Topeka, KS 66609~~ LAWRENCE KS 66044			Address:	1400 E 19th Lawrence, KS 66044
Email:	nick.laskares@ghd.com / wq-orquality@lawrenceks.org	Purchase Order #:	FARMland Groundwater	Pace Quote:	
Phone:	(785)783-8982 Fax:	Project Name:	~~Geotech~~ Farmland Groundwater	Pace Project Manager:	hank.kapka@pacelabs.com,
Requested Due Date:		Project #:		Pace Profile #:	14184

Regulatory Agency	State / Location
	KS

ITEM #	SAMPLE ID (One Character per box. (A-Z, 0-9 / , -) Sample Ids must be unique)	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED START DATE	COLLECTED START TIME	COLLECTED END DATE	COLLECTED END TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Requested Analysis Filtered (Y/N): Y/N	Analyses Test: Ammonia / NO2, NO3, %M	ammonia	NO3 / NO2	Residual Chlorine (Y/N)	605460051
1	SO-081720-NL-001	SL	GR			8/17	0950		1	X									X				
2	SO-081720-NL-002						0955		1	X									X				
3	SO-081720-NL-003						1000		1	X									X				
4	SO-081720-NL-004						1005		1	X									X				
5	SO-081720-NL-005						1010		1	X									X				
6	SO-081720-NL-006						1015		1	X									X				
7	SO-081720-NL-007						1025		1	X									X				
8	SO-081720-NL-008						1045		1	X									X				
9	SO-081720-NL-009						1047		1	X									X				
10	SO-081720-NL-010						1050		1	X									X				
11	SO-081720-NL-011						1100		1	X									X				
12	SO-081720-NL-012	SL	GR			8/17	1105		1	X									X				

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS: TEMP in C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
		8/20	1048	FEDEX/Pace	8/20/20	1048	0.9	Y	Y	Y
							0.5	Y		
							1.4			

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER:

SIGNATURE of SAMPLER: DATE Signed: 20 20/08/20

Pace Analytical
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CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Section A Required Client Information:		Section B Required Project Information:		Section C Invoice Information:	
Company:	GHD / City of Lawrence	Report To:	Laskares, Nick	Attention:	
Address:	1502 SW 41st St	Copy To:	SEE PG 1	Company Name:	
	Topeka, KS 66609			Address:	
Email:	nick.laskares@ghd.com	Purchase Order #:		Pace Quote:	
Phone:	(785)783-8982 Fax:	Project Name:	Geotech Farmland	Pace Project Manager:	hank.kapka@pacelabs.com,
Requested Due Date:		Project #:		Pace Profile #:	14184

Regulatory Agency	
State / Location	KS

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID One Character per box. (A-Z, 0-9 / , -) Sample Ids must be unique	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED START DATE	COLLECTED START TIME	COLLECTED END DATE	COLLECTED END TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Analyses Test Y/N	Ammonia / NO2, NO3, %M	ammonia	NO3 / NO2	Residual Chlorine (Y/N)	60346051
1	SO-081720-NL-013	W	G			8/17	1110		1	X									X				
2	SO-081720-NL-014						1115		1	X									X				
3	SO-081720-NL-015						1145		1	X									X				
4	SO-081720-NL-016						1145		1	X									X				
5	SO-081720-NL-017						1150		1	X									X				
6	SO-081720-NL-018						1155		1	X									X				
7	SO-081720-NL-019						1205		1	X									X				
8	SO-081720-NL-020						1210		1	X									X				
9	SO-081720-NL-021						1330		1	X									X				
10	SO-081720-NL-022						1335		1	X									X				
11	SO-081720-NL-023						1345		1	X									X				
12	SO-081720-NL-024						1350		1	X									X				

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
	[signature] / GHD	8/20	1045	MKeller / PACE	8/20/20	1048	0.9	Y	Y	Y
							0.5			
							1.4			

SAMPLER NAME AND SIGNATURE		TEMP in C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
PRINT Name of SAMPLER:	[signature]				
SIGNATURE of SAMPLER:	DATE Signed: 2020/08/20				

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CHAIN-OF-CUSTODY / Analytical Request Document

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Company:	GHD / City of Lawrence	Report To:	Laskares, Nick	Attention:	
Address:	1502 SW 41st St	Copy To:		Company Name:	
	Topeka, KS 66609		see pg 1	Address:	
Email:	nick.laskares@ghd.com	Purchase Order #:		Pace Quote:	
Phone:	(785)783-8982 Fax:	Project Name:	Geotech Farmland	Pace Project Manager:	hank.kapka@pacelabs.com,
Requested Due Date:		Project #:		Pace Profile #:	14184

Regulatory Agency	
State / Location	
KS	

ITEM #	SAMPLE ID One Character per box. (A-Z, 0-9 / , -) Sample Ids must be unique	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED START DATE	COLLECTED START TIME	COLLECTED END DATE	COLLECTED END TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Analyses Test Y/N	Requested Analysis Filtered (Y/N): Ammonia / NO2, NO3, %M	ammonia	NO3 / NO2	Residual Chlorine (Y/N)	6034 605
1	SO-081720-NL-025	SL	G			8/17	1355		1	X								Y	X				
2	SO-081720-NL-026						1455		1	X									X				
3	SO-081720-NL-027						1500		1	X									X				
4	SO-081720-NL-028						1520		1	X									X				
5	SO-081720-NL-029						1525		1	X									X				
6	SO-081720-NL-030						1530		1	X									X				
7	SO-081720-NL-031						1535		1	X									X				
8	SO-081720-NL-032						1540		1	X									X				
9	SO-081820-NL-033					8/18	0830		1	X									X				
10	SO-081820-NL-034						0835		1	X									X				
11	SO-081820-NL-035						0840		1	X									X				
12	SO-081820-NL-036						0845		1	X									X				

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
		8/20	1045	MKeller/PACE	8/20/20	1048	0.9	Y	Y	Y
							0.5			
							1.4			

SAMPLER NAME AND SIGNATURE					
PRINT Name of SAMPLER:					
SIGNATURE of SAMPLER:		DATE Signed: 2020/08/20	TEMP in C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

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CHAIN-OF-CUSTODY / Analytical Request Document

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Section A Required Client Information:		Section B Required Project Information:		Section C Invoice Information:	
Company:	GHD / City of Lawrence	Report To:	Laskares, Nick	Attention:	
Address:	1502 SW 41st St	Copy To:		Company Name:	
	Topeka, KS 66609	Purchase Order #:		Address:	
Email:	nick.laskares@ghd.com	Project Name:	Geotech-Farmland	Pace Quote:	
Phone:	(785)783-8982 Fax:	Project #:		Pace Project Manager:	hank.kapka@pacelabs.com,
Requested Due Date:				Pace Profile #:	14184

Regulatory Agency	
State / Location	KS

ITEM #	SAMPLE ID (One Character per box. (A-Z, 0-9 / , -) Sample Ids must be unique)	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED START DATE	COLLECTED START TIME	COLLECTED END DATE	COLLECTED END TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Analyses Test Y/N	Ammonia / NO2, NO3, %M	ammonia	NO3 / NO2	Residual Chlorine (Y/N)	6034 6051
1	SO-081820-NL-037	SO	G			8/18	0820		1	X									X					
2	SO-081820-NL-038						0900		1	X									X					
3	SO-081820-NL-039						0905		1	X									X					
4	SO-081820-NL-040						0915		1	X									X					
5	SO-081820-NL-041						0920		1	X									X					
6	SO-081820-NL-042						0925		1	X									X					
7	SO-081820-NL-043						0935		1	X									X					
8	SO-081820-NL-044						0945		1	X									X					
9	SO-081820-NL-045						1010		1	X									X					
10	SO-081820-NL-046						1015		1	X									X					
11	SO-081820-NL-047						1020		1	X									X					
12	SO-081820-NL-048						1025		1	X									X					

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS				
		8/20	1045	MKeller/PACE	8/20/20	1048	0.7	Y	Y	Y	
							0.5	1	1	1	
							1.4	—	—	—	

SAMPLER NAME AND SIGNATURE		TEMP in C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
PRINT Name of SAMPLER:					
SIGNATURE of SAMPLER:	DATE Signed: 2020/08/20				

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CHAIN-OF-CUSTODY / Analytical Request Document

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Section A Required Client Information:		Section B Required Project Information:		Section C Invoice Information:	
Company:	GHD / City of Lawrence	Report To:	Laskares, Nick	Attention:	
Address:	1502 SW 41st St	Copy To:	see pg 1	Company Name:	
Topeka, KS 66609				Address:	
Email:	nick.laskares@ghd.com	Purchase Order #:		Pace Quote:	
Phone:	(785)783-8982 Fax	Project Name:	Geotech Farmland	Pace Project Manager:	hank.kapka@pacelabs.com,
Requested Due Date:		Project #:		Pace Profile #:	14184

Regulatory Agency	
State / Location	KS

ITEM #	SAMPLE ID (One Character per box. (A-Z, 0-9 / , -) Sample Ids must be unique)	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED START DATE	COLLECTED START TIME	COLLECTED END DATE	COLLECTED END TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Requested Analysis Filtered (Y/N) Y/N	Analyses Test: Ammonia / NO2, NO3, %M	ammonia	NO3 / NO2	Residual Chlorine (Y/N)	60346051
1	SO-081820-NL-049	S	G			8/18	1030		1	X									X				
2	SO-081820-NL-050						1040		1	X									X				
3	SO-081820-NL-051						1050		1	X									X				
4	SO-081820-NL-052						11:10		1	X									X				
5	SO-081820-NL-053						11:15		1	X									X				
6	SO-081820-NL-054						11:20		1	X									X				
7	SO-081820-NL-055						11:25		1	X									X				
8	SO-081820-NL-056						1130		1	X									X				
9	SO-081820-NL-057						11:35		1	X									X				
10	SO-081820-NL-058						11:45		1	X									X				
11	SO-081820-NL-059						1245		1	X									X				
12	SO-081820-NL-060						1250		1	X									X				

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
	[signature] / GHD	8/20	1045	Miller / Pace	8/20/20	1048	0.9	Y	Y	Y
							0.5	1	1	1
							1.4			

SAMPLER NAME AND SIGNATURE			TEMP in C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
PRINT Name of SAMPLER:						
SIGNATURE of SAMPLER:	[signature]	DATE Signed: 2020/08/20				

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CHAIN-OF-CUSTODY / Analytical Request Document

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Page : 6 Of 9

Section A Required Client Information:		Section B Required Project Information:		Section C Invoice Information:	
Company:	GHD / City of Lawrence	Report To:	Laskares, Nick	Attention:	
Address:	1502 SW 41st St	Copy To:		Company Name:	
	Topeka, KS 66609	Purchase Order #:		Address:	
Email:	nick.laskares@ghd.com	Project Name:	Geotech Farmland	Pace Quote:	
Phone:	(785)783-8982 Fax:	Project #:		Pace Project Manager:	hank.kapka@pacelabs.com,
Requested Due Date:				Pace Profile #:	14184

Regulatory Agency	
State / Location	KS

MATRIX	CODE
Drinking Water	DW
Water	WT
Waste Water	WW
Product	P
Soil/Solid	SL
Oil	OL
Wipe	WP
Air	AR
Other	OT
Tissue	TS

ITEM #	SAMPLE ID (One Character per box. (A-Z, 0-9 / , -) Sample Ids must be unique)	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED START DATE	COLLECTED START TIME	COLLECTED END DATE	COLLECTED END TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Requested Analysis Filtered (Y/N) Y/N	Analyses Test: Ammonia / NO2, NO3, %M	ammonia	NO3 / NO2	Residual Chlorine (Y/N)	6034 6051
1	SO-081820-NL-061	SL	G			8/18	1255		1	X									Y				
2	SO-081820-NL-062						1300		1	X									X				
3	SO-081820-NL-063						1305		1	X									X				
4	SO-081820-NL-064						1310		1	X									X				
5	SO-081820-NL-065						1325		1	X									X				
6	SO-081820-NL-066						1330		1	X									X				
7	SO-081820-NL-067						1335		1	X									X				
8	SO-081820-NL-068						1340		1	X									X				
9	SO-081820-NL-069						1345		1	X									X				
10	SO-081820-NL-070						1350		1	X									X				
11	SO-081820-NL-071						1410		1	X									X				
12	SO-081820-NL-072						1415		1	X									X				

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS: TEMP in C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
		8/20	1048	MWell/PACE	8/24/20	1048	0.9	Y	Y	Y
							0.5			
							1.4			

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER:

SIGNATURE of SAMPLER: DATE Signed: 2020/08/20

Pace Analytical
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CHAIN-OF-CUSTODY / Analytical Request Document

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Section A Required Client Information:		Section B Required Project Information:		Section C Invoice Information:	
Company:	GHD / City of Lawrence	Report To:	Laskares, Nick	Attention:	
Address:	1502 SW 41st St	Copy To:		Company Name:	
Topeka, KS 66609				Address:	
Email:	nick.laskares@ghd.com	Purchase Order #:		Pace Quote:	
Phone:	(785)783-8982 Fax:	Project Name:	Geotech Farmland	Pace Project Manager:	hank.kapka@pacelabs.com
Requested Due Date:		Project #:		Pace Profile #:	14184

Regulatory Agency

State / Location: KS

ITEM #	SAMPLE ID (One Character per box. (A-Z, 0-9 / , -) Sample Ids must be unique)	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED START DATE	COLLECTED START TIME	COLLECTED END DATE	COLLECTED END TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Analyses Test: Ammonia / NO2, NO3, %M	ammonia	NO3 / NO2	Residual Chlorine (Y/N)	6034 6051
1	SO-081820-NL-073	SL	G			8/18	1425		1	X								X				
2	SO-081820-NL-074						1440		1	X								X				
3	SO-081820-NL-075						1500		1	X								X				
4	SO-081820-NL-076						1510		1	X								X				
5	SO-081920-NL-077					8/19	0930		1	X								X				
6	SO-081920-NL-078						0932		1	X								X				
7	SO-081920-NL-079						0935		1	X								X				
8	SO-081920-NL-080						0940		1	X								X				
9	SO-081920-NL-081						0945		1	X								X				
10	SO-081920-NL-082						0947		1	X								X				
11	SO-081920-NL-083						0950		1	X								X				
12	SO-081920-NL-084						0955		1	X								X				

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS: TEMP in C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
		8/20	1045	Mater/Pace	8/20/20	1048	0.9	Y	Y	Y
							0.5			
							1.4			

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER:

SIGNATURE of SAMPLER: DATE Signed: 2020/08/20

Pace Analytical
WWW.PACELABS.COM

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Address: ~~1502 SW 41st St~~	Copy To: see pg 1	Company Name:
Topeka, KS 66609		Address:
Email: nick.laskares@ghd.com	Purchase Order #:	Pace Quote:
Phone: (785)783-8982 Fax:	Project Name: Geotech Farmland	~~Pace Project Manager:~~ hank.kapka@pacelabs.com,
Requested Due Date:	Project #:	Pace Profile #: 14184

Regulatory Agency
State / Location
KS

ITEM #	SAMPLE ID (One Character per box. (A-Z, 0-9 / , -) Sample Ids must be unique)	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED START DATE	COLLECTED START TIME	COLLECTED END DATE	COLLECTED END TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Analyses Test Y/N	Ammonia / NO2, NO3, %M	ammonia	NO3 / NO2	Residual Chlorine (Y/N)	6034 6051
1	SO-081920-NL-085	W	G		1000	8/19			1	X								Y	X				
2	SO-081920-NL-086				1005				1	X									X				
3	SO-081920-NL-087				1010				1	X									X				
4	SO-081920-NL-088				1015				1	X									X				
5	SO-081920-NL-089				1030				1	X									X				
6	SO-081920-NL-090				1035				1	X									X				
7	SO-081920-NL-091				1040				1	X									X				
8	SO-081920-NL-092				1045				1	X									X				
9	SO-081920-NL-093				1050				1	X									X				
10	SO-081920-NL-094				1055				1	X									X				
11	SO-081920-NL-095				1100				1	X									X				
12	SO-081920-NL-096	↓	↓		1105	↓			1	X									X				

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
	[signature]	8/20	1045	MKeller/PACE	8/20/20	1048

SAMPLE CONDITIONS				
TEMP in C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
0.9	Y	Y	Y
0.5			
1.4			

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: [signature]

SIGNATURE of SAMPLER: [signature] DATE Signed: 2020/08/20

CHAIN OF CUSTODY RECORD

CONESTOGA-ROVERS & ASSOCIATES

Address: _____

Phone: _____ Fax: _____

COC NO.: 45741

PAGE 9 OF 9

(See Reverse Side for Instructions)

60346051

Project No/ Phase/Task Code:	Laboratory Name:	Lab Location:	SSOW ID:
Project Name:	Lab Contact:	Lab Quote No:	Cooler No:
Project Location:			Carrier:
Chemistry Contact:			Airbill No:
Sampler(s):			Date Shipped:

Item	Sample Identification (Containers for each sample may be combined on one line)	Date (mm/dd/yy)	Time (hh:mm)	Sample Type: Matrix Code (see back of COC)	Sample Type: Grab (G) or Comp (C)	Container Quantity & Preservation: Unpreserved	Hydrochloric Acid (HCl)	Nitric Acid (HNO_3)	Sulfuric Acid (H_2SO_4)	Sodium Hydroxide (NaOH)	Methanol/Water (Soil VOC)	EnCores 3x5-g, 1x25-g	Other:	Total Containers/Sample	Analysis Requested: $NH_4^+/NO_2/NO_3/Total\ N$	Analysis Requested: NH_4^+	Analysis Requested: NO_3/NO_2 as N	MS/MSD Request	Comments/ Special Instructions:
1	SD-081920-NL-097	8/19	1115	SL	G	X									X				
2	SD-081920-NL-098	"	1120	"	"	X									X				
3	SD-081920-NL-099	"	1135	"	"	X									X				
4	WW-081820-NL-001	8/18	16:45	NW	G	X			X							X	X		SHORT HOLD
5	WW-081920-NL-002	8/19	12:15	"	"	X			X							X	X		
6	WW-081920-NL-003	8/19	12:35	"	"	X			X							X	X		
7																			
8																			
9																			
10																			
11																			
12																			
13																			
14																			
15																			

NO

TAT Required in business days (use separate COCs for different TATs):

☐ 1 Day ☐ 2 Days ☐ 3 Days ☐ 1 Week ☐ 2 Week ☐ Other:

Total Number of Containers:

All Samples in Cooler must be on COC

Notes/ Special Requirements:

Relinquished By	Company	Date	Time	Received By	Company	Date	Time
1.				1.	GHD	8/20/20	1048
2.				2.	Pace	8/20/20	1048
3.				3.			0.9, 0.5, 1.4

THE CHAIN OF CUSTODY IS A LEGAL DOCUMENT – ALL FIELDS MUST BE COMPLETED ACCURATELY

Distribution: WHITE – Fully Executed Copy (CRA) YELLOW – Receiving Laboratory Copy PINK – Shipper GOLDENROD – Sampling Crew

CRA Form: COC-10B (20110804)

Appendix D
Reduced Data Validation Memo

Memorandum

September 15, 2020

To:	Travis Kogl	Ref. No.:	11216633
From:	Angela Bown/cs/1-NF	Tel:	513-285-1102
cc:	Nick Laskares		

Subject: **Analytical Results and Reduced Validation**
MSO Environmental Sampling
City of Lawrence - Farmland
Lawrence, Kansas
August 2020

1. Introduction

This document details a reduced validation of analytical results for soil samples collected in support of the MSO Environmental Sampling at the Lawrence, Kansas site during August 2020. Samples were submitted to Pace Analytical (Pace) located in Lenexa, Kansas. A sample collection and analysis summary is presented in Table 1. The validated analytical results are summarized in Table 2. A summary of the analytical methodology is presented in Table 3.

Standard GHD report deliverables were submitted by the laboratory. The final results and supporting quality assurance/quality control (QA/QC) data were assessed. Evaluation of the data was based on information obtained from the chain of custody forms, finished report forms, method blank data, duplicate data, recovery data from laboratory control samples (LCS) and matrix spikes (MS), and field quality assurance/quality control (QA/QC) samples.

The QA/QC criteria by which these data have been assessed are outlined in the analytical methods referenced in Table 3 and applicable guidance from the document entitled: "USEPA National Functional Guidelines for Superfund Inorganic Methods Data Review", USEPA 540-R-2016-001, September 2016.

This item will subsequently be referred to as the "Guidelines" in this Memorandum.

2. Sample Holding Time and Preservation

The sample holding time criteria for the analyses are summarized in Table 3. Sample chain of custody documents and analytical report were used to determine sample holding times. All samples were prepared and analyzed within the required holding times.

All samples were properly delivered on ice and stored by the laboratory at the required temperature (0-6°C).

3. Laboratory Method Blank Analyses

Method blanks are prepared from a purified matrix and analyzed with investigative samples to determine the existence and magnitude of sample contamination introduced during the analytical procedures.

For this study, laboratory method blanks were analyzed at a minimum frequency of 1 per 20 investigative samples and/or 1 per analytical batch.

All method blank results were non-detect, indicating that laboratory contamination was not a factor for this investigation.

4. Laboratory Control Sample Analyses

LCSs are prepared and analyzed as samples to assess the analytical efficiencies of the methods employed, independent of sample matrix effects.

For this study, LCSs were analyzed at a minimum frequency of 1 per 20 investigative samples and/or 1 per analytical batch.

The LCSs contained all analytes of interest. LCS recoveries were assessed per the "Guidelines". All LCS recoveries were within the control limits, demonstrating acceptable analytical accuracy.

5. Matrix Spike Analyses

To evaluate the effects of sample matrices on the preparation, measurement procedures, and accuracy of a particular analysis, samples are spiked with a known concentration of the analyte of concern and analyzed as MS samples. For this study, MS samples were prepared and analyzed by the laboratory as specified in Table 1.

The MS results were evaluated per the "Guidelines". In accordance with the "Guidelines", MS recoveries for samples with analyte concentrations significantly greater than the spike concentrations (> 4 times) could not be assessed.

Due to dilutions equal to or greater than 5 times that were necessary to successfully analyze the samples, some MS recoveries were not assessed.

Most MS analyses performed were acceptable, demonstrating acceptable analytical accuracy. Table 4 presents the sample results that were qualified or rejected due to outlying MS recoveries.

6. Duplicate Sample Analyses – Inorganic Analyses

Analytical precision is evaluated based on the analysis of laboratory duplicate samples. For this study, duplicate samples were prepared and analyzed by the laboratory for inorganic analyses as specified in Table 1. The duplicate results were evaluated per the "Guidelines". All duplicate analyses performed were acceptable, demonstrating acceptable analytical precision.

7. Field QA/QC Samples

The field QA/QC consisted of two equipment blank samples and five field duplicate sample sets.

Equipment Blank Sample Analysis

To assess field decontamination procedures, ambient conditions at the site, and cleanliness of sample containers, two equipment blanks were submitted for analysis, as identified in Table 1. All results were non-detect for the analytes of interest.

Field Duplicate Sample Analysis

To assess the analytical and sampling protocol precision, five field duplicate sample sets were collected and submitted "blind" to the laboratory, as specified in Table 1. The RPDs associated with these duplicate samples must be less than 100 percent for soil samples. If the reported concentration in either the investigative sample or its duplicate is less than five times the reporting limit (RL), the evaluation criterion is two times the RL value.

All field duplicate results were within acceptable agreement, demonstrating acceptable sampling and analytical precision.

8. Analyte Reporting

No positive analyte detections less than the RL but greater than the laboratory's method detection limit (MDL) were reported. Non-detect results were presented as non-detect at the RL in Table 2.

All soil results were reported on a dry weight basis.

9. Conclusion

Based on the assessment detailed in the foregoing, the data summarized in Table 2 are acceptable with the specific exceptions and qualifications noted herein.

Table 1

Sample Collection and Analysis Summary
MSO Environmental Sampling
City of Lawrence - Farmland
Lawrence, Kansas
August 2020

							Analysis/Parameters				
Sample Identification	**Location**	**Matrix**	**Initial Sample Depth (ft. bgs)**	**Final Sample Depth (ft. bgs)**	**Collection Date (mm/dd/yyyy)**	**Collection Time (hr:min)**	**Ammonia**	**Nitrate as N**	**Nitrite as N**	**Nitrite/Nitrate-N**	**Comments**
SO-081720-NL-001	BH-06	Soil	0	1	08/17/2020	09:50	X	X	X	X	MS
SO-081720-NL-002	BH-06	Soil	1	1.5	08/17/2020	09:55	X	X	X	X	
SO-081720-NL-003	BH-06	Soil	1.5	3.5	08/17/2020	10:00	X	X	X	X	DUP
SO-081720-NL-004	BH-06	Soil	3.5	5	08/17/2020	10:05	X	X	X	X	
SO-081720-NL-005	BH-06	Soil	6	7.5	08/17/2020	10:10	X	X	X	X	
SO-081720-NL-006	BH-06	Soil	8.5	9	08/17/2020	10:15	X	X	X	X	
SO-081720-NL-007	BH-06	Soil	13.5	15	08/17/2020	10:25	X	X	X	X	
SO-081720-NL-008	BH-20	Soil	0	1	08/17/2020	10:45	X	X	X	X	
SO-081720-NL-009	BH-20	Soil	1	1.5	08/17/2020	10:47	X	X	X	X	MS
SO-081720-NL-010	BH-20	Soil	3.5	5	08/17/2020	10:50	X	X	X	X	DUP
SO-081720-NL-011	BH-20	Soil	6	75	08/17/2020	11:00	X	X	X	X	MS
SO-081720-NL-012	BH-20	Soil	7.5	10	08/17/2020	11:05	X	X	X	X	
SO-081720-NL-013	BH-20	Soil	13.5	15	08/17/2020	11:10	X	X	X	X	
SO-081720-NL-014	BH-20	Soil	18.5	19	08/17/2020	11:15	X	X	X	X	
SO-081720-NL-015	BH-19	Soil	0	1	08/17/2020	11:45	X	X	X	X	
SO-081720-NL-016	BH-19	Soil	1	2.5	08/17/2020	11:45	X	X	X	X	
SO-081720-NL-017	BH-19	Soil	3.5	5	08/17/2020	11:50	X	X	X	X	
SO-081720-NL-018	BH-19	Soil	6	7.5	08/17/2020	11:55	X	X	X	X	MS
SO-081720-NL-019	BH-19	Soil	8.5	10	08/17/2020	12:05	X	X	X	X	
SO-081270-NL-020	BH-19	Soil	0	-	08/17/2020	12:10	X	X	X	X	
SO-081720-NL-021	BH-05	Soil	0	1	08/17/2020	01:30	X	X	X	X	MS
SO-081720-NL-022	BH-05	Soil	1	1.5	08/17/2020	01:35	X	X	X	X	

Table 1

Sample Collection and Analysis Summary
MSO Environmental Sampling
City of Lawrence - Farmland
Lawrence, Kansas
August 2020

							Analysis/Parameters				
Sample Identification	**Location**	**Matrix**	**Initial Sample Depth (ft. bgs)**	**Final Sample Depth (ft. bgs)**	**Collection Date (mm/dd/yyyy)**	**Collection Time (hr:min)**	**Ammonia**	**Nitrate as N**	**Nitrite as N**	**Nitrite/Nitrate-N**	**Comments**
SO-081720-NL-023	BH-05	Soil	6	7.5	08/17/2020	01:45	X	X	X	X	DUP
SO-081720-NL-024	BH-05	Soil	8.5	10	08/17/2020	01:50	X	X	X	X	
SO-081720-NL-025	BH-05	Soil	13.5	15	08/17/2020	01:55	X	X	X	X	
SO-081720-NL-026	BH-16	Soil	0	1	08/17/2020	02:55	X	X	X	X	
SO-081720-NL-027	BH-16	Soil	1	1.75	08/17/2020	03:00	X	X	X	X	
SO-081720-NL-028	BH-17A	Soil	0	1	08/17/2020	03:20	X	X	X	X	
SO-081720-NL-029	BH-17A	Soil	1	2.5	08/17/2020	03:25	X	X	X	X	MS
SO-081720-NL-030	BH-17A	Soil	3.5	4	08/17/2020	03:30	X	X	X	X	DUP
SO-081720-NL-031	BH-17A	Soil	6	6.5	08/17/2020	03:35	X	X	X	X	MS
SO-081720-NL-032	BH-17A	Soil	8.5	9	08/17/2020	03:40	X	X	X	X	
SO-081820-NL-033	BH-44	Soil	0	1	08/18/2020	08:30	X	X	X	X	
SO-081820-NL-034	BH-44	Soil	1	2.5	08/18/2020	08:35	X	X	X	X	
SO-081820-NL-035	BH-44	Soil	3.5	5	08/18/2020	08:40	X	X	X	X	
SO-081820-NL-036	BH-44	Soil	6	7.5	08/18/2020	08:45	X	X	X	X	
SO-081820-NL-037	BH-44	Soil	8.5	10	08/18/2020	08:50	X	X	X	X	
SO-081820-NL-038	BH-51	Soil	0	1	08/18/2020	09:00	X	X	X	X	MS
SO-081820-NL-039	BH-51	Soil	1	2.5	08/18/2020	09:05	X	X	X	X	
SO-081820-NL-040	BH-51	Soil	3.5	5	08/18/2020	09:15	X	X	X	X	
SO-081820-NL-041	BH-51	Soil	6	7.5	08/18/2020	09:20	X	X	X	X	MS
SO-081820-NL-042	BH-51	Soil	8.5	10	08/18/2020	09:25	X	X	X	X	
SO-081820-NL-043	BH-51	Soil	13.5	15	08/18/2020	09:35	X	X	X	X	DUP
SO-081820-NL-044	BH-51	Soil	18	18.5	08/18/2020	09:45	X	X	X	X	
SO-081820-NL-045	BH-09	Soil	0	1	08/18/2020	10:10	X	X	X	X	
SO-081820-NL-046	BH-09	Soil	1	2.5	08/18/2020	10:15	X	X	X	X	
SO-081820-NL-047	BH-09	Soil	3.5	5	08/18/2020	10:20	X	X	X	X	
SO-081820-NL-048	BH-09	Soil	6	7.5	08/18/2020	10:25	X	X	X	X	

Table 1

Sample Collection and Analysis Summary
MSO Environmental Sampling
City of Lawrence - Farmland
Lawrence, Kansas
August 2020

							Analysis/Parameters				
Sample Identification	**Location**	**Matrix**	**Initial Sample Depth (ft. bgs)**	**Final Sample Depth (ft. bgs)**	**Collection Date (mm/dd/yyyy)**	**Collection Time (hr:min)**	**Ammonia**	**Nitrate as N**	**Nitrite as N**	**Nitrite/Nitrate-N**	**Comments**
SO-081820-NL-049	BH-09	Soil	8.5	10	08/18/2020	10:30	X	X	X	X	MS
SO-081820-NL-050	BH-09	Soil	13.5	15	08/18/2020	10:40	X	X	X	X	DUP
SO-081820-NL-051	BH-09	Soil	18.5	20	08/18/2020	10:50	X	X	X	X	MS
SO-081820-NL-052	BH-21	Soil	0	1	08/18/2020	11:10	X	X	X	X	
SO-081820-NL-053	BH-21	Soil	1	2.5	08/18/2020	11:15	X	X	X	X	
SO-081820-NL-054	BH-21	Soil	3.5	5	08/18/2020	11:20	X	X	X	X	
SO-081820-NL-055	BH-21	Soil	6	7.5	08/18/2020	11:25	X	X	X	X	
SO-081820-NL-056	BH-21	Soil	8.5	10	08/18/2020	11:30	X	X	X	X	
SO-081820-NL-057	BH-21	Soil	13.5	15	08/18/2020	11:36	X	X	X	X	
SO-081820-NL-058	BH-21	Soil	18.5	20	08/18/2020	11:45	X	X	X	X	MS
SO-081820-NL-059	BH-23	Soil	0.25	0.75	08/18/2020	12:45	X	X	X	X	
SO-081820-NL-060	BH-23	Soil	1	2.5	08/18/2020	12:50	X	X	X	X	
SO-081820-NL-061	BH-23	Soil	3.5	5	08/18/2020	12:55	X	X	X	X	MS
SO-081820-NL-062	BH-23	Soil	6	7.5	08/18/2020	01:00	X	X	X	X	
SO-081820-NL-063	BH-23	Soil	8.5	10	08/18/2020	01:05	X	X	X	X	DUP
SO-081820-NL-064	BH-23	Soil	13.5	15	08/18/2020	01:10	X	X	X	X	
SO-081820-NL-065	BH-52	Soil	0.25	0.75	08/18/2020	01:25	X	X	X	X	
SO-081820-NL-066	BH-52	Soil	0.75	2.5	08/18/2020	01:30	X	X	X	X	
SO-081820-NL-067	BH-52	Soil	3.5	5	08/18/2020	01:35	X	X	X	X	
SO-081820-NL-068	BH-52	Soil	6	7.5	08/18/2020	01:40	X	X	X	X	
SO-081820-NL-069	BH-52	Soil	8.5	10	08/18/2020	01:45	X	X	X	X	MS
SO-081820-NL-070	BH-52	Soil	13.5	15	08/18/2020	01:50	X	X	X	X	DUP

Table 1

Sample Collection and Analysis Summary
MSO Environmental Sampling
City of Lawrence - Farmland
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August 2020

							Analysis/Parameters				
Sample Identification	**Location**	**Matrix**	**Initial Sample Depth (ft. bgs)**	**Final Sample Depth (ft. bgs)**	**Collection Date (mm/dd/yyyy)**	**Collection Time (hr:min)**	**Ammonia**	**Nitrate as N**	**Nitrite as N**	**Nitrite/Nitrate-N**	**Comments**
SO-081820-NL-071	BH-10	Soil	0.25	1	08/18/2020	02:10	X	X	X	X	MS
SO-081820-NL-072	BH-10	Soil	1	2.5	08/18/2020	02:15	X	X	X	X	
SO-081820-NL-073	BH-10	Soil	3.5	5	08/18/2020	02:25	X	X	X	X	
SO-081820-NL-074	BH-10	Soil	6	7.5	08/18/2020	02:40	X	X	X	X	
SO-081820-NL-075	BH-10	Soil	8.5	10	08/18/2020	03:00	X	X	X	X	
SO-081820-NL-076	BH-10	Soil	13.5	15	08/18/2020	03:10	X	X	X	X	
SO-081920-NL-077	BH-60	Soil	0.75	1	08/19/2020	09:30	X	X	X	X	
SO-081920-NL-078	BH-60	Soil	0.75	1	08/19/2020	09:32	X	X	X	X	FD(SO-081920-NL-077); MS
SO-081920-NL-079	BH-60	Soil	1	2.5	08/19/2020	09:35	X	X	X	X	
SO-081920-NL-080	BH-60	Soil	3.5	5	08/19/2020	09:40	X	X	X	X	
SO-081920-NL-081	BH-27	Soil	0.75	1	08/19/2020	09:45	X	X	X	X	MS
SO-081920-NL-082	BH-27	Soil	0.75	1	08/19/2020	09:47	X	X	X	X	FD(SO-081920-NL-081)
SO-081920-NL-083	BH-27	Soil	1	2.5	08/19/2020	09:50	X	X	X	X	DUP
SO-081920-NL-084	BH-27	Soil	3.5	5	08/19/2020	09:55	X	X	X	X	
SO-081920-NL-085	BH-58	Soil	0.75	1	08/19/2020	10:00	X	X	X	X	
SO-081920-NL-086	BH-58	Soil	0.75	1	08/19/2020	10:05	X	X	X	X	FD(SO-081920-NL-085)
SO-081920-NL-087	BH-58	Soil	1	2.5	08/19/2020	10:10	X	X	X	X	
SO-081920-NL-088	BH-58	Soil	3.5	5	08/19/2020	10:15	X	X	X	X	
SO-081920-NL-089	BH-55	Soil	0.75	1	08/19/2020	10:30	X	X	X	X	MS
SO-081920-NL-090	BH-55	Soil	0.75	1	08/19/2020	10:35	X	X	X	X	FD(SO-081920-NL-089); DUP
SO-081920-NL-091	BH-55	Soil	1	2.5	08/19/2020	10:40	X	X	X	X	
SO-081920-NL-092	BH-55	Soil	3.5	5	08/19/2020	10:45	X	X	X	X	
SO-081920-NL-093	BH-53	Soil	0.75	1	08/19/2020	10:50	X	X	X	X	
SO-081920-NL-094	BH-53	Soil	1	2.5	08/19/2020	10:55	X	X	X	X	
SO-081920-NL-095	BH-53	Soil	3.5	5	08/19/2020	11:00	X	X	X	X	
SO-081920-NL-096	BH-53	Soil	6	7.5	08/19/2020	11:05	X	X	X	X	
SO-081920-NL-097	BH-53	Soil	8.5	10	08/19/2020	11:15	X	X	X	X	

Table 1

Sample Collection and Analysis Summary
MSO Environmental Sampling
City of Lawrence - Farmland
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							Analysis/Parameters				
Sample Identification	**Location**	**Matrix**	**Initial Sample Depth (ft. bgs)**	**Final Sample Depth (ft. bgs)**	**Collection Date (mm/dd/yyyy)**	**Collection Time (hr:min)**	**Ammonia**	**Nitrate as N**	**Nitrite as N**	**Nitrite/Nitrate-N**	**Comments**
SO-081920-NL-098	BH-53	Soil	8.5	10	08/19/2020	11:20	X	X	X	X	FD(SO-081920-NL-097); MS
SO-081920-NL-099	BH-53	Soil	13.5	15	08/19/2020	11:35	X	X	X	X	
WW-081820-NL-001	-	WGQ	-	-	08/18/2020	04:45	X	X	X	X	Equipment Blank
WW-081920-NL-002	-	WGQ	-	-	08/19/2020	12:15	X	X	X	X	Equipment Blank

Notes:

-	- Not Applicable
DUP	- Laboratory Duplicate
FD	- Field Duplicate Sample of sample in parentheses
ft. bgs.	- Feet below ground surface
MS	- Matrix Spike
N	- Nitrogen
WGQ	- Water Quality Control Sample

Table 2

Analytical Results Summary
MSO Environmental Sampling
City of Lawrence - Farmland
Lawrence, Kansas
August 2020

Location ID:		**BH-05**	**BH-05**	**BH-05**	**BH-05**
Sample Name:		**SO-081720-NL-022**	**SO-081720-NL-023**	**SO-081720-NL-024**	**SO-081720-NL-025**
Sample Date:		**08/17/2020**	**08/17/2020**	**08/17/2020**	**08/17/2020**
Depth:		**1-1.5 ft BGS**	**6-7.5 ft BGS**	**8.5-10 ft BGS**	**13.5-15 ft BGS**
Parameters	**Unit**				
General Chemistry					
Percent moisture	%	20.9	15.1	12.8	14.3
Ammonia	mg/kg	894 J-	633 J-	381 J-	161 J-
Nitrate (as N)	mg/kg	805	156	192	86.6
Nitrite (as N)	mg/kg	62.4 U	5.8 U	5.7 U	2.3 U
Nitrite/Nitrate	mg/kg	805	156	192	86.6

Notes:

J- - Estimated concentration but result may be biased low

U - Not detected at the associated reporting limit
UJ - Not detected; associated reporting limit is estimated
N - Nitrogen
R - Rejected

Table 2

Analytical Results Summary
MSO Environmental Sampling
City of Lawrence - Farmland
Lawrence, Kansas
August 2020

Location ID:		**BH-05**	**BH-06**	**BH-06**	**BH-06**
Sample Name:		**SO-081720-NL-021**	**SO-081720-NL-002**	**SO-081720-NL-003**	**SO-081720-NL-004**
Sample Date:		**08/17/2020**	**08/17/2020**	**08/17/2020**	**08/17/2020**
Depth:		**0-1 ft BGS**	**1-1.5 ft BGS**	**1.5-3.5 ft BGS**	**3.5-5 ft BGS**
Parameters	**Unit**				
General Chemistry					
Percent moisture	%	18.1	22.8	17.6	20.1
Ammonia	mg/kg	72.6 J-	2890	2920	2830
Nitrate (as N)	mg/kg	971	1950	716	1370
Nitrite (as N)	mg/kg	61.9 U	65.7 U	59.8 U	61.9 U
Nitrite/Nitrate	mg/kg	971	1950	716	1370

Notes:

J- - Estimated concentration but result may be biased low

U - Not detected at the associated reporting limit
UJ - Not detected; associated reporting limit is estimated
N - Nitrogen
R - Rejected

Table 2

Analytical Results Summary
MSO Environmental Sampling
City of Lawrence - Farmland
Lawrence, Kansas
August 2020

Location ID:		**BH-06**	**BH-06**	**BH-06**	**BH-06**
Sample Name:		**SO-081720-NL-005**	**SO-081720-NL-006**	**SO-081720-NL-007**	**SO-081720-NL-001**
Sample Date:		**08/17/2020**	**08/17/2020**	**08/17/2020**	**08/17/2020**
Depth:		**6-7.5 ft BGS**	**8.5-9 ft BGS**	**13.5-15 ft BGS**	**0-1 ft BGS**
Parameters	**Unit**				
General Chemistry					
Percent moisture	%	18.3	17.6	14	17.9
Ammonia	mg/kg	3220	2210	1660	805
Nitrate (as N)	mg/kg	2240	1630	941	458
Nitrite (as N)	mg/kg	62.4 U	61.9 U	57.6 U	24.3 U
Nitrite/Nitrate	mg/kg	2240	1630	941	458

Notes:

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N - Nitrogen
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Table 2

Analytical Results Summary
MSO Environmental Sampling
City of Lawrence - Farmland
Lawrence, Kansas
August 2020

Location ID:		**BH-09**	**BH-09**	**BH-09**	**BH-09**
Sample Name:		**SO-081820-NL-046**	**SO-081820-NL-047**	**SO-081820-NL-048**	**SO-081820-NL-049**
Sample Date:		**08/18/2020**	**08/18/2020**	**08/18/2020**	**08/18/2020**
Depth:		**1-2.5 ft BGS**	**3.5-5 ft BGS**	**6-7.5 ft BGS**	**8.5-10 ft BGS**
Parameters	**Unit**				
General Chemistry					
Percent moisture	%	15.6	17.4	14.8	14.2
Ammonia	mg/kg	12 J-	631 J-	357 J-	48.1 J-
Nitrate (as N)	mg/kg	67.7	358	547	687
Nitrite (as N)	mg/kg	2.3 U	24.6 U	23.2 U	58 U
Nitrite/Nitrate	mg/kg	67.7 J-	358 J-	547 J-	687 J-

Notes:

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U - Not detected at the associated reporting limit
UJ - Not detected; associated reporting limit is estimated
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R - Rejected

Table 2

Analytical Results Summary
MSO Environmental Sampling
City of Lawrence - Farmland
Lawrence, Kansas
August 2020

Location ID:		**BH-09**	**BH-09**	**BH-09**	**BH-10**
Sample Name:		**SO-081820-NL-050**	**SO-081820-NL-051**	**SO-081820-NL-045**	**SO-081820-NL-071**
Sample Date:		**08/18/2020**	**08/18/2020**	**08/18/2020**	**08/18/2020**
Depth:		**13.5-15 ft BGS**	**18.5-20 ft BGS**	**0-1 ft BGS**	**0.25-1 ft BGS**
Parameters	**Unit**				
General Chemistry					
Percent moisture	%	12.3	11.9	13.6	6.7
Ammonia	mg/kg	82.8 J-	32.5 J-	18.3 J-	137
Nitrate (as N)	mg/kg	176	50.7	44.6	643 J-
Nitrite (as N)	mg/kg	5.8 U	1.1 U	1.2 U	R
Nitrite/Nitrate	mg/kg	176 J-	50.7 J-	44.6 J-	643 J-

Notes:

J- - Estimated concentration but result may be biased low
U - Not detected at the associated reporting limit
UJ - Not detected; associated reporting limit is estimated
N - Nitrogen
R - Rejected

Table 2

Analytical Results Summary
MSO Environmental Sampling
City of Lawrence - Farmland
Lawrence, Kansas
August 2020

Location ID:		**BH-10**	**BH-10**	**BH-10**	**BH-10**
Sample Name:		**SO-081820-NL-072**	**SO-081820-NL-073**	**SO-081820-NL-074**	**SO-081820-NL-075**
Sample Date:		**08/18/2020**	**08/18/2020**	**08/18/2020**	**08/18/2020**
Depth:		**1-2.5 ft BGS**	**3.5-5 ft BGS**	**6-7.5 ft BGS**	**8.5-10 ft BGS**
Parameters	**Unit**				
General Chemistry					
Percent moisture	%	14.1	21.8	18.2	19.9
Ammonia	mg/kg	2070	2150	2140	2800
Nitrate (as N)	mg/kg	556 J-	128 J-	173 J-	332 J-
Nitrite (as N)	mg/kg	R	R	R	R
Nitrite/Nitrate	mg/kg	556 J-	128 J-	173 J-	332 J-

Notes:

J- - Estimated concentration but result may be biased low

U - Not detected at the associated reporting limit
UJ - Not detected; associated reporting limit is estimated
N - Nitrogen
R - Rejected

Table 2

Analytical Results Summary
MSO Environmental Sampling
City of Lawrence - Farmland
Lawrence, Kansas
August 2020

Location ID:		**BH-10**	**BH-16**	**BH-16**	**BH-17A**
Sample Name:		**SO-081820-NL-076**	**SO-081720-NL-027**	**SO-081720-NL-026**	**SO-081720-NL-029**
Sample Date:		**08/18/2020**	**08/17/2020**	**08/17/2020**	**08/17/2020**
Depth:		**13.5-15 ft BGS**	**1-1.75 ft BGS**	**0-1 ft BGS**	**1-2.5 ft BGS**
Parameters	**Unit**				
General Chemistry					
Percent moisture	%	18.8	9.9	9.1	20.5
Ammonia	mg/kg	5160	1.1 UJ	1 UJ	189 J-
Nitrate (as N)	mg/kg	2710 J-	79.1	27	55.4
Nitrite (as N)	mg/kg	R	2.2 U	1.1 U	1.3 U
Nitrite/Nitrate	mg/kg	2710 J-	79.1	27	55.4

Notes:

J- - Estimated concentration but result may be biased low
U - Not detected at the associated reporting limit
UJ - Not detected; associated reporting limit is estimated
N - Nitrogen
R - Rejected

Table 2

Analytical Results Summary
MSO Environmental Sampling
City of Lawrence - Farmland
Lawrence, Kansas
August 2020

Location ID:		**BH-17A**	**BH-17A**	**BH-17A**	**BH-17A**
Sample Name:		**SO-081720-NL-030**	**SO-081720-NL-031**	**SO-081720-NL-032**	**SO-081720-NL-028**
Sample Date:		**08/17/2020**	**08/17/2020**	**08/17/2020**	**08/17/2020**
Depth:		**3.5-4 ft BGS**	**6-6.5 ft BGS**	**8.5-9 ft BGS**	**0-1 ft BGS**
Parameters	**Unit**				
General Chemistry					
Percent moisture	%	12.2	12.9	12.4	19.3
Ammonia	mg/kg	147 J-	260 J-	379 J-	79.8 J-
Nitrate (as N)	mg/kg	52.5	116	169	32.4
Nitrite (as N)	mg/kg	1.2	5.8 U	5.6 U	1.3 U
Nitrite/Nitrate	mg/kg	53.8	116	169	32.4

Notes:

J- - Estimated concentration but result may be biased low

U - Not detected at the associated reporting limit
UJ - Not detected; associated reporting limit is estimated
N - Nitrogen
R - Rejected

Table 2

Analytical Results Summary
MSO Environmental Sampling
City of Lawrence - Farmland
Lawrence, Kansas
August 2020

Location ID:		**BH-19**	**BH-19**	**BH-19**	**BH-19**
Sample Name:		**SO-081720-NL-016**	**SO-081720-NL-017**	**SO-081720-NL-018**	**SO-081720-NL-019**
Sample Date:		**08/17/2020**	**08/17/2020**	**08/17/2020**	**08/17/2020**
Depth:		**1-2.5 ft BGS**	**3.5-5 ft BGS**	**6-7.5 ft BGS**	**8.5-10 ft BGS**
Parameters	**Unit**				
General Chemistry					
Percent moisture	%	19.5	19.2	19.9	20.8
Ammonia	mg/kg	1050 J-	716 J-	174 J-	189 J-
Nitrate (as N)	mg/kg	757	544	190	93.9
Nitrite (as N)	mg/kg	61.2 U	24.3 U	6.2 U	2.5 U
Nitrite/Nitrate	mg/kg	757	544	190	93.9

Notes:

J- - Estimated concentration but result may be biased low

U - Not detected at the associated reporting limit
UJ - Not detected; associated reporting limit is estimated
N - Nitrogen
R - Rejected

Table 2

Analytical Results Summary
MSO Environmental Sampling
City of Lawrence - Farmland
Lawrence, Kansas
August 2020

Location ID:		**BH-19**	**BH-19**	**BH-20**	**BH-20**
Sample Name:		**SO-081720-NL-015**	**SO-081270-NL-020**	**SO-081720-NL-009**	**SO-081720-NL-010**
Sample Date:		**08/17/2020**	**08/17/2020**	**08/17/2020**	**08/17/2020**
Depth:		**0-1 ft BGS**	**--**	**1-1.5 ft BGS**	**3.5-5 ft BGS**
Parameters	**Unit**				
General Chemistry					
Percent moisture	%	21.8	16.7	20.4	16.3
Ammonia	mg/kg	247 J-	177 J-	759 J-	967 J-
Nitrate (as N)	mg/kg	484	49	1210	804
Nitrite (as N)	mg/kg	25.9 U	1.2 U	61.7 U	58.9 U
Nitrite/Nitrate	mg/kg	484	49	1210	804

Notes:

J- - Estimated concentration but result may be biased low

U - Not detected at the associated reporting limit
UJ - Not detected; associated reporting limit is estimated
N - Nitrogen
R - Rejected

Table 2

Analytical Results Summary
MSO Environmental Sampling
City of Lawrence - Farmland
Lawrence, Kansas
August 2020

Location ID:		**BH-20**	**BH-20**	**BH-20**	**BH-20**
Sample Name:		**SO-081720-NL-011**	**SO-081720-NL-012**	**SO-081720-NL-013**	**SO-081720-NL-014**
Sample Date:		**08/17/2020**	**08/17/2020**	**08/17/2020**	**08/17/2020**
Depth:		**6-75 ft BGS**	**7.5-10 ft BGS**	**13.5-15 ft BGS**	**18.5-19 ft BGS**
Parameters	**Unit**				
General Chemistry					
Percent moisture	%	14	17.9	18.9	21.4
Ammonia	mg/kg	747 J-	602 J-	372 J-	282 J-
Nitrate (as N)	mg/kg	537	477	448	660
Nitrite (as N)	mg/kg	23.3 U	24 U	25 U	62.8 U
Nitrite/Nitrate	mg/kg	537	477	448	660

Notes:

J- - Estimated concentration but result may be biased low

U - Not detected at the associated reporting limit
UJ - Not detected; associated reporting limit is estimated
N - Nitrogen
R - Rejected

Table 2

Analytical Results Summary
MSO Environmental Sampling
City of Lawrence - Farmland
Lawrence, Kansas
August 2020

Location ID:		**BH-20**	**BH-21**	**BH-21**	**BH-21**
Sample Name:		**SO-081720-NL-008**	**SO-081820-NL-053**	**SO-081820-NL-054**	**SO-081820-NL-055**
Sample Date:		**08/17/2020**	**08/18/2020**	**08/18/2020**	**08/18/2020**
Depth:		**0-1 ft BGS**	**1-2.5 ft BGS**	**3.5-5 ft BGS**	**6-7.5 ft BGS**
Parameters	**Unit**				
General Chemistry					
Percent moisture	%	17.9	9.6	20.3	16.9
Ammonia	mg/kg	318	1.1 UJ	1.2 UJ	145 J-
Nitrate (as N)	mg/kg	672	2.9	41.2	43.3
Nitrite (as N)	mg/kg	62.1 U	1.1 U	1.2 U	1.2 U
Nitrite/Nitrate	mg/kg	672	2.9 J-	41.2 J-	43.3 J-

Notes:

J- - Estimated concentration but result may be biased low
U - Not detected at the associated reporting limit
UJ - Not detected; associated reporting limit is estimated
N - Nitrogen
R - Rejected

Table 2

Analytical Results Summary
MSO Environmental Sampling
City of Lawrence - Farmland
Lawrence, Kansas
August 2020

Location ID:		**BH-21**	**BH-21**	**BH-21**	**BH-21**
Sample Name:		**SO-081820-NL-056**	**SO-081820-NL-057**	**SO-081820-NL-058**	**SO-081820-NL-052**
Sample Date:		**08/18/2020**	**08/18/2020**	**08/18/2020**	**08/18/2020**
Depth:		**8.5-10 ft BGS**	**13.5-15 ft BGS**	**18.5-20 ft BGS**	**0-1 ft BGS**
Parameters	**Unit**				
General Chemistry					
Percent moisture	%	19	13.4	14.5	12.6
Ammonia	mg/kg	326 J-	337 J-	137 J-	10.2 J-
Nitrate (as N)	mg/kg	53	31.6	39.2	24.2
Nitrite (as N)	mg/kg	1.2 U	1.2 U	1.2 U	1.1 U
Nitrite/Nitrate	mg/kg	53 J-	31.6 J-	39.2 J-	24.2 J-

Notes:

J- - Estimated concentration but result may be biased low
U - Not detected at the associated reporting limit
UJ - Not detected; associated reporting limit is estimated
N - Nitrogen
R - Rejected

Table 2

Analytical Results Summary
MSO Environmental Sampling
City of Lawrence - Farmland
Lawrence, Kansas
August 2020

Location ID:		**BH-23**	**BH-23**	**BH-23**	**BH-23**
Sample Name:		**SO-081820-NL-059**	**SO-081820-NL-060**	**SO-081820-NL-061**	**SO-081820-NL-062**
Sample Date:		**08/18/2020**	**08/18/2020**	**08/18/2020**	**08/18/2020**
Depth:		**0.25-0.75 ft BGS**	**1-2.5 ft BGS**	**3.5-5 ft BGS**	**6-7.5 ft BGS**
Parameters	**Unit**				
General Chemistry					
Percent moisture	%	12.4	20.1	21.1	20.5
Ammonia	mg/kg	24.2 J-	188 J-	791 J-	1040 J-
Nitrate (as N)	mg/kg	1.2 U	1.2 U	R	27.9 J-
Nitrite (as N)	mg/kg	1.2 U	1.2 U	2.2 J-	2.2 J-
Nitrite/Nitrate	mg/kg	1.2 UJ	1.2 UJ	1.7 J-	30.1 J-

Notes:

J- - Estimated concentration but result may be biased low
U - Not detected at the associated reporting limit
UJ - Not detected; associated reporting limit is estimated
N - Nitrogen
R - Rejected

Table 2

Analytical Results Summary
MSO Environmental Sampling
City of Lawrence - Farmland
Lawrence, Kansas
August 2020

Location ID:		**BH-23**	**BH-23**	**BH-27**	**BH-27**
Sample Name:		**SO-081820-NL-063**	**SO-081820-NL-064**	**SO-081920-NL-081**	**SO-081920-NL-082**
Sample Date:		**08/18/2020**	**08/18/2020**	**08/19/2020**	**08/19/2020**
Depth:		**8.5-10 ft BGS**	**13.5-15 ft BGS**	**0.75-1 ft BGS**	**0.75-1 ft BGS Duplicate**
Parameters	**Unit**				
General Chemistry					
Percent moisture	%	17.9	19.5	11.9	11.9
Ammonia	mg/kg	1520 J-	1180 J-	1120	809
Nitrate (as N)	mg/kg	58.2 J-	161 J-	701	677
Nitrite (as N)	mg/kg	2.2 J-	R	55.8 U	55.7 U
Nitrite/Nitrate	mg/kg	60.4 J-	161 J-	701	677

Notes:

J- - Estimated concentration but result may be biased low
U - Not detected at the associated reporting limit
UJ - Not detected; associated reporting limit is estimated
N - Nitrogen
R - Rejected

Table 2

Analytical Results Summary
MSO Environmental Sampling
City of Lawrence - Farmland
Lawrence, Kansas
August 2020

Location ID:		**BH-27**	**BH-27**	**BH-44**	**BH-44**
Sample Name:		**SO-081920-NL-083**	**SO-081920-NL-084**	**SO-081820-NL-034**	**SO-081820-NL-035**
Sample Date:		**08/19/2020**	**08/19/2020**	**08/18/2020**	**08/18/2020**
Depth:		**1-2.5 ft BGS**	**3.5-5 ft BGS**	**1-2.5 ft BGS**	**3.5-5 ft BGS**
Parameters	**Unit**				
General Chemistry					
Percent moisture	%	16.1	22	17.7	11
Ammonia	mg/kg	1520	2740	22.7 J-	42.7 J-
Nitrate (as N)	mg/kg	999	992	9.2	51.2
Nitrite (as N)	mg/kg	58.7 U	65.4 U	1.2 U	1.1 U
Nitrite/Nitrate	mg/kg	999	992	9.2	51.2

Notes:

J- - Estimated concentration but result may be biased low

U - Not detected at the associated reporting limit
UJ - Not detected; associated reporting limit is estimated
N - Nitrogen
R - Rejected

Table 2

Analytical Results Summary
MSO Environmental Sampling
City of Lawrence - Farmland
Lawrence, Kansas
August 2020

Location ID:		**BH-44**	**BH-44**	**BH-44**	**BH-51**
Sample Name:		**SO-081820-NL-036**	**SO-081820-NL-037**	**SO-081820-NL-033**	**SO-081820-NL-039**
Sample Date:		**08/18/2020**	**08/18/2020**	**08/18/2020**	**08/18/2020**
Depth:		**6-7.5 ft BGS**	**8.5-10 ft BGS**	**0-1 ft BGS**	**1-2.5 ft BGS**
Parameters	**Unit**				
General Chemistry					
Percent moisture	%	11.3	12.5	15.6	18
Ammonia	mg/kg	43.7 J-	47.1 J-	8.5 J-	493 J-
Nitrate (as N)	mg/kg	14.4	33.6	4.8	182
Nitrite (as N)	mg/kg	1.1 U	1.1 U	1.2 U	6.1 U
Nitrite/Nitrate	mg/kg	14.4	33.6	4.8	182

Notes:

J- - Estimated concentration but result may be biased low

U - Not detected at the associated reporting limit
UJ - Not detected; associated reporting limit is estimated
N - Nitrogen
R - Rejected

Table 2

Analytical Results Summary
MSO Environmental Sampling
City of Lawrence - Farmland
Lawrence, Kansas
August 2020

Location ID:		**BH-51**	**BH-51**	**BH-51**	**BH-51**
Sample Name:		**SO-081820-NL-040**	**SO-081820-NL-041**	**SO-081820-NL-042**	**SO-081820-NL-043**
Sample Date:		**08/18/2020**	**08/18/2020**	**08/18/2020**	**08/18/2020**
Depth:		**3.5-5 ft BGS**	**6-7.5 ft BGS**	**8.5-10 ft BGS**	**13.5-15 ft BGS**
Parameters	**Unit**				
General Chemistry					
Percent moisture	%	20.1	12.9	12.2	14
Ammonia	mg/kg	453 J-	104 J-	109 J-	207 J-
Nitrate (as N)	mg/kg	300	116	56.1	79.4
Nitrite (as N)	mg/kg	12.6 U	5.8 U	1.1 U	2.3 U
Nitrite/Nitrate	mg/kg	300	116 J-	56.1 J-	79.4 J-

Notes:

J- - Estimated concentration but result may be biased low

U - Not detected at the associated reporting limit
UJ - Not detected; associated reporting limit is estimated
N - Nitrogen
R - Rejected

Table 2

Analytical Results Summary
MSO Environmental Sampling
City of Lawrence - Farmland
Lawrence, Kansas
August 2020

Location ID:		**BH-51**	**BH-51**	**BH-52**	**BH-52**
Sample Name:		**SO-081820-NL-044**	**SO-081820-NL-038**	**SO-081820-NL-065**	**SO-081820-NL-066**
Sample Date:		**08/18/2020**	**08/18/2020**	**08/18/2020**	**08/18/2020**
Depth:		**18-18.5 ft BGS**	**0-1 ft BGS**	**0.25-0.75 ft BGS**	**0.75-2.5 ft BGS**
Parameters	**Unit**				
General Chemistry					
Percent moisture	%	19.1	16.2	11.7	16.8
Ammonia	mg/kg	241 J-	17.4 J-	372 J-	8 J-
Nitrate (as N)	mg/kg	65.2	21.4	35.4 J-	41.9 J-
Nitrite (as N)	mg/kg	2.5 U	1.2 U	R	1.7 J-
Nitrite/Nitrate	mg/kg	65.2 J-	21.4	35.4 J-	43.5 J-

Notes:

J- - Estimated concentration but result may be biased low
U - Not detected at the associated reporting limit
UJ - Not detected; associated reporting limit is estimated
N - Nitrogen
R - Rejected

Table 2

Analytical Results Summary
MSO Environmental Sampling
City of Lawrence - Farmland
Lawrence, Kansas
August 2020

Location ID:		**BH-52**	**BH-52**	**BH-52**	**BH-52**
Sample Name:		**SO-081820-NL-067**	**SO-081820-NL-068**	**SO-081820-NL-069**	**SO-081820-NL-070**
Sample Date:		**08/18/2020**	**08/18/2020**	**08/18/2020**	**08/18/2020**
Depth:		**3.5-5 ft BGS**	**6-7.5 ft BGS**	**8.5-10 ft BGS**	**13.5-15 ft BGS**
Parameters	**Unit**				
General Chemistry					
Percent moisture	%	4.7	19.5	18.9	19.1
Ammonia	mg/kg	39.5 J-	3560 J-	4130	5380
Nitrate (as N)	mg/kg	19 J-	410 J-	916 J-	1410 J-
Nitrite (as N)	mg/kg	1.7 J-	R	R	R
Nitrite/Nitrate	mg/kg	20.7 J-	410 J-	916 J-	1410 J-

Notes:

J- - Estimated concentration but result may be biased low
U - Not detected at the associated reporting limit
UJ - Not detected; associated reporting limit is estimated
N - Nitrogen
R - Rejected

Table 2

Analytical Results Summary
MSO Environmental Sampling
City of Lawrence - Farmland
Lawrence, Kansas
August 2020

Location ID:		**BH-53**	**BH-53**	**BH-53**	**BH-53**
Sample Name:		**SO-081920-NL-093**	**SO-081920-NL-094**	**SO-081920-NL-095**	**SO-081920-NL-096**
Sample Date:		**08/19/2020**	**08/19/2020**	**08/19/2020**	**08/19/2020**
Depth:		**0.75-1 ft BGS**	**1-2.5 ft BGS**	**3.5-5 ft BGS**	**6-7.5 ft BGS**
Parameters	**Unit**				
General Chemistry					
Percent moisture	%	7	5.2	4.6	18.2
Ammonia	mg/kg	1.1 UJ	1.7 J-	2.5 J-	2040 J-
Nitrate (as N)	mg/kg	1.3	1.1 U	1.4	245
Nitrite (as N)	mg/kg	1.1 U	1.1 U	1.1 U	6.1 U
Nitrite/Nitrate	mg/kg	1.3	1.1 U	1.4	245

Notes:

J- - Estimated concentration but result may be biased low

U - Not detected at the associated reporting limit
UJ - Not detected; associated reporting limit is estimated
N - Nitrogen
R - Rejected

Table 2

Analytical Results Summary
MSO Environmental Sampling
City of Lawrence - Farmland
Lawrence, Kansas
August 2020

Location ID:		**BH-53**	**BH-53**	**BH-53**	**BH-55**
Sample Name:		**SO-081920-NL-097**	**SO-081920-NL-098**	**SO-081920-NL-099**	**SO-081920-NL-089**
Sample Date:		**08/19/2020**	**08/19/2020**	**08/19/2020**	**08/19/2020**
Depth:		**8.5-10 ft BGS**	**8.5-10 ft BGS**	**13.5-15 ft BGS**	**0.75-1 ft BGS**
			Duplicate		
Parameters	**Unit**				
General Chemistry					
Percent moisture	%	24.5	29.1	22.4	13.1
Ammonia	mg/kg	3890 J-	4380 J-	5510 J-	1.8 J-
Nitrate (as N)	mg/kg	843	1250	2140	4.7
Nitrite (as N)	mg/kg	66.2 U	71.1 U	64.3 U	1.2 U
Nitrite/Nitrate	mg/kg	843	1250	2140	4.7

Notes:

J- - Estimated concentration but result may be biased low

U - Not detected at the associated reporting limit
UJ - Not detected; associated reporting limit is estimated
N - Nitrogen
R - Rejected

Table 2

Analytical Results Summary
MSO Environmental Sampling
City of Lawrence - Farmland
Lawrence, Kansas
August 2020

Location ID:		**BH-55**	**BH-55**	**BH-55**	**BH-58**
Sample Name:		**SO-081920-NL-090**	**SO-081920-NL-091**	**SO-081920-NL-092**	**SO-081920-NL-085**
Sample Date:		**08/19/2020**	**08/19/2020**	**08/19/2020**	**08/19/2020**
Depth:		**0.75-1 ft BGS**	**1-2.5 ft BGS**	**3.5-5 ft BGS**	**0.75-1 ft BGS**
		Duplicate			
Parameters	**Unit**				
General Chemistry					
Percent moisture	%	13.1	16.5	23.1	11
Ammonia	mg/kg	2.1 J-	1.2 J-	4.5 J-	60.5
Nitrate (as N)	mg/kg	4.4	1.4	1.3	73.2
Nitrite (as N)	mg/kg	1.1 U	1.2 U	1.3 U	2.2 U
Nitrite/Nitrate	mg/kg	4.4	1.4	1.3	73.2

Notes:

J- - Estimated concentration but result may be biased low

U - Not detected at the associated reporting limit
UJ - Not detected; associated reporting limit is estimated
N - Nitrogen
R - Rejected

Table 2

Analytical Results Summary
MSO Environmental Sampling
City of Lawrence - Farmland
Lawrence, Kansas
August 2020

Location ID:		**BH-58**	**BH-58**	**BH-58**	**BH-60**
Sample Name:		**SO-081920-NL-086**	**SO-081920-NL-087**	**SO-081920-NL-088**	**SO-081920-NL-077**
Sample Date:		**08/19/2020**	**08/19/2020**	**08/19/2020**	**08/19/2020**
Depth:		**0.75-1 ft BGS**	**1-2.5 ft BGS**	**3.5-5 ft BGS**	**0.75-1 ft BGS**
		Duplicate			
Parameters	**Unit**				
General Chemistry					
Percent moisture	%	11	18.6	18.4	9.9
Ammonia	mg/kg	70.3	1.2 U	1.2 U	94.9
Nitrate (as N)	mg/kg	62.2	2.4	10.2	8 J-
Nitrite (as N)	mg/kg	2.3 U	1.2 U	1.8	R
Nitrite/Nitrate	mg/kg	62.2	2.4	12	8 J-

Notes:

J- - Estimated concentration but result may be biased low

U - Not detected at the associated reporting limit
UJ - Not detected; associated reporting limit is estimated
N - Nitrogen
R - Rejected

Table 2

Analytical Results Summary
MSO Environmental Sampling
City of Lawrence - Farmland
Lawrence, Kansas
August 2020

Location ID:		**BH-60**	**BH-60**	**BH-60**
Sample Name:		**SO-081920-NL-078**	**SO-081920-NL-079**	**SO-081920-NL-080**
Sample Date:		**08/19/2020**	**08/19/2020**	**08/19/2020**
Depth:		**0.75-1 ft BGS**	**1-2.5 ft BGS**	**3.5-5 ft BGS**
		Duplicate		
Parameters	**Unit**			
General Chemistry				
Percent moisture	%	10.6	15	18.8
Ammonia	mg/kg	91.5	191	769
Nitrate (as N)	mg/kg	7.1 J-	38.5 J-	387 J-
Nitrite (as N)	mg/kg	R	1.6 J-	R
Nitrite/Nitrate	mg/kg	7.1 J-	40.1 J-	387 J-

Notes:

J- - Estimated concentration but result may be biased low

U - Not detected at the associated reporting limit
UJ - Not detected; associated reporting limit is estimated
N - Nitrogen
R - Rejected

Table 3

Analytical Methods
MSO Environmental Sampling
City of Lawrence - Farmland
Lawrence, Kansas
August 2020

Parameter		Method [1]	Matrix	Holding Time Collection or Extraction to Analysis (Days)
General Chemistry	Ammonia	EPA 350.1	Soil	28
	Nitrate as N	EPA 353.2	Soil	28
	Nitrite as N	EPA 353.2	Soil	28
	Nitrite/Nitrate-N	EPA 353.2	Soil	28

Notes:

[1] - "Methods for Chemical Analysis of Water and Wastes," EPA-600/4-79-020, March 1983 (with all subsequent revisions)

N - Nitrogen

Table 4

Qualified Sample Data Due to Outlying Matrix Spike Recoveries
MSO Environmental Sampling
City of Lawrence - Farmland
Lawrence, Kansas
August 2020

Parameter	Spiked Sample ID	Analyte	MS % Recovery	Control Limits % Recovery	Associated Sample IDs	Qualified Result		Units
General Chemistry	SO-081720-NL-018	Ammonia	79	80-120	SO-081720-NL-018	174	J-	mg/kg
					SO-081720-NL-009	759	J-	mg/kg
					SO-081720-NL-010	967	J-	mg/kg
					SO-081720-NL-011	747	J-	mg/kg
					SO-081720-NL-012	602	J-	mg/kg
					SO-081720-NL-013	372	J-	mg/kg
					SO-081720-NL-014	282	J-	mg/kg
					SO-081720-NL-015	247	J-	mg/kg
					SO-081720-NL-016	1050	J-	mg/kg
					SO-081720-NL-017	716	J-	mg/kg
					SO-081720-NL-019	189	J-	mg/kg
					SO-081270-NL-020	177	J-	mg/kg
					SO-081720-NL-021	72.6	J-	mg/kg
					SO-081720-NL-022	894	J-	mg/kg
					SO-081720-NL-023	633	J-	mg/kg
					SO-081720-NL-024	381	J-	mg/kg
					SO-081720-NL-025	161	J-	mg/kg
					SO-081720-NL-026	1	UJ	mg/kg
					SO-081720-NL-027	1.1	UJ	mg/kg
					SO-081720-NL-028	79.8	J-	mg/kg
General Chemistry	SO-081720-NL-029	Ammonia	7	80-102	SO-081720-NL-029	189	J-	mg/kg
					SO-081720-NL-030	147	J-	mg/kg
					SO-081720-NL-031	260	J-	mg/kg
					SO-081720-NL-032	379	J-	mg/kg
					SO-081820-NL-033	8.5	J-	mg/kg
					SO-081820-NL-034	22.7	J-	mg/kg
					SO-081820-NL-035	42.7	J-	mg/kg
					SO-081820-NL-036	43.7	J-	mg/kg
					SO-081820-NL-037	47.1	J-	mg/kg

Table 4

Qualified Sample Data Due to Outlying Matrix Spike Recoveries
MSO Environmental Sampling
City of Lawrence - Farmland
Lawrence, Kansas
August 2020

Parameter	Spiked Sample ID	Analyte	MS % Recovery	Control Limits % Recovery	Associated Sample IDs	Qualified Result		Units
General Chemistry	SO-081820-NL-038	Ammonia	53	80-120	SO-081820-NL-038	17.4	J-	mg/kg
					SO-081820-NL-039	493	J-	mg/kg
					SO-081820-NL-040	453	J-	mg/kg
					SO-081820-NL-041	104	J-	mg/kg
					SO-081820-NL-042	109	J-	mg/kg
					SO-081820-NL-043	207	J-	mg/kg
					SO-081820-NL-044	241	J-	mg/kg
					SO-081820-NL-045	18.3	J-	mg/kg
					SO-081820-NL-046	12	J-	mg/kg
					SO-081820-NL-047	631	J-	mg/kg
					SO-081820-NL-048	357	J-	mg/kg
					SO-081820-NL-049	48.1	J-	mg/kg
					SO-081820-NL-050	82.8	J-	mg/kg
					SO-081820-NL-051	32.5	J-	mg/kg
					SO-081820-NL-052	10.2	J-	mg/kg
					SO-081820-NL-053	1.1	UJ	mg/kg
					SO-081820-NL-054	1.2	UJ	mg/kg
					SO-081820-NL-055	145	J-	mg/kg
					SO-081820-NL-056	326	J-	mg/kg
					SO-081820-NL-057	337	J-	mg/kg

Table 4

Qualified Sample Data Due to Outlying Matrix Spike Recoveries
MSO Environmental Sampling
City of Lawrence - Farmland
Lawrence, Kansas
August 2020

Parameter	Spiked Sample ID	Analyte	MS % Recovery	Control Limits % Recovery	Associated Sample IDs	Qualified Result		Units
General Chemistry	SO-081820-NL-058	Ammonia	71	80-120	SO-081820-NL-058	137	J-	mg/kg
					SO-081820-NL-059	24.2	J-	mg/kg
					SO-081820-NL-060	188	J-	mg/kg
					SO-081820-NL-061	791	J-	mg/kg
					SO-081820-NL-062	1040	J-	mg/kg
					SO-081820-NL-063	1520	J-	mg/kg
					SO-081820-NL-064	1180	J-	mg/kg
					SO-081820-NL-065	372	J-	mg/kg
					SO-081820-NL-066	8	J-	mg/kg
					SO-081820-NL-067	39.5	J-	mg/kg
					SO-081820-NL-068	3560	J-	mg/kg
General Chemistry	SO-081920-NL-089	Ammonia	75	80-120	SO-081920-NL-089	1.8	J-	mg/kg
					SO-081920-NL-090	2.1	J-	mg/kg
					SO-081920-NL-091	1.2	J-	mg/kg
					SO-081920-NL-092	4.5	J-	mg/kg
					SO-081920-NL-093	1.1	UJ	mg/kg
					SO-081920-NL-094	1.7	J-	mg/kg
					SO-081920-NL-095	2.5	J-	mg/kg
					SO-081920-NL-096	2040	J-	mg/kg
					SO-081920-NL-097	3890	J-	mg/kg
					SO-081920-NL-098	4380	J-	mg/kg
					SO-081920-NL-099	5510	J-	mg/kg

Table 4

Qualified Sample Data Due to Outlying Matrix Spike Recoveries
MSO Environmental Sampling
City of Lawrence - Farmland
Lawrence, Kansas
August 2020

Parameter	Spiked Sample ID	Analyte	MS % Recovery	Control Limits % Recovery	Associated Sample IDs	Qualified Result		Units
General Chemistry	SO-081820-NL-061	Nitrate (as N)	0	85-115	SO-081820-NL-061	R		
					SO-081820-NL-062	27.9	J-	mg/kg
					SO-081820-NL-063	58.2	J-	mg/kg
					SO-081820-NL-064	161	J-	mg/kg
					SO-081820-NL-065	35.4	J-	mg/kg
					SO-081820-NL-066	41.9	J-	mg/kg
					SO-081820-NL-067	19	J-	mg/kg
					SO-081820-NL-068	410	J-	mg/kg
					SO-081820-NL-069	916	J-	mg/kg
					SO-081820-NL-070	1410	J-	mg/kg
					SO-081820-NL-071	643	J-	mg/kg
					SO-081820-NL-072	556	J-	mg/kg
					SO-081820-NL-073	128	J-	mg/kg
					SO-081820-NL-074	173	J-	mg/kg
					SO-081820-NL-075	332	J-	mg/kg
					SO-081820-NL-076	2710	J-	mg/kg
					SO-081920-NL-077	8	J-	mg/kg
					SO-081920-NL-078	7.1	J-	mg/kg
					SO-081920-NL-079	38.5	J-	mg/kg
					SO-081920-NL-080	387	J-	mg/kg

Table 4

Qualified Sample Data Due to Outlying Matrix Spike Recoveries
MSO Environmental Sampling
City of Lawrence - Farmland
Lawrence, Kansas
August 2020

Parameter	Spiked Sample ID	Analyte	MS % Recovery	Control Limits % Recovery	Associated Sample IDs	Qualified Result		Units
General Chemistry	SO-081820-NL-061	Nitrite (as N)	-4	90-110	SO-081820-NL-061	2.2	J-	mg/kg
					SO-081820-NL-062	2.2	J-	mg/kg
					SO-081820-NL-063	2.2	J-	mg/kg
					SO-081820-NL-064		R	
					SO-081820-NL-065		R	
					SO-081820-NL-066	1.7	J-	mg/kg
					SO-081820-NL-067	1.7	J-	mg/kg
					SO-081820-NL-068		R	
					SO-081820-NL-069		R	
					SO-081820-NL-070		R	
					SO-081820-NL-071		R	
					SO-081820-NL-072		R	
					SO-081820-NL-073		R	
					SO-081820-NL-074		R	
					SO-081820-NL-075		R	
					SO-081820-NL-076		R	
					SO-081920-NL-077		R	
					SO-081920-NL-078		R	
					SO-081920-NL-079	1.6	J-	mg/kg
					SO-081920-NL-080		R	

Table 4

Qualified Sample Data Due to Outlying Matrix Spike Recoveries
MSO Environmental Sampling
City of Lawrence - Farmland
Lawrence, Kansas
August 2020

Parameter	Spiked Sample ID	Analyte	MS % Recovery	Control Limits % Recovery	Associated Sample IDs	Qualified Result		Units
General Chemistry	SO-081820-NL-051	Nitrite/Nitrate	64	90-110	SO-081820-NL-051	50.7	J-	mg/kg
					SO-081820-NL-041	116	J-	mg/kg
					SO-081820-NL-042	56.1	J-	mg/kg
					SO-081820-NL-043	79.4	J-	mg/kg
					SO-081820-NL-044	65.2	J-	mg/kg
					SO-081820-NL-045	44.6	J-	mg/kg
					SO-081820-NL-046	67.7	J-	mg/kg
					SO-081820-NL-047	358	J-	mg/kg
					SO-081820-NL-048	547	J-	mg/kg
					SO-081820-NL-049	687	J-	mg/kg
					SO-081820-NL-050	176	J-	mg/kg
					SO-081820-NL-052	24.2	J-	mg/kg
					SO-081820-NL-053	2.9	J-	mg/kg
					SO-081820-NL-054	41.2	J-	mg/kg
					SO-081820-NL-055	43.3	J-	mg/kg
					SO-081820-NL-056	53	J-	mg/kg
					SO-081820-NL-057	31.6	J-	mg/kg
					SO-081820-NL-058	39.2	J-	mg/kg
					SO-081820-NL-059	1.2	UJ	mg/kg
					SO-081820-NL-060	1.2	UJ	mg/kg

Table 4

Qualified Sample Data Due to Outlying Matrix Spike Recoveries
MSO Environmental Sampling
City of Lawrence - Farmland
Lawrence, Kansas
August 2020

Parameter	Spiked Sample ID	Analyte	MS % Recovery	Control Limits % Recovery	Associated Sample IDs	Qualified Result	Units
General Chemistry	SO-081820-NL-061	Nitrite/Nitrate	-1	90-110	SO-081820-NL-061	1.7 J-	mg/kg
					SO-081820-NL-062	30.1 J-	mg/kg
					SO-081820-NL-063	60.4 J-	mg/kg
					SO-081820-NL-064	161 J-	mg/kg
					SO-081820-NL-065	35.4 J-	mg/kg
					SO-081820-NL-066	43.5 J-	mg/kg
					SO-081820-NL-067	20.7 J-	mg/kg
					SO-081820-NL-068	410 J-	mg/kg
					SO-081820-NL-069	916 J-	mg/kg
					SO-081820-NL-070	1410 J-	mg/kg
					SO-081820-NL-071	643 J-	mg/kg
					SO-081820-NL-072	556 J-	mg/kg
					SO-081820-NL-073	128 J-	mg/kg
					SO-081820-NL-074	173 J-	mg/kg
					SO-081820-NL-075	332 J-	mg/kg
					SO-081820-NL-076	2710 J-	mg/kg
					SO-081920-NL-077	8 J-	mg/kg
					SO-081920-NL-078	7.1 J-	mg/kg
					SO-081920-NL-079	40.1 J-	mg/kg
					SO-081920-NL-080	387 J-	mg/kg

Notes:

J- - Estimated concentration, result may be biased low
MS - Matrix Spike
N - Nitrogen
R - Rejected
UJ - Not detected; associated reporting limit is estimated

about GHD

GHD is one of the world's leading professional services companies operating in the global markets of water, energy and resources, environment, property and buildings, and transportation. We provide engineering, environmental, and construction services to private and public sector clients.

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N 1500 RD. (E. 15TH STREET)

E. 15TH STREET (N 1500 RD.)

BNSF RAILWAY

BNSF RAILROAD R/W

BAG WAREHOUSE

LOT 1
BLOCK E
FORMER FARMLAND PROPERTY

TRACT 'E'
FORMER FARMLAND PROPERTY

BUILDING C

BUILDING B

BUILDING A

MSO-CONDITIONED STORAGE

SOLID WASTE DIVISION

CENTRAL MAINTENANCE GARAGE

FUEL

TANK/CISTERN

HHW

FACILITIES

HORTICULTURE & FORESTRY

NURSERY

LOT 1
BLOCK C
FORMER FARMLAND PROPERTY

LOT 3

GREEN WAY
TRACT 'A'

BULK WAREHOUSE

NORTH SUMP

SOUTH SUMP

NORTHWEST SUMP

PUMP

MW PW-08 (LA)

MW PW-05 (LA/BR)

MW PW-06 (BR)

MW PSW-09B

MW PSW-09A

MW PSW-05A (UA)

MW PSW05B (LA)

MW PSW-04A (LA/BR)

MW PSW-18 (UA)

MW PW-02 (LA/BR)

MW PW-26 (BR)

MW PW-03A (UA)

MW PSW-03B (LA)

MW PSW-08

MW N-01

19TH STREET

CONNELL ROAD

COUNTRY VIEW DRIVE

RUNNER DRIVE

1 Inch = 125' ft.

CFS ENGINEERS
cfse.com

Mark	Description	Date

Designed by: RLW
Date: 08-17-20
Drawn by: RLW
Ckd by: AJG
Reviewed by: AJG
Submitted by: AJG
Plot scale: NTS
File name=191196-SITE PLAN.dwg
Plot date=10/01/15

Concept Plans

Site Layout

MSO-Field Operations Facility

Lawrence, Kansas

Sheet reference number:
1

Lawrence Field Operations Campus Responses to Public Questions

22 September 2020
Revised 20 October 2020

A number of questions concerning the Lawrence Field Operations Campus have been raised in the Public Information Meeting on 31 August 2020 and the City Commission Meeting on 15 September 2020. This document is intended to respond to those questions.

1. **Why was the Brook Creek location selected rather than another one of the 12 sites?**

   There was a formal site selection process, in which the sites were evaluated according to criteria developed by a city-appointed committee. The selected site was appealing because of ownership (city-owned), size, appropriate industrial use, access to major arterials, and the opportunity to remediate a contaminated site.*

   With regard to traffic on 19th Street the following additional information is provided:

   - Truck traffic will be routed to 23th & O'Connell.
   - 19th Street is not a truck route.
   - Only trucks on 19th Street will be what is seen today, for direct service to that neighborhood.
   - Traffic study estimated 10% of newly generated trips (employees in personal vehicles coming to and from work) using 19th Street. This equates to 13-19 vph in the am & pm peaks, in full buildout.
   - The City will be able to direct fleet truck traffic down to 23rd Street more so than any other industrial user.**
   - Design team recommends keeping the "T" intersection as it is reflected in the concept plan.

   *Additional comment / question: Were any other sites near neighborhoods? If so, which ones?

   Response: 6 of the 12 sites evaluated met the size requirements. 2 of the 6 were the Farmland site and the VenturePark site immediately south of the Farmland site (also adjacent to this neighborhood). The other 4 sites that met the size requirements had several issues that caused them to score lower including: not City-owned, not for sale,

not in City limits, current interest from developers. Other City-owned properties are 25 to 45 acres and not sufficiently sized for the Field Operations Campus.

**Additional comment / question: “why were designers / planners not similarly concerned with traffic 340 feet behind a neighborhood”

Response: The 340 foot dimension is from the edge of the MSO building / fuel island. The distance from neighborhood property lines to the vehicle circulation spine is over 640 feet. The Central Maintenance Garage is even farther away from the neighborhood--700 feet. During Schematic Design, the City will look at the potential of modifying the property line at the southwest corner of the site to increase the distance to the neighborhood. In this case, an even more substantial earth berm could be established.

2. **Wouldn’t it be better to locate the facility on something other than a toxic site that, as far as residents of Brook Creek know, has not been sufficiently remediated?**

   It is a goal of the City to safely remediate the site per Kansas Department of Health & Environment requirements. The construction of a phased Field Operations Campus provides an opportunity to remediate it in a safe manner, through GHD’s recommended strategies of capping (pavement and buildings) and cover (deep rooted vegetation on properly prepared soils.) There are efficiencies and cost-savings associated with having the project contribute to the remediation goals.

   Additional comment / question: What, exactly are the approaches that will meet KDHE requirements. How do plans correlate with or respond to issues/information in the 2006 Remediation Plan?

   Response: from Trevor Flynn, General Manager – Environment, Health and Science Municipal Services & Operations | City of Lawrence, KS:

   “The next steps are to evaluate the remedial options in the [GHD] Cost Benefit Analysis report and develop a remedial design plan. Revisions to the Remedial Action Plan will be completed in 2021 as part of this process. The purpose of the CBA and the overall GHD project is to assess the remedial action plan and update it to ensure remedial objectives are being met.”

Additional comment / question: This response leads to an additional question: Why were plans made for the site prior to “assess[ing] the remedial action plan and updat[ing] it to ensure remedial objectives are being met.”?

Response: The Master Plan process and the process to finalize a remediation strategy go hand in hand. Because paving and building floor slabs offer an acceptable strategy to cap the site, the Master Plan will benefit GHD as they develop final recommendations.

3. **Why was this plan developed before the GHD report is finalized?**

Programming and planning for the Field Operations Campus is a process that was not site specific--it was not dependent on where the final site was. The Design Team received an initial study from GHD before “test fits” on the site began--helped focus a strategy for the campus design and for construction phasing. The project is currently in Master Planning, and full coordination between the Design Team and GHD will continue into Schematic Design and beyond.

Additional comment / question: Is it usual to proceed with programming and planning/devising a specific plan that is not site specific? If so, will the submitted plan work at other sites?

Response: Selection of the Farmland site was discussed in the response to question 1. Based on the limited number of other sites that meet the requirements for the Field Operations Campus and the potential beneficial reuse of the Farmland site, it is unlikely that other sites will be pursued.

a. **When will Brook Creek residents be privy to the GHD report?**

The GHD report and other documentation related to the Farmland site will be located on the City’s Farmland project website: https://lawrenceks.org/farmland/.

Additional comment / question: Again, according to an email to us from Trevor Flynn, General Manager – Environment, Health and Science Municipal Services & Operations | City of Lawrence, KS: “The City will add these reports to the Farmland website within the next few weeks, GHD has one deliverable that is being corrected that will size the electronic files appropriately for web access. The reports are additionally publically available through a Kansas Open Records Act request through KDHE or the City.”

Members of the public cannot make an informed decision when they don't have all of the information regarding proposals.

Response: The Data Gap Study and Cost Benefit Analysis reports from GHD have been added to the Farmland project website.

4. **According to the plan, "Distance, vegetation and structures will all be utilized to mitigate sounds of operational activity." That statement raises a number of questions?**
    a. **What specific studies or evidence is there to support the statement that sound and other pollutants can be mitigated by such measures?**

Controlling the effects of sound impacts on residential areas to the west of the Campus are important to the Design Team--being a great neighbor is one of the Project Imperatives. The two most impactful means to reduce sound transmission are providing distance between the source and the receiver, and creating barriers near the source. The project will benefit from a minimum of 340 feet between the west wall of the MSO building and the residential property line. This distance will reduce sound significantly. The project will also benefit from the shielding effect of the building itself, which traverses the west side of the site. In addition, earth berming will be provided at the south end of the site, which is also an effective barrier. Some tree species can also provide benefit. The Design Team is only in Master Planning at the time, and further strategies will be developed during Schematic Design and beyond. It is the intent of the Design Team to include analysis and recommendations by an acoustician.

Additional comment / question: If we can now hear the one or two trucks that occasionally use McConnel Road, what assurances do we have that we won't hear multiple trucks? Why wasn't an acoustician not hired prior to designing the plan? Finally, again, what evidence do you have that the approaches you plan to use are effective? Why not plant evergreen plans all around the facility, but particularly by the border between the proposed facility and the neighborhood? (BTW, have you ever heard the noise generated by one Lawrence Recycling truck when it is in your neighborhood? –We are not referring to the whirr of the pick up arm; rather, the noise of the motor.)

Response: The Master Plan process focused on programming the campus, developing a sustainable design strategy, and outlining a conceptual vision for the site to be explored further during Schematic Design. The Master Plan that was developed during this process balances issues of functionality, adjacency, daily operation, neighborhood

impacts, site grading, remediation potential and eventual construction phasing on this site. During Schematic Design, an acoustician will be at the table at the earliest meetings, to provide further insight into best practices on noise reduction. In preliminary discussions with him, he was encouraged by the distances being proposed between vehicular circulation spines and the neighborhood, and in the potential of berming to further alleviate noise issues.

b. Is the intent to simply mitigate (that is, "to make less severe;" to lessen in force or intensity, as wrath, grief, harshness, or pain; moderate?")?

The intent of the city is to be a good neighbor and to reduce the impact of sound generated by the Campus operation, through distance and barriers. The Field Operations Campus will operate respectfully, within the requirements of all ordinance requirements.

Additional comment / question: What is the city ordinance for properties such as the planned facility? Is the ordinance the same as that for residential areas? If not, what are the differences? We understand you want to be a good neighbor and to operate respectfully, but more specificity would be reassuring.

Response: City Code 20-1005 sets bufferyard requirements to mitigate the impacts associated with incompatible land uses on adjacent properties. The requirements in this Code will be exceeded by the Field Operations Campus.

c. If so, whose/what standards of mitigation will be used?

See responses above. The Field Operations Campus will operate respectfully, within the requirements of all ordinance requirements. The Design Team will engage in this issue fully during Schematic Design.

5. It appears the maintenance and fueling station will be closest to the tree line separating the facility from the neighborhood.

a. Why are these buildings that will have heavy traffic (currently 223 vehicles and 312 in the future) located so close to the neighborhood?

The Campus was planned with sound control in mind. The MSO building (the long building to the west of the site) serves as a sound buffer. Vehicular activities within the building are limited to leaving the facility to go do their work at the beginning of the day (they exit to the east of the facility) and parking at the end of the day. The walls of the

building themselves act as a buffer--and the distance from neighborhood property lines to the vehicle circulation spine is over 640 feet. The Central Maintenance Garage is even farther away from the neighborhood--700 feet. Campus planning led to an arrangement of buildings that reduces onsite circulation to a minimum, which reduces the amount of sound generated.

Additional comment / question: Is the road by which vehicles enter and leave the facility 640 feet or closer to 340 feet?

Response: The entrance road at the southwest corner of the property is approximately 200 feet from the property line. It is separated from the neighborhood by an earth berm to reduce noise impacts.

The 200 feet is the closest point of the entrance road to the neighborhood to make the connection to 19th & O'Connell Road. The entrance road will then angle to the northeast, away from the neighborhood to enter the campus. Distance, berming, existing trees, proposed trees and fencing will all be studied during Schematic Design to reduce and minimize noise impacts to the neighborhood.

b. What evidence do you have that the building and trees (particularly when the trees are bare) will provide a sufficient barrier for sound, light, and fumes?

See previous responses for sound issues. With regard to trees--they are somewhat beneficial, but the majority of sound attenuation comes from distance, and the barriers created by the buildings themselves. A north-south running earth berm will be designed to add an additional barrier at the southwest portion of the site, i.e. at the entrance drive.*

Light pollution will be dealt with via standard LED fixtures with favorable "cut offs" designed specifically to eliminate light spill beyond property lines. A photometric plan will be developed during the planning process to meet City requirements.

On the fumes issues, more study will occur during Schematic Design--but suffice it to say that the City will not support any Campus Plan that introduces fumes from fueling into the neighborhood. Based on CAPCOA California Air Pollution Control Officers Association emission estimates, the California Air Resources Board (CARB) determined their setback regulation of 300 feet (91 meters) from large fueling stations. The Campus plan is showing the Fuel Island at a minimum of 340 feet away.

*Additional comment / question: What is the distance between the berm and the tree line and building that will reduce sound? What is the plan for reducing sound in that area? As mentioned above, why not plan evergreens in this area?

Response: The berm will occupy the area between the entrance road and the property line. The distance from the centerline of the entrance road to the property line is approximately 200' at 19th & O'Connell. This distance increases as you go north. During Schematic Design, the Design Team will study the positive impacts of evergreen trees--it is very likely an effective strategy.

c. **The plan asserts that for every tree removed, three will be planted in its place. Will those trees be planted in the tree line or placed around the campus?**

Although this will be explored in Schematic Design, one goal of the Landscape Design would be to introduce berming to the northwest of the site, and evergreen trees along the west boundary.

Additional comment / question: More specificity in the initial plan would do much to alleviate concerns; as it is, we have only a statement that the goal is to provide evergreen trees. With regard to the latter, would those be added to the existing tree line as well as in the space where there are no trees?

Response: Detailed Landscape Plans were not in the Master Planning scope. During Schematic Design, the Design Team will study the most effective locations of trees. Planting evergreen trees to aid in sound mitigation will likely be a high priority.

6. **From 23rd street, the main entrance to the facility runs along the border of the neighborhood. The 292 staff vehicles, and 223 city vehicles, particularly large trucks, will create significant noise.**
   a. **Why not place the entrance farther away (i.e., farther east) from the neighborhood?**

The entrance was located to connect the Campus to the closest street/public right-of-way, which is 19th Street & O'Connell Road. O'Connell Road also has direct access to 23rd Street, and has the capacity to support traffic generated by the development. In addition, moving the entrance to the east would remove acreage from that parcel and make it less desirable for future development as part of the Lawrence VenturePark initiative.

Additional comment / question: Why not move the entrance/road so it comes between Buildings 4 and 5, the Solid Waste Division and the Facilities Management Division, respectively? Even better, why not "flip" the plan and locate the first buildings to be constructed to the east?

Response: The least amount of soil remediation that will be required is likely under the "MSO" Building which is part of the reason it is selected as Phase 1. Soil remediation is more likely under the CMG and Solid Waste buildings because of the amount of cut that will be required to level the site.

Regardless of vehicular circulation within the site, access will need to be at 19th & O'Connell Road.

Additional comment / question: Again, according to an email to us from Trevor Flynn, General Manager – Environment, Health and Science Municipal Services & Operations | City of Lawrence, KS, "During geotechnical analysis that is required for civil design, soil samples were taken to ensure that the City, the design team, and the GHD team have an understanding of soil conditions in all areas where buildings have been proposed. The proposed location of the buildings is not directly related to the areas on site where impacted soil exists. The primary reason that the more western buildings are being considered for construction first is access from O'Connell Road." In a plan that will cost millions and millions of dollars, why not consider the residents of a neighborhood rather than only the cost of cutting an additional road?

Response: The proposed access road to the Field Operations Campus is the closest access to the public right of way at 19th and O'Connell. The access drive to the Campus is in a location between easements that will not impact the VenturePark lot east of 19th and O'Connell and south of the Farmland site. Shifting the access drive east will require an access easement or right of way from the VenturePark lot and will reduce the size of that lot. Many factors and layouts of this development were considered before this layout was selected, and the neighborhood was an important consideration.

Aside from the berm, what other light and sound barriers are planned?

See previous responses on design elements related to light pollution control and sound barriers.

7. **The Plan says buildings, sidewalks, and parking lots will assure no air, ground, or water pollution.**
    a. **What evidence is there for that?**
    b. **Who studied soil samples from the site?**
    c. **What was found in the soil samples?**
    d. **Is the assumption that five feet of top soil will suffice to assure soil will not be disturbed during construction?**
    e. **What will happen when and if the soil is disturbed for construction of the campus?**
    f. **What will happen when the buildings compact the soil beneath them?**

    The final Remediation Report from GHD will address these questions. The Design Team has coordinated with GHD thus far and looks forward to working closely with them during Schematic Design to implement their recommendations.

    Additional comment / question: As we mention above, the GHD report is not available on line; in fact, only recently did we know such a report exists. What evidence is there that the remediation recommendations will not greatly increase the cost of this location?

    Response: Remediation of the Farmland site will be required regardless of the location of the Field Operations Campus. Using the buildings and parking lots as a cap over the impacted soils may be a viable remediation strategy that is acceptable to KDHE. This will result in efficiencies and savings in costs compared to building the campus on another site, in addition to remediating this site.

    g. **What assurance is there of containment of air pollution, e.g., fumes from the fueling system to mention only one.**

    See previous response with regard to fueling. The Design Team looks forward to further study (location of tanks, infrastructure, dispensing layouts) during Schematic Design to identify more specific materials and systems. New technologies will be explored, including features such as fuel vapor recovery, alternative fuels, and fuel storage methodologies. One best practice that is being designed into the Campus is the location of dedicated washbays at each of the Campus buildings. Improving the speed and efficiency with which trucks are washed will increase the frequency of washing, and reduce fumes.

Additional comment / question: We are not trained in architecture, engineering, etc., but it appears the issues you cite as needing further study should have been given more attention in conceiving the plan.

Response: The level of detail the Design Team provided for the Master Plan is consistent with the scope that was requested by the City. The Master Plan was developed with best practices in mind, and full attention will be given during Schematic Design to further define design elements related to the fueling system.

8. **What are the plans to assure no toxic run-off from use of facilities?**

With regard to remediation issues, refer to previous response. With regard to operational practices, Campus buildings are planned to contain vehicles and operations indoors and undercover wherever possible to reduce the potential for contamination due to equipment handling. The Campus will be designed with a goal of being an exemplar of a municipal field operations facility. The design will provide for up-to-date safety measures and implementation of best practices to handle operations efficiently and safely to reduce potential for accidents harmful to staff and residents. There will be a focus on safely handling and storing fluids for distribution and disposal. There will be dedicated containment of bulk materials such as salt and sand. Also, the new location is out of the floodway and floodplain, ensuring those events do not create larger pollution potential from existing operational sites.

9. **Since there are no fences included in the plan, what measures will be taken to assure security of the facility?**

A security programming meeting will be conducted during Schematic Design to determine the desired level of security. The goal is to establish appropriate security measures promoting safety and limiting the potential of foul play, without creating the negative perceptions associated with tall fences topped with razor wire. The current Campus Plan includes gates to avoid unauthorized vehicles within the perimeter of Campus, combined with limited fencing, signage and landscape barriers to restrict unauthorized pedestrians from entering. Natural topographic features will also help limit access.

Additional comment / question: In view of the choice of a toxic waste site, it seems more and earlier attention and thought would have been given to “the desired level of security.”

Response: The Master Plan describes a design with a wide range of potential security strategies. The City's security goals will be a primary area of focus as the Design Team moves forward into Schematic Design.

10. **The plan states that the 15th street entry/exit will be used only for emergencies.**
    a. **What risk assessment has been made, say, for example, for hazardous waste fires, explosions, etc.?**

    The Design Team held a Pre-application meeting with the City to discuss the project. The Fire Department is aware of the project and made a few requests related to access and safety that were accommodated. Moving forward into Schematic Design, the development will meet all requirements of the Fire Department. Safeguards include: sprinklered buildings; 2nd feed for water line off of 15th street; fire truck access at perimeter of all buildings; and the fact that none of the facilities generate hazardous materials. With regard to Household Hazardous Waste collecting hazardous materials, they are currently operating in a safe and up-to-date facility, and are not planned to join the campus for many years. When that time comes, the facility will be designed with the latest safeguards.

    b. **What assessment of potential threat to the neighborhood has been made in case of fire or explosion at the facility?**

    Fuel Island tanks and dispensers will be designed to meet all current regulations. Fire truck access will be provided per Lawrence requirements around all buildings. The number of fire hydrants and spacing within the development will meet Fire Department requirements. All access roads will meet an unobstructed width of not less than 26 feet meeting Fire Department requirements. 2 site access points will be provided meeting Fire Department requirements. Auto-Turn analysis has been completed to verify a 49' firetruck can navigate that site. All buildings will be built with fire sprinklers and fire department connections.

11. **Have owners of vacant lots on 17th street been notified of these plans?**
    a. **What is the projected impact on the value of, and, therefore, tax on, new homes to be built on 17th street?**
    b. **What is the projected impact on the value of, and, therefore, tax on, existing homes in the neighborhood?**

The City issued a press release to notify the public of the public information meeting and provided door hanger notifications to the homeowners in the neighborhood west of the site. During upcoming Schematic Design, the entitlements and planning process will include notifying surrounding property owners. The proposed use is consistent with Lawrence VenturePark.

12. **Lastly, why did you choose the most economically and ethnically diverse neighborhood for a project to be built on a toxic site? What specific factors did you discuss with regard to "public acceptance"? How does this plan support the city's recently declared intention to study and address issues of race and ethnicity?**

    Providing a safe, healthy, functional, durable operation for the city with as minimal impact as possible to the neighborhood is a Project Imperative that will be achieved by the Design Team. Currently, the site is in need of remediation--the Field Operations Campus contributes significantly to achieve this goal. With regard to site selection, it was the desire of the city to find a site big enough for the operation, with vehicular access that did not disrupt a neighborhood, with an appropriate industrial use. The potential of using the project to catalyze remediation efforts was seen as a positive aspect for the neighborhood. Also, it should be noted that the Lawrence workforce is very diverse, and many of these essential workers are currently working in conditions that are in need of improvement, and on a site with a risk of flooding. A major goal of the project is to provide them with an exemplary, safe and healthy place to work.

    Additional comment / question: Isn't it possible to provide a solution that not only improves the worksite conditions of a diverse workforce but also does not infringe on a diverse neighborhood? Why do you make this an "either or" issue (i.e., the logical fallacy of "false dilemma")? Why provide a solution that potentially pits members of your diverse community against each other? The City of Lawrence often proclaims its commitment to diversity and just as often raises the need for more affordable and attractive housing. How does this plan square with those proclamations and concerns.

    Response: Selection of the Farmland site was discussed in the response to question 1. Development of the Field Operations Campus in this location is not intended to create a negative environment with the adjacent neighborhoods. The project is intended to align with the City's Strategic Plan including addressing deferred facility needs, improving

service efficiency and resiliency, promoting environmental stewardship, compliance and sustainability, and promoting employee safety, well-being and morale.

Additional Questions provided to Commissioner Lisa Larsen and Trevor Flynn with responses from Trevor.

13. **Have City Commissioners seen the Cost Benefit Analysis?**

    City Commissioners have been provided access to the GHD reports.

14. **What assurance do you have regarding the projected costs of the revised remedial action plan?**

    The projected costs are estimated based on the Cost-Benefit Analysis, which will be better understood as the remediation alternatives and options are fully evaluated. Remediation projects are complex and alternatives are commonly identified to adapt strategies to provide reasonable assurances that the outcomes will be achieved, whereas costs will vary among the strategies implemented.

15. **Why did the plan for the Farmland site proceed prior to the revisions of the Remedial Action Plan.**

    See Question 3 response above.

16. **Our questions/concerns regarding the last three answers: We understand the only/primary reason for beginning construction on the western edge of the site is the existing road. If so, in a project that will cost millions and millions of dollars, why not consider the residents of a neighborhood rather than the sole focus of the cost of cutting an additional road?**

See Question 6 response above.

17. **Moreover, if the remediation plan is accepted and put into place, and the City determines to use the site as proposed, why not address the remaining source of light pollution by planting evergreen trees on the east, south, and west sides of the site? Why not flip the entrance to the east?**

See Question 4 response above.