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Part B Elements

The preceding Part A of this report, prepared by Resource Planning Group Inc. (RPG), focuses on the program and service elements related to the proposed South Muskoka Memorial Hospital Redevelopment. The following sections constituting Part B, prepared by Stantec Architecture Ltd. (SAL), address specific spatial requirements, along with other physical and capital cost elements.

The intent of the proposed project is to provide a new acute care hospital building for the Bracebridge Site of the Muskoka Algonquin Healthcare organization. Our proposed planning approach aims to provide the required physical infrastructure to deliver the programs and services prescribed in the Functional Program. In addition, as the hospital will be located on a greenfield site, extensive due diligence was completed to ideally locate and design the building and services for the site.

In developing these Part B elements, we have worked in conjunction with the programming team, the MAHC Redevelopment group, and the broader project team. Through a series of user meetings and engagement sessions, we have further refined the initial project proposal put forward in the previous (Stage 1) submission. The more detailed Block Plans are included here, along with building servicing considerations, phasing and scheduling information, preliminary equipment and furniture lists, and an updated project cost estimate.

1.3.3 DESIGN AND SPATIAL REQUIREMENTS

1.3.3.1 SUMMARY

Background

Muskoka Algonquin Healthcare (MAHC) is a multi-site healthcare organization providing acute care services at the Huntsville District Memorial Hospital (HDMH) in Huntsville and the South Muskoka Memorial Hospital (SMMH) in Bracebridge. MAHC is located within the District Municipality of Muskoka and is part of the North Simcoe Muskoka Local Health Integrated Network (NSM LHIN). The catchment area includes:

- Town of Huntsville
- Town of Bracebridge
- Town of Gravenhurst
- Township of Lake of Bays
- Township of Muskoka Lakes
- Township of Georgian Bay
- In addition, MAHC also services:
- East Parry Sound
- Beaver Creek Federal Penitentiary

- Moose Deer Point
- Wahta First Nation

The South Muskoka Memorial Hospital is centrally located within the Town of Bracebridge, west of Highway 11. The site is surrounded by residential communities with a golf course to the north, across Liddard Street. A ravine intersects the north-west corner of the site. The site is bounded by Liddard Street to the north, Aubrey Street to the east, Ann Street to the south and a ravine to the west. Primary access occurs from Ann Street and is used by the public and emergency vehicles. Secondary access occurs from Liddard Street and is used by staff and service vehicles. A helipad is located north of the building near Liddard Street.

The site of the existing South Muskoka Memorial Hospital site is mainly flat, with only a 5 m grade change over the buildable site, sloping towards the south. As such, there are few particularly scenic views from the site. There is a significant slope at the ravine along the southwest border of the site.

Updates from Stage 1

The Stage 1 Master Plan for both campuses began in 2014 and a Stage 1 Refresh was submitted to the Ministry of Health in 2019. The Design Principles that were established as part of the Master Plan were:

- Aligns with the goals of the MAHC organization
- Supports Patient- and Family-Centred Care
- Promotes Health and Wellness
- Facilitates Operational Excellence
- Facilitates Future Flexibility
- Enables Innovation
- Enables Environmental Sustainability
- Promotes Community Connection and System Integration
- Meets the ‘Quadruple Aim’ priorities of better health; better care; better value; and better provider experience.

The development Option that was recommended in the Facility Development Plan and is carried forward in this Stage 1.3 report proposes a new hospital build on a new site. The other options that were evaluated but not pursued were a renovation and expansion of the current building and a new, replacement building on the current site. Some reasons that the renovation and expansion option was not pursued were the constricted existing floor-to-floor heights, the tight column grid, limitations on where expansion could occur and the disruption that renovation would cause during construction. A new, replacement building on the current site was considered too disruptive during construction and

the site too small to provide long-term flexibility for the organization. The current SMMH is located on 14 acres and the proposed size of the future hospital would not be feasible on the existing site. Further, the existing property is landlocked by a deep ravine and residential properties.

Stage 1.3

As part of the 1.3 Part B work, the design team further developed the option recommended in Stage 1; a new hospital build on a new site. There was an extensive site selection process that began in November 2022 and concluded in September 2023. More than 20 sites were evaluated as part of that process and numerous consultations were held with the various communities that make up the District of Muskoka. The two short listed sites were identified as 300 Pine Street and 1975 Muskoka Beach Road. After an extensive site due diligence completed by Stantec, and numerous discussions between MAHC and various stakeholders, 300 Pine Street was identified as the preferred site.

Before design began, there were multiple visioning sessions held. The goal of being a net zero hospital was established at the outset of the planning process. The design team and MAHC felt that this was of utmost importance in order to be good stewards of the environment in Muskoka and Ontario. Extensive community consultation informed the design process and the idea of being a net zero hospital was socialized early on. The community was very supportive of the direction that Muskoka Algonquin Healthcare was proposing to take. A sustainably built, minimum of LEED Silver certified, net zero hospital would benefit from the natural resources located in the Muskoka region including the use of heavy timber as a construction material and would include design features that represent the character of Muskoka.

The aspiration to be a net zero hospital informed design decisions from the massing and siting of the building to the layout of the departments within the hospital. Concepts such as keeping the building footprint as small as possible, looking at alternate ways of heating and cooling the building (such as utilizing geothermal energy and full electrification of the building), were just some of the strategies explored.

The building concept that was presented in Stage 1 was revisited as part of 1.3 to better align with the goal of being a net zero hospital, the goals of the Functional Program, and to ensure that the design would allow for ongoing operational and energy efficiencies. It was also determined during design that the project cost had increased significantly from Stage 1. The model of care was revised and SMMH took on most of the outpatient activity as well as a number of short stay (less than 6 day) inpatient beds. Other developments from Stage 1 include the colocation of two inpatient units with close proximity to the emergency department, the inclusion of a procedure suite in the surgical department, the colocation of pharmacy and ambulatory care programs on the second floor and close to the main entrance, and the introduction of gardens for programs such as spiritual care, foundation and the cafeteria.

Site Selection

MAHC undertook a robust process in parallel to completing the Stage 1.3 in order to choose a new site for the SMMH hospital. A site selection committee made up of MAHC project team members and members of the community, taking into account the site analysis completed by USI and Stantec Engineering, recommended 300 Pine Street as the site for the SMMH hospital. The Town of Bracebridge is the owner of 300 Pine and supportive of the recommendation. The Town and the District are also aware of the infrastructure upgrades required to the surrounding areas and given that the Town, District and MAHC are all in agreement of the selected site, MAHC is anticipating and expecting support and cooperation from the District and Town to complete the required developments.

The site is located along Highway 11 south of Taylor Road. It is accessed from Depot Drive along the east side and Gray Road along the west side. The western half of the site was a former aggregate extraction pit and the eastern half of the site is forested and is located approximately 20 metres higher than the western half. The total area of the site is 47 acres. The eastern, forested portion of the site will be the location of the new hospital and is approximately 22 acres. The pit will not be remediated or used as part of this project.

[redacted]

1.3.3.2 NEW PHYSICAL PLANT REQUIREMENTS

1.3.3.2.1 STRUCTURAL

Introduction

The proposed new South Muskoka Memorial Hospital is a two-level facility, plus mechanical/electrical penthouse.

The structural system for the new building is presently being developed as a cast-in-place reinforced concrete structure with a structural steel penthouse. As a result of the low-rise nature of the facility, two additional framing options will be considered as design progresses in future stages. A full structural steel framing option will be reviewed from an economic, schedule and prefabrication perspective and a full mass timber option will be reviewed from a carbon reduction, sustainability, and prefabrication perspective. Regardless of option selected, the one-level public space proposed along the west elevation that includes such uses as the main lobby and corridor, foundation, cafeteria, and spiritual care is envisioned as a mass timber structure connected to the main building structure.

The new building will be designed in accordance with the latest Ontario Building Code (OBC), its referenced design standards and Post Disaster design provisions.

The new building will be designed for a Design Service Classification of Long Life (50 to 99 years) in accordance with the recommendations of CSA S478, Guideline on Durability in Buildings.

Building Code and Design Standards

The new building will be designed in accordance with the most current editions/addendums to the following Building Code and design standards at a minimum.

- Ontario Building Code (OBC)
- User's Guide- NBC Structural Commentaries (Part 4 Division B) (NBC)
- CSA A23.3– Design of Concrete Structures
- CSA A3000 – Cementitious Materials Compendium
- CSA 086 – Engineering Design in Wood
- CSA S16 – Limit States Design of Steel Structures
- CSA S478 – Guideline on Durability in Buildings
- CSA Z32 – Electrical Safety and Essential Electrical Systems in Health Care

- CSA Z8000 – Canadian Healthcare Facilities
- Canadian Foundation Manual

Design Loadings

Design live loads and superimposed partition allowances identified in the OBC shall be used as a minimum and a uniform live load allowance across each of the floor plates is recommended to ensure future flexibility of operation and hospital function with minimal disruption during any re-planning in the future.

Dead loads are comprised of the actual weights of the building structural elements, anticipated finishes and allowances for services.

Floor Loading

The following live loads shall be used:

- Level 1: 4.8 kPa plus 1.0 kPa dead load partition allowance.
- Level 2 3.8 kPa plus a 1.0 kPa partition allowance treated as a live load.
- Record storage areas: a minimum live load of 7.2 kPa or the actual loadings from mobile filing system, whichever is greater.
- Mechanical/Electrical Rooms/Penthouse: 7.2 kPa or the actual mechanical/electrical equipment weight, whichever is greater.
- Diagnostic Imaging (both present and future) including paths of equipment travel: 7.2 kPa.

The following dead loads shall be used:

- Level 1: 1.0 kPa partition allowance.
- Mechanical/Electrical Rooms/Penthouse: weight of a 100 mm floating isolation floor and/or 100 mm housekeeping pads as a superimposed dead load.

Roof Loading

Roofs shall be designed for the snow and associated rain loads in accordance with Part 4 of the OBC Subsection 4.1.6 and water retention in accordance with the storm water management report. A minimum roof live load shall be 1.0 kPa.

Green Roofs: Green roof areas will be designed to accommodate the selected systems.

Lateral Loading

The new building shall be designed for lateral forces due to wind or seismic, whichever governs, in accordance with the Ontario Building Code and the NBC User's Guide.

Structural Framing System

Developing a framing system with typical structural bay sizes in the order of 9.0 m x 9.0 m and maximizing repetitive bay sizes in each direction allows for a traditional form of structure to be implemented.

Although both structural steel and cast-in-place reinforced concrete framing systems are both traditional and practical for healthcare environments and mass timber has evolved in certain applications, for costing purposes, a cast-in-place concrete scheme is described below at this stage.

The suspended floor levels and main roof slabs are proposed to be constructed of cast-in-place concrete (f'c = 30 MPa) construction consisting of a 250 mm flat slab with 3000 mm square by 250 mm deep drop panels supported by isolated concrete columns. The reinforcing steel weight for this type of floor system is anticipated to be approximately 35 kg/m2. This framing system minimizes structural framing depths and assists in accommodating the unimpeded distribution of mechanical, electrical, communication and other services in the ceiling spaces. In addition, this framing system minimizes the amount of vertical load bearing elements within the new floor plate, maximizes the amount of usable space on each of the levels and allows for maximum flexibility of room layouts in the future. Cast-in-place concrete, as a framing system for these areas, provides inherent favourable vibration and infection control, as well as inherent acoustical and fire rating characteristics. Based upon the anticipated bay sizes, this system optimizes capital cost of the structural system and with the incorporation of a repetitive and systematic design, economies of scale can be obtained. The typical slab thickness may be increased, or slab depressions utilized to incorporate isolation systems introduced in specific areas to reduce vibration transmission from both equipment to the adjacent occupancies and from occupancies to sensitive diagnostic or image enhancing equipment.

One storey spaces along the east elevation shall be framed in mass timber comprised of 178mm CLT deck on glulam beams at approximately 7 metres on centre.

The mechanical penthouse roof shall be constructed of a 76 mm steel roof deck supported on a structural steel frame (approximately 27 kg/m2) and allowing for removal of portions of the walls and roof to accommodate the installation, and future replacement, of equipment as well as to reduce the mass of the construction.

Level 1 shall be constructed of an unreinforced 125 mm cast-in-place concrete slab-on-grade with a concrete mix that in combination with closely spaced saw-cut control joints, will minimize potential shrinkage cracking. The loading dock area, mechanical/electrical service spaces and materials management areas shall have slabs on grade with 200mm and 150mm thickness depending on anticipated loads and durability requirements. A 300 mm thick clear crushed stone moisture barrier shall support the slab-on-grade, in accordance with geotechnical recommendations.

Foundation System

Geotechnical investigations were conducted by Stantec in October 2023 (test pits) and December 2023 (bore holes) and form the basis of the structural recommendations used in this report. The site slopes extensively (+/- 9m) from northwest to southeast across the extent of the proposed building footprint. Bedrock elevations range anywhere from 2.0 to 5.0m below existing grade. Based on these findings and the elevations required for the new road and driveway network grades and site servicing inverts connecting to existing, an assumed Level 1 elevation is 282.0 at this stage of design. Existing soil removal shall extend to 1m below the proposed Level 1 slab or to approximately elevation 281.0. This results in a site cut and fill that ideally avoids removal of bedrock (blasting). Due to the variability of bedrock elevations, an additional borehole investigation, augmenting the current geotechnical report and specific to the final building footprint and its positioning, will be required once the site is cleared and unrestricted site access is available.

Existing soils above the elevation of bedrock have a variable consistency and yield very low bearing values where they are deemed suitable to support building foundations. Therefore, at this stage, it is assumed that the building structure will be founded on bedrock using spread footings or caissons/piles. Maximum bearing pressures of 1.5 MPa Ultimate Limit State (ULS) will be utilized for design of foundations founded on bedrock.

For seismic design considerations, the site is designated as Site Class “B” however a shear wave velocity assessment should be conducted during the future geotechnical investigation to verify this assumption.

Perimeter foundations (strip footings or grade beams) shall extend 1.8 m below finished grade for frost protection.

Lateral Load Resisting Elements

The lateral forces due to wind and earthquake shall be resisted by 300 mm thick cast-in-place concrete shear wall elements. These elements will be located at all stair walls and elevator cores. Local isolated shear walls may be introduced within the building footprint, coordinated with clinical planning should the use of elevator and stair walls be insufficient to support the lateral loads.

Architecturally exposed timber or structural steel cross bracing will be introduced along the east elevations of the mass timber structure.

Columns

Columns within the concrete structure shall be 600 mm x 600 mm and within the public space mass timber structure they shall be 450 mm x 450 mm.

Horizontal and Vertical Expansion

The structures may be designed for future horizontal expansion in specific locations enabling designated department expansion. Future structures will be designed as standalone entities with expansion joints provided at the interface of current and future work. This ensures that lateral design of future structures does not affect the present design.

The structure is not currently planned to allow for future vertical expansion.

Future Flexibility

The proposed structural framing systems have been selected to allow for easily reconfigurable spaces and unhindered change of use in the future. Structural loading provisions that allow conversion of soft space (administration) to clinical spaces without disruptive structural modification.

Accommodation of the impacts of technological change, equipment replacement, both base building and clinical, and selection of design floor loadings for the associated change of uses will be made. Consideration will be given to the following in selected areas:

- Enhanced vibration criteria for both present and future areas of sensitive equipment placement.
- Floor depressions within the base structure in sensitive equipment areas to allow for future or reconfigured equipment layouts, passive or rf shielding, vibration control and service routing. without affecting the base building structure.
- Limiting rebar concentrations in areas of equipment sensitive to ferrous material content.
- Provision for capped fire rated sleeves through the floor slab within all mechanical, electrical and communication rooms to reduce the extent of disruption due to core drilling in the future.
- Appropriately located and sized shafts for present and future mechanical and electrical servicing needs

1.3.3.2.2 MECHANICAL

Executive Summary

This report covers the mechanical systems for the new South Muskoka Memorial Hospital Redevelopment Project to be located in Bracebridge, Ontario.

The new facility will function as a standalone acute care hospital and will replace the existing hospital in its entirety. The existing hospital will be decommissioned after the new hospital is fully operational.

This Mechanical engineering narrative will briefly outline the works planned for the building including the plumbing, fire protection, medical gas, HVAC, and building automation systems.

Introduction

This design brief outlines the mechanical systems design approach to be followed for the project. The report also provides a description of the types of mechanical systems that will serve the various areas of the building.

Mechanical systems for the project will include potable water distribution, domestic hot water generation, rainwater harvesting for non-potable water system, sanitary and storm drainage systems, fire protection systems (sprinkler, standpipe, etc.), medical gas (plant, storage, and distribution), HVAC (heating, humidification, air conditioning, and ventilation systems), pneumatic tube system, and the building automation system.

The mechanical systems will be designed in accordance with the requirements of the applicable codes and standards, authorities having jurisdiction, and good industry practice. The principal codes and standards are the building code (OBC), CSA standards, NFPA standards, and ASHRAE standards.

Mechanical systems will be designed for flexibility and expandability; as a minimum, a 10% spare capacity will be required in all systems at the time of the initial building occupancy.

The lower level rooms will serve to house equipment related to the incoming water services, for the potable water and fire protection services, medical gas plant equipment, and for the fuel oil systems for the emergency power generators and boiler plants.

Mechanical equipment rooms (MERs) will be provided for the main plant equipment, the air handling units (AHU), and various small exhaust fans. From the MERs, piping will distribute the hydronic services and ductwork will distribute the ventilation air to all areas of the building.

The mechanical systems will be designed and installed to be water and energy efficient, supporting the overall project target of being a net zero hospital. Low flow plumbing fixtures will be used where clinical functionality will not be compromised. The HVAC systems will be designed to minimize distribution losses, and heat recovery in the water and air systems will be used where feasible. The mechanical system will also be based on principles to reduce operational emissions when compared to minimum code requirements.

The mechanical equipment and systems will be selected and located to minimize potential noise and vibration issues. Support and mounting systems will also be designed to provide the seismic restraint capacity necessary to meet the post disaster requirements of the building.

Building Codes and Standards

The new building will be designed in accordance with the most current editions/addendums to the following Building Code and design standards at a minimum.

- Ontario Building Code
- Ontario Fire Code
- Ministry of the Environment – Environmental Protection Act
- TSSA Standards
- CSA Standards
- CSA Z23500 Preparation and Quality Management of Fluids for Hemodialysis and Related Therapies
- CSA Z32, Electrical Safety and Essential Electrical Systems in Health Care Facilities
- CSA B44 Safety Code for Elevators and Escalators
- CSA B51 Boiler, Pressure Vessel, and Pressure Piping Code
- CSA B52 Mechanical Refrigeration Code
- CSA B64.10 Selection and Installation of Backflow Preventors
- CSA B139 Installation Code for Oil-burning Equipment
- CSA B149.1 Natural Gas and Propane Installation Code (2021 Ontario Amendments)
- CSA Standard C282 Emergency Electrical Power Supply for Buildings
- CAN/CSA Z314 Canadian Medical Device Reprocessing
- CAN/CSA Z317.1 Special Requirements for Plumbing Installations in Health Care Facilities
- CAN/CSA Standard Z317.2 Special Requirements for Heating, Ventilation, and Air Conditioning Systems in Health Care Facilities
- CAN/CSA Standard Z317.13 Infection Control During Construction, Renovation, and Maintenance of Health Care Facilities
- CSA Standard Z7396.1 Medical Gas Pipeline Systems – Part 1: Pipelines for Medical Gases, Medical Vacuum, Medical Support Gases, and Anesthetic Gas Scavenging Systems
- CSA Standard Z8000 Canadian Health Care Facilities
- CAN/CSA Standard Z8001 (R2018) Commissioning of Health Care Facilities
- ANSI/CSA/IGSHPA 448.1 Design and Installation of Ground Source Heat Pumps for Commercial and Institutional Buildings
- NFPA 10 Standard for Portable Fire Extinguishers
- NFPA 13 Standard for the Installation of Automatic Sprinkler Systems
- NFPA 14 Standard for the Installation of Standpipe and Hose Systems
- NFPA 30 Flammable and Combustible Liquids Code
- NFPA 45 Standard on Fire Protection for Laboratories Using Chemicals
- NFPA 55 Compressed Gases and Cryogenic Fluids Code
- NFPA 68 Standard on Explosion Protection by Deflagration Venting

- NFPA 69 Standard on Explosion Prevention Systems
- NFPA 90A Standard for the Installation of Air Conditioning and Ventilation Systems
- NFPA 90B Standard for the Installation of Warm Air Heating and Air Conditioning Systems
- NFPA 92 Standard for Smoke Control Systems
- NFPA 91 Standard for Exhaust Systems for Air Conveying of Vapours, Gases, Mists, and Particulate Solids
- NFPA 96 Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations
- NFPA 99 Health Care Facilities Code
- NFPA 110 Standard for Emergency and Standby Power Systems
- NFPA 2001 Standard on Clean Agent Fire Extinguishing Systems
- NSF/ANSI/CAN 61 Drinking Water System Components–Health Effects
- ASHRAE Handbooks
- ASHRAE Healthcare Design Guidelines
- ASHRAE 55 Thermal Environmental Conditions for Human Occupancy
- ASHRAE 62.1 Ventilation for Acceptable Indoor Air Quality
- ASHRAE 90.1 Energy Standard for Buildings Except Low-Rise Residential Buildings
- ASHRAE 170 (including all addendums) Ventilation of Health Care Facilities
- ASPE Plumbing Engineer Design Handbooks, Vols 1-17, Vols 2-18, Vols 3-19, and Vols 4-16
- ANSI standard Z358.1 Emergency Eyewash and Shower Equipment
- USP 797 Pharmaceutical Compounding – Sterile Preparations
- USP General Chapter 797 – Pharmaceutical Compounding – Sterile Preparations
- USP General Chapter 800 – Hazardous Drugs – Handling in Healthcare Settings
- NAPRA Standards (all risk categories)
- ISO Standard 14644 Series
- SMACNA Guidelines
- SMACNA 001-08 Seismic Restraint Manual Guidelines for Mechanical Systems-3rd Edition
- SMACNA 006-20 HVAC Duct Construction Standards-Metal and Flexible-3rd Edition
- LEED Reference Guide for Building Design and Construction v4 (LEED v4)
- CSA ORNAC standards, guidelines, and position statements for perioperative registered nurses, 15th Ed. 2021
- Ontario Laboratory Accreditation Requirement V B.4 “Automated transport systems”
- Muskoka Algonquin Healthcare IPAC standards and policies

Plumbing

Two new potable water services from two separate municipal mains will be provided for the facility. Each service will be sized to handle the initial and future expansion load of the facility. Separate water service entry rooms will be provided in the building, which will house the required reduced pressure backflow prevention devices and metering.

A domestic water booster pump set consisting of a triplex pump assembly and redundant controllers, with variable speed drives on the pumps will be provided to distribute the potable water through the building.

Domestic cold water will be distributed through the building via multiple interconnected main risers and looped rings on each floor. Valves at each floor and riser connection will allow for easier isolation in the future during renovation projects while maintaining service to unaffected areas. The main risers will also be looped at the top to provide alternative routing for continuous make-up water supply to the steam boilers, and to facilitate for back feeding other risers from the top.

Domestic hot water (DHW) and hot water recirculation will also follow this distribution model for the same reasons. DHW production will use high efficiency condensing gas boilers with pre-heat from the heat recovery system and will be circulated at 60°C in accordance with CSA standard Z317.1, with thermostatic mixing valves at point of use. It is anticipated that heating for DHW production will be provided from a central DHW heating loop. This DHW heating loop would be maintained at a temperature higher than the building heating loop temperature. Each DHW heating system will draw thermal energy from this central loop via heat exchangers. Potential legionella issues will be addressed by the installation of copper silver ion units on the recirculation systems. DHW systems for patient care areas will be separate from those systems that serve support or process areas (i.e., MDRD, laboratory/pharmacy, and food service). It is anticipated that other specialized end uses such as food service will also have separate DHW systems.

Plumbing fixtures will be institutional grade; designed for the intended function, to work in concert with the hospital's infection control practices, and to withstand repeated cleaning and disinfection cycles. Hands-free faucets will be electronic, powered from emergency power sources.

Water softening systems will be provided to address supply hardness and system and equipment requirements. Dedicated reverse osmosis systems will be provided for the MDRD and laboratory departments. Water for use by the humidification system will be treated to meet water quality requirements of the humidification system selected. It is anticipated that at minimum water will be softened but potentially a reverse osmosis system may be required.

Sanitary and storm drainage will be via gravity systems where possible. Areas with depressed floors may require both sanitary and storm (below slab drainage) sump pits. For reliability, duplex sump pumps for each system will be provided, powered from emergency power sources, and provided with level alarms connected to the building automation system (BAS). Foundation drainage will also connect into the storm sump. Should there be site service invert limitations on the sanitary service, a portion of the building will need to be pumped. Elevator pits will also be provided with sump pump systems as outlined above. As part of the future expected climate resiliency assessment, it is anticipated that additional pumps may be required to reduce risks of flooding.

Control flow roof drains will not be used as part of the stormwater management. The system will be designed for a 100-year storm. Each roof section will be provided with secondary overflow drains or where practicable scuppers may be used. Should stormwater retention tanks be required for the site, a rainwater harvesting system will be considered to deliver non-potable water that will be used for cooling tower make-up.

Back-up diesel fuel oil storage tanks and supply pumps and piping will be provided for the emergency generator plant and the boiler plants. Underground double-wall monitored tanks will be provided for each system for the new facility.

The emergency generator system oil storage capacity will provide for 72 hours of full load generator usage; the boiler plant oil storage will provide 72 hours of full load capacity. An automatic fuel polishing system will be installed to maintain fuel oil's quality within generator manufacturer's standards.

A new natural gas service will be piped to the new facility.

Fire Protection

Two fire protection water services from two separate municipal mains will be provided for the facility; each service will be sized to handle the initial and future expansion load of the facility. Separate water service entry rooms will be provided in the building, which will house the required reduced pressure backflow prevention devices. A duplex fire pump will be provided for the facility.

Separate sprinkler and standpipe systems will be provided for the facility.

The sprinkler system shall be provided with zone isolation valves for ease of service and maintenance.

Wet sprinkler protection will be provided throughout the building; fully concealed sprinkler heads will be provided in patient care areas.

Pre-action systems will be provided for critical diagnostic imaging rooms (CT, general radiology, fluoroscopy, and interventional ultrasound), pharmacy production rooms, operating rooms, and the IT rooms (data centre and floor IT closets).

The primary and secondary data centres will be served by an inert gas fire suppression system.

In fume hoods where there is a risk of fire or explosion, automatic detection and suppression systems will be provided.

A pre-engineered ULC listed inert gas fire detection and suppression system will be provided on kitchen exhaust hoods where required by code.

A dry sprinkler system will be provided in the emergency department ambulance bay area, loading dock, and other unconditioned spaces.

Fire hose cabinets will be provided throughout the building. Fire extinguishers will be provided according to the room usage, and the nature of the equipment installed.

Medical Gases

Medical gas systems used in the facility will include oxygen, medical air, medical vacuum, nitrous oxide (TBD), anesthetic gas scavenging (AGS), nitrogen, and instrument air.

Oxygen for the new facility will be supplied from a new bulk storage installation on the site near the loading dock. The bulk storage will consist of primary and reserve cryogenic storage vessels, with emergency connections for a mobile service.

Medical air and instrument air systems will be compressor systems with reserve cylinder banks. Instrument air will be medical air grade but applied only for surgical arm and medical tool usage. A medical vacuum system, and an AGS or anaesthetic gas capture and recover system, will be provided.

If nitrous oxide and nitrogen systems are provided, they will be provided via high pressure cylinder systems.

Medical gas equipment and cylinders will be installed in dedicated fire rated rooms in the building. The room will be located on the exterior of the building for ease of delivery and retrieval of gas tanks.

Medical gas system piping distribution through the building will include interconnected redundant piping risers to allow for maintenance and renovations without the need to shut down the entire floor affected.

Medical gases will be delivered to patients via connections in medical service units. Each medical service unit will be served from a dedicated drop and be for a single patient.

The medical gas system shall be provided with monitors and alarms in accordance with CSA Z7396.1.

HVAC Piping Systems

Various HVAC piping systems will be applied in the project. These hydronic systems will be centrally generated and distributed throughout the building. These services will be chilled and condenser water, heating water, and steam.

All new facility air conditioning and cooling loads will be served by a central chilled water system. Chilled water will be used in AHU and other various processing cooling loads. The chilled water system will be distributed throughout the building to serve the data centres, IT and electrical rooms, elevator machine rooms, and other critical function room cooling loads. A sub-system of the main chilled water system will be provided to serve specialized DI equipment (i.e., CT machines) cooling loads.

The cooling plant for the new facility is proposed to consist of semi hermetic low pressure chillers, and heat recovery chillers. The chillers will use next gen hydrofluoroolenfins (HOFs) refrigerants which result in minimal ozone depletion potential (ODP) and ultra-low global warming Potential (GWP). Matching cooling towers will be located on the roof. This arrangement will provide an N+1 redundancy to service all critical loads should one of the units fail. The data centres will be served by dedicated computer room air conditioning (CRAC) units; these units will, as the primary cooling source, use the building chilled water system, but will also include a back-up glycol-based DX cooling system coupled to a roof mounted dry cooler unit.

Due to the emissions reduction mandate of the project the system will not be equipped with a free cooling heat exchanger for the chilled water system. As part of the water-cooling process the heat recovery chiller will produce heating water. Heating is the largest source of emissions. As a result, to reduce emissions it is best to operate the heat recovery chiller system instead of using waterside free cooling. Similarly, the AHUs will be configured to allow for air side free cooling in the shoulder seasons and winter however this mode will only be engaged when the heat recovery chiller system is at capacity, or the heating load of the facility has been met by the heat recovery chiller plant.

With the proposed changes to CSA Z317.2 permitting the use of high pressure adiabatic humidification, and the availability of MDRD equipment with reliable on-board steam generation, it is now possible to remove gas fired steam boilers for a hospital. Steam boilers account for the largest source of carbon produced at a healthcare facility. To achieve the carbon reduction, it is necessary to make up the cooling effect of the adiabatic humidification on the air by reheating the air with a carbon-free heat source, such as from the heat recovery chillers, or ground or air source heat pumps.

The hot water heating plant will consist of firetube hot water boilers providing hot water heating to serve reheat coils, and non-patient area convectors, in floor heating, and unit heaters.

To reduce emissions the first stage of heating will be the heat recovery chiller plant. Heat recovery chillers are a very efficient way to recover heat from water side systems. However, to ensure efficient operation the supply and return water (heating and chilled) temperatures must be within a certain range. With contemporary heat recovery chillers this requirement will restrict the heating water temperature to a maximum of 43oC (110 F). An advantage of this lower heating water temperature is it will allow for a wider range of lower energy and emissions heating water generation options. A disadvantage is this lower water temperature is the perimeter heating is air based instead of radiant panels.

To further reduce emissions a geo-exchange system will be deployed. A vertical geo-exchange system is the most likely configuration considering the facility and local geology. Deployment of a geo-exchange system will require geo heat pumps to transfer energy to and from the geo-field. It is possible to use heat recovery chillers as geo heat pumps which can result in capital cost savings. It is assumed that the heat recovery chiller plant will be dual duty and service both the geo-exchange system and the building simultaneous heating and cooling needs.

HVAC Ventilation Systems

Air ventilation for the new facility will be provided via AHUs grouped together in mechanical equipment rooms.

The AHU's will be hospital grade units with supply and return fans, heating and cooling coils, humidification, pre and final filters, and ultraviolet disinfection. All ventilation systems will be in accordance with CSA Z-317.2 requirements.

The AHU's will be sized with an additional 10% spare capacity for future increased loads without any modifications to the unit or power supply. All AHU fans will be equipped with variable frequency drives to compensate for filter loading, allow for future changes in capacity requirements, and to aid in commissioning. Direct drive fans will be used where

possible to reduce maintenance, and automatic belt tensioners will be provided on all belt drive fans for energy efficiency and maintenance.

All system will have the minimum redundancy outlined in CSA Z317.2 based on the space classification type. Type I spaces shall have 100% redundancy, and Type II spaces shall have a minimum of 50% redundancy.

AHU's which include an outdoor air section will be equipped with an enthalpy wheel. Where exhaust for air can pass-through an enthalpy wheel where feasible will be equipped with glycol coils for heat recovery. Critical departments will be served by air handling systems that include back-up AHU's such that the failure of any component in one of the units the systems will provide 100% redundancy for the critical departments.

The mechanical rooms will also house various specialty exhaust fan systems. The isolation room exhaust systems will include fully redundant exhaust fans and HEPA filter units with bag-in bag-out, and decontamination capability.

Miscellaneous Exhaust Systems

Dedicated exhaust systems will be provided for fume hoods, biological safety cabinets, isotope exhaust, kitchen exhaust, and other exhaust systems as required to service the hospital program.

Areas that produce contaminated or hazardous air such as flammable storage rooms, compressed gas storage rooms, and waste management rooms, will be provided with dedicated exhaust systems. Automatic air quality monitoring and control will be provided to maintain a safe environment.

Operating and Energy Consumption

A requirement of Infrastructure Ontario projects is to include the goals of energy efficiency in the systems design and reductions in resource usage. The project will require a minimum LEED Silver certification and compliance with OBC SB-10. MAHC, however, has elected to exceed this minimum requirement as part of an enhanced design and to target net zero.

Building Automation System

A building automation system (BAS) will be provided for the facility that will directly control various mechanical systems and will monitor and alarm the operation of several mechanical, electrical, and other building systems. The BAS will be connected to the central alarm control facility (CACF) room to monitor and control the smoke management system.

The BAS will provide monitoring and alarm of the various medical and patient nutrition fridges and freezers.

Pneumatic Linen, Waste & Recycling System

Should the Hospital request the new facility to be equipped with a pneumatic linen system, and a pneumatic waste & recycling system, on floor fire rated chute rooms will provide access to the touchless linen and waste/recycling chutes. The system would suck soiled linen to the auto cart loading room on the service level. Waste and recycling will be sucked to the loading dock area, where it will be separated into its respective compactors.

1.3.3.2.3 ELECTRICAL

Introduction

This report covers the electrical systems for the new ambulatory care hospital building for the Bracebridge Site of the Muskoka Algonquin Healthcare organization. The new facility will be constructed on a greenfield site.

This design brief outlines the electrical systems design approach to be followed in the preparation of the next stage of design. The report also provides a description of the types of electrical systems that will serve the various areas of the building including the normal and emergency power distribution, fire alarm and voice communication, lighting and lighting controls.

Electrical systems will be designed for flexibility and expandability, as a minimum 25% spare capacity will be required in all major electrical systems at the time of the initial building occupancy. The incoming electrical services will be sufficiently sized to accommodate expected load increases throughout the lifecycle of the equipment. Main equipment room planning will allow for the addition of equipment in the future to increase system capacity further.

In addition, the electrical systems will be designed and installed to be energy efficient, supporting the overall project target of being a net zero hospital. For example, high energy efficient lighting will be used both for exterior and interior lighting; all panels will be metered to provide an accurate picture of which systems are consuming how much energy; exterior lighting using Dark Sky compliant fixtures and implementing ultra-low glare interior lighting design for interior spaces.

Building Code and Design Standards

The new building shall be designed in accordance with the most current editions/addendums to the following Building Code and design standards at a minimum.

- Public Hospitals Act.
- Ontario Building Code (OBC)
- Ontario Electrical Safety Code (OESC)

- Ontario Fire Code
- Provincial Lightning Rods Act
- ASHRAE Standard (Applicable version)
- LEED Version 4 Building Design and Construction Rating System for Healthcare
- CAN/CSA Standard Z32, Electrical Safety and Essential Electrical Systems in Health Care Facilities
- CSA Standard Z317.5 - Illumination Systems in Health Care Facilities
- CSA Standard C282 - Emergency Electrical Power Supply for Buildings
- CSA Standard Z8000 - Canadian Health Care Facilities
- CSA/ULC S series, Fire Alarm Systems
- NFPA 20, Standard for the Installation of Stationary Pumps for Fire Protection
- IEEE 519, Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems
- IEEE Standard 1159, Monitoring Electric Power Quality
- IEEE Standard 1250, Voltage Quality
- IEEE Standard 1346, Recommended Practice for Evaluating Electric Power System Compatibility with Electronic Process Equipment
- ANSI/EIA/EIA-607 (CSA T527) Grounding and Bonding Requirements for Telecommunications
- Illuminating Engineering Society of North America - IESNA RP29, Lighting for Health Care Facilities
- Authorities Having Jurisdictions
- Local Building Department
- Local Fire Department
- Electrical Safety Authority.

Electrical Incoming Utility

The electrical Local Distributor Company is Lakeland Power Systems; the existing electrical infrastructure for the area is 27.6kV single phase overhead line.

Normal power will be provided to the hospital via one 27.6kV feeder. The feeder will run underground to a new exterior high voltage substation outside the facility.

The projected estimated maximum demand for the hospital is 2.6MVA with the inclusion of full electrification to meet net zero carbon designs.

Electrical Distribution – Normal Power

The HV switchgear will feed two 2500kVA 27.6kV:600V transformers located outside the facility within the fenced exterior high voltage substation.

Each transformer shall be sized to accommodate 100% of the hospital load and an additional 25% for future expansion. The 600V secondary of the transformers will run underground to the hospital and into the Level 1 main electrical room where it will be connected to the utility power inputs at either end of the main 600V double ended switchgear.

Downstream 600V:120/208V transformation shall be utilized to service lighting, plug loads and process equipment throughout the facility.

The power distribution will be zoned by department, and further sub-panels shall be implemented in a manner that reduces down time during renovations or electrical work. Zoned power areas to include by are not limited to

- Surgery
- Acute inpatient units
- Ambulatory Care
- Pharmacy
- Oncology
- MDRD
- DI areas
- Staff areas
- Back of house

The electrical distribution characteristics shall be:

- Primary Power Distribution - 27.6 kV/13.8kV, 3phase, 3 wire
- Secondary Power Distribution - 600V, 3 phase, 3 wire
- Emergency Power Supplies - 600V, 3 phase, 3 wire
- Generator output - 13.8kV, 3 phase, 3 wire

- Exterior/Site lighting - 347V (600 volt, 3 phase, 4 wire) – Normal and Emergency.
- Secondary Power Supplies - 120/208V, 3 phase, 4 wire
- Motors .373 kw (1/2 hp) and Larger - 600V, 3 phase
- Motors Less Than .373 kw (1/2 hp) - 120/208V, 1 phase
- Lighting - Interior - 120V
- Lighting - Exterior/Site - 347V
  - Convenience Receptacles - 120V
- Owners Equipment - as required
- Including 600V/480V transformation for diagnostic imaging equipment

The electrical riser rooms at each floor shall be stacked vertically to provide a vertical pathway for the electrical distribution and life safety spine. The electrical distribution shall consist of the Conditional and Vital/Delayed Vital bus duct risers. The risers will be sized to accommodate future expansions and growth.

Power factor correction shall be installed at the incoming switchgear.

Surge protection devices shall be employed.

All wiring shall be copper. 600V insulation for 120/208V and 1000V insulation for 347/600V installations and in conduit sized appropriately to address voltage drop. Minimum wiring size shall be #12 AWG.

The electrical equipment and systems will be selected and located to minimize potential noise and vibration issues. Support and mounting systems will also be designed to provide the seismic restraint capacity necessary to meet the post disaster requirements of the building.

Electrical Distribution – Emergency Power

The on-site diesel generator system shall be consistent with the requirements of CSA Z32 standard and CSA C282 standard.

There will be four 1250kW, 600V diesel generators located outside adjacent to the exterior high voltage substation to provide a minimum of 72 hours of emergency power to the entire hospital. The generators will be sized such that two generators are able to provide power to 100% of the building loads within the hospital in the event that the other two generator were to fail.

The generators will provide emergency power to either end of the main 600V double ended switchgear in the main electrical room.

The constructor shall be responsible for all emission and noise approvals from the Ministry of Environment (MOE) and Technical Standards and Safety Association (TSSA) approval.

Fire Alarm and Emergency Voice Communication System

The two-stage fully addressable fire alarm system shall be equipped with an Emergency Voice Communication (EVC) speaker system all in accordance with the Ontario Building Code, Ontario Fire Code, CAN/ULC Standards and other Authorities Having Jurisdiction. The fire alarm system shall include pre-programmed alarm tones and emergency voice messages appropriate for the facility.

Notification devices shall include:

- Speakers
- Combination speaker/strobe in high ambient noise areas
- Strobe lights as visual signal devices

Detection and alarm initiation devices shall include:

- Smoke detectors
- Ducted mounted smoke detectors
- Heat detectors
- Manual pull stations
- Sprinkler flow switches
- Sprinkler tamper switches

Firefighter's telephones/handsets shall be located on all levels of the facility as per the Ontario Building Code (OBC) including fire pump room, incoming water room and generator room(s).

The fire alarm system shall interface/communicate with, but not limited to:

- ULC listed off-site notification centre
- Elevator homing and elevator control systems
- Building management system

- Security system
- Emergency generator operations and position of all automatic transfer switches
- The lighting control system
- Sprinkler system
- Monitor all electric pipe tracing related to the fire protection sprinkler system.
- Fans start up and shutdown
- Smoke control management system
- Pre-action sprinkler systems
- Dry sprinkler systems
- Kitchen fire suppression systems
- Nurse Call Systems
- Audio Visual systems

Uninterruptible Power Supply (UPS)

A new centralized 2N UPS system each sized for 3% of the full facility load will be provided for all IT loads and critical healthcare facility loads. Power will be distributed from the main electrical room to levels 1 and 2 via the stacked electrical rooms. The UPS battery banks will be sized to support the loads for 10 minutes.

The UPS system as a whole will allow for expected annual load increases through additional modules, batteries, as well as allowance within panel and feeder capacities.

Grounding

The grounding and bonding systems shall conform with the Ontario Electrical Safety Code, Electrical Safety Inspection, and the local Power Supply Authority.

All conductors shall be stranded copper. All connectors and accessories shall be copper.

All ground rods shall be copper clad steel with all buried connections utilizing exothermic weld.

Lighting and Lighting Controls

All interior and exterior light fixtures shall be highly energy efficient LED fixtures. The LEDs shall conform to or exceed ANSI NEMA C78-377-08.

The lighting shall meet the IESNA and CSA Z-317.5 recommended illumination levels. Where differences occur, the higher illumination level shall be provided.

The lighting system power densities shall meet ASHRAE 90.1.

Interior lighting shall operate at 120 Volts / 60 Hz. All interior lighting design shall use ultra-low glare fixtures.

The central lighting control system utilizing software in conjunction with wall switches, occupancy/vacancy sensors, photocell, dimming and daylight harvesting sensors shall be compatible with the LED Lighting system. Lighting controls shall be provided to operate luminaires automatically based on astronomical time clock and work area operation schedules with the capability to override operation schedules. Large open areas shall be subdivided into smaller lighting zones.

Local switching and vacancies sensors shall be provided in private offices and small meeting rooms except nurse call stations and offices that operate 24/7.

Dedicated battery-supplied unit emergency lighting shall be provided as per CSA Z32 in all prime equipment electrical rooms, prime equipment mechanical rooms, main ICAT data room and operating rooms in addition to luminaires operated by on-site emergency generator power.

Exit signs shall be green pictogram LED each 5w or less.

Building exterior and site lighting luminaires shall be specified with full cut-off dark sky and DLC compliant and approved to mitigate light trespass and light pollution operating at 347V and controlled by photocell and astronomical time clock via radio.

Patient room lighting shall be provided with additional lighting for examination.

Control of all lights within a patient room shall be from the patient's headwall/bed and a switch by the entrance.

LED nightlight shall be provided within all patient rooms and washrooms within patient rooms.

Metering

The electronic metering system shall be equipped with metres located on the equipment and with a computer display of all metered values and integrated with the Building Automation System.

The electronic metering system shall provide:

- Automatic recording of values as historical data
- Plotting of graphs to identify trends
- A software package included computer and screen to allow searching of the historical data

Each tenant space shall have separate revenue grade metering.

Metering shall also be provided to support the LEED Advanced Energy Metering credit and energy management and shall be provided to separately metre, at minimum, the following:

- Interior lighting
- Exterior lighting
- Mechanical loads
- Chiller loads
- Boiler loads
- Loads larger than 100kW
- Imaging machines (MRI, CT, X-rays, etc.)
- Receptacles loads
- Sterilizers, cart washers
- Medical air / vacuum
- Medical gas scavenging
- Chiller / HRC supply (BTU metre)
- Reheat loop (BTU metre)
- Glycol heating loop (BTU metre)
- Snow melting (BTU metre)

Lightning Protection

The lightning protection system shall include metallic air terminals, and all required conductors from air terminals to ground and interconnected ground electrodes. The system shall conform to the current CSA Standard B72 lightning Rods Act and local authorities having jurisdiction.

The lightning protection contractors shall be licensed by the Provincial Fire Marshall and shall perform the system work.

A permanent means for inspection and testing of the termination of lightning conductors to ground rods by utilizing inspection wells shall be provided. Two inspection wells will be installed in at least two accessible locations.

Down conductors shall be routed through non-critical areas only.

The design of the lightning protection system shall blend in with the architecture of the facility to the extent that the system remains fully functional.

The design of the lightning protection system shall factor in future radio antennae to be mounted on the roof and all roof mounted appurtenances.

1.3.3.2.4 INFORMATION, COMMUNICATION AND AUTOMATION TECHNOLOGY (ICAT)

Refer to Appendix 2-A.

1.3.3.2.5 CIVIL

Two sites were under consideration, 300 Pine and 1975 Muskoka Beach. Based on the due diligence assessment conducted at both sites by Stantec Consulting Ltd. (SCL) and consultation with MAHC and the Town of Bracebridge, the preferred site selected is 300 Pine. The following site characteristics were observed for 300 Pine:

300 Pine St.

300 Pine Street in the Town of Bracebridge (Town), is referred to herein as the 'Site'. The Site, depicted in the aerial figure below, is approximately 18 ha in size and is located between Highway 11 and Cedar Lane just east of Gray Road. A hydro corridor traverses the Site along the northern boundary.

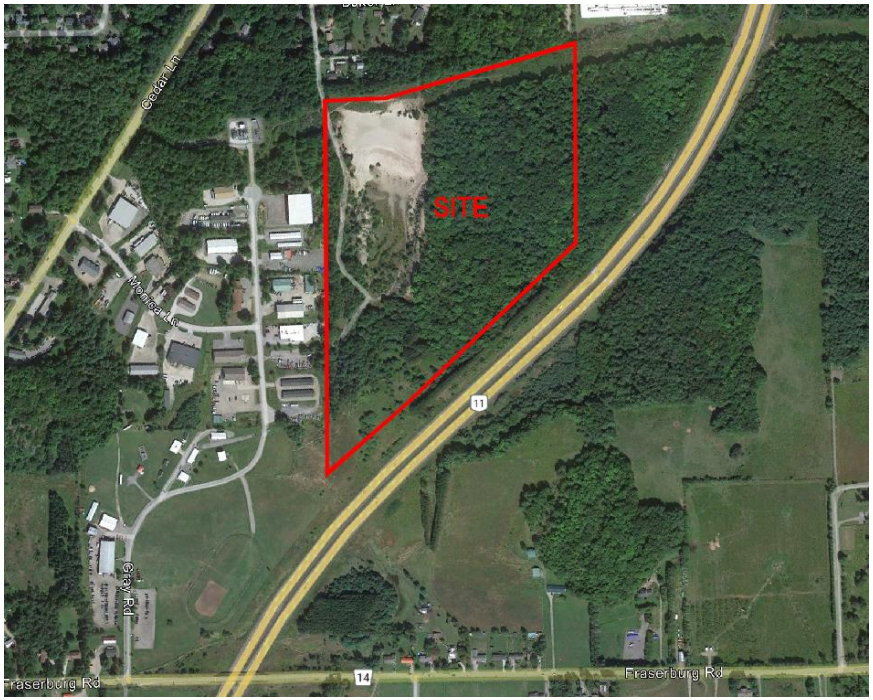


Figure 2. Site Location Plan

The Site is being considered for a hospital development as depicted below with driveway access connections to the private commercial laneway at the northeast (Depot Lane) and Monica Lane to the west. As the entirety of the western portion of the Site is a former gravel pit and the eastern portion is a valley with a watercourse, the

development will be concentrated along the centre portion of the Site. For the purposes of this review, the proposed hospital is assumed to have 46 beds and a ground floor area of 10,900 m2. The site statistics have varied through the life of the project, and the conclusions of this report should be reviewed against the final cemented site statistics once available.



Figure 3. Site Concept Plan

As part of the review, the following documents were referenced:

- Contour files and existing sewer infrastructure data obtained from the District of Muskoka

- Muskoka New Developments W&WW Model – Project No. 11149488-MEM-71 1st, prepared by GHD, September 2021
- Concept Site Plan, Stantec, September 14, 2023

The figure below provides an overview of the existing servicing infrastructure in the vicinity of the Site.

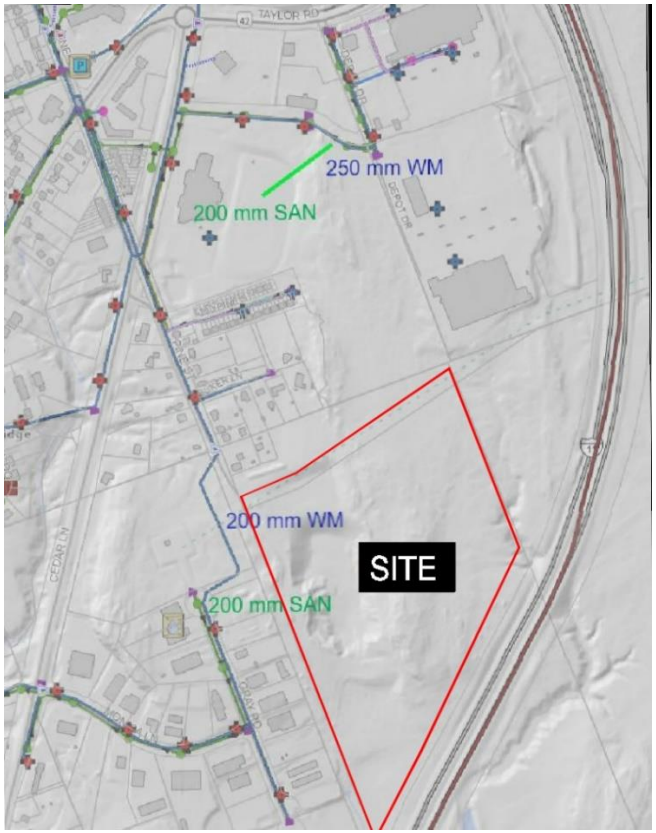


Figure 4. Nearby Servicing Infrastructure

Grading And Earthworks

[redacted] A perched area in the eastern half sits approximately 10 m above the eastern property line. An approximately 20 m deep hole presides within the western half of the Site. The drop from the perched area to this depression is close to 30 m.

The general site gradient is southerly at a vertical relief of close to 30 m across the property. [redacted]

[redacted]

Storm

From the available background documentation, no existing stormwater quantity or quality controls were located on the Site. Per Google Maps Aerial Imagery, there are two existing culverts crossing Highway 11 South that are presumed to convey runoff generated by the Site.

Sanitary

As shown on **Figure 4**, the closest sanitary sewer is the 200 mm sewer approximately 130 m west of the Site on Gray Road which continues west on Monica Lane. This sewer system is upstream of a number of pumping stations prior to discharge into the Lagoon Lane Wastewater Treatment Plant (WWTP). The next closest system is approximately 330 m to the north on Pine Street. This connection option would require crossing the hydro easement along the northern boundary which would trigger additional approval stages and also necessitate pumping of sewage as the area in question is close to 15 m higher than the Site. The recommended sanitary outlet is the 200 mm sewer at Gray Road and Monica Lane. This option requires approximately 130 m of off-site municipal sewer construction between the Site and the connection point. A conceptual overview of the sanitary servicing has been provided on Plan C-101 in **Attachment A in Appendix 2-C.**

According to the available preliminary site statistics, a peak site sewage flow of 17.6 L/s in anticipated. The district had modelling conducted by GHD in July 2023 to review the impact of the introduction of this flow into the existing downstream municipal infrastructure. The study concluded that two (2) pump stations (Woodchester SPS and Muskoka SPS) downstream of the Site do not have the reserve capacity to handle the additional flow. These two

pump stations would require upgrades to service the proposed development. The details of these upgrades would require additional study and are beyond the scope of this review. Furthermore, the GHD analysis was based on the preliminary minimum site statistics required for the functioning of the hospital. The analysis results should be reviewed against flows based on final and cemented site statistics once available. The sanitary flow design sheet has been provided in **Attachment C in Appendix 2-C**. The GDH technical memorandum has been included in **Attachment F in Appendix 2-C**.

Watermain

As shown on **Figure 4**, the closest watermain is the 200 mm main approximately 50 m west of the Site that runs through an easement leading to Gray Road. Healthcare facilities normally require two (2) water connections to separate mains on separate streets isolated by a valve chamber in between for redundancy. The closest separate main is the 250 mm watermain approximately 400 m north in commercial land, and connection to this system would require crossing the hydro easement along the northern boundary and trigger associated approval stages. The recommended watermain servicing scheme is a connection to the 200 mm watermain in the nearby easement to the west near Gray Road and a secondary connection to the 200 mm watermain at Gray Road and Monica Lane for redundancy. A valve chamber would be installed on the existing watermain between the two connection points to create isolation. The district requires the main water line into the Site to be split into separate domestic and fire feeds at property line. Approximately 180 m of off-site municipal watermain construction is required to service the development. A conceptual overview of the water servicing has been provided on Plan C-101 in **Attachment A in Appendix 2-C.**

According to the available preliminary site statistics, a total Maximum Day Water Demand + Fire Flow of 125.0 L/s in anticipated. The district had modelling conducted by GHD in July 2023 to review the impact of the introduced load on the existing municipal water infrastructure. The study concluded that the existing municipal system does not have the capacity to support the development under fire flow conditions. The recommended mitigation is the use of on-site private storage to increase fire flow capacity. The details and sizing of this storage system would require additional study and are beyond the scope of this review. Furthermore, the GHD analysis was based on the preliminary minimum site statistics required for the functioning of the hospital. The analysis results should be reviewed against flows based on final and cemented site statistics once available. The water demand calculation sheets have been provided in **Attachment D in Appendix 2-C**. The GHD technical memorandum has been included in **Attachment F in Appendix 2-C**.

Stormwater Management Criteria

The stormwater management (SWM) criteria for the proposed Site was taken from the following background documents. Relevant excerpts are provided in **Attachment F in Appendix 2-C.**

- The District Municipality of Muskoka Engineering Design Criteria and Standards Manual, prepared by the District Municipality of Muskoka, dated January 2023;

- Muskoka Official Plan, prepared by the District Municipality of Muskoka, dated March 2023;
- Low Impact Development Stormwater Management Guidance Manual (DRAFT), prepared by the Ministry of the Environment, Conservation and Parks, dated January 2022; and
- Stormwater Management Planning and Design Manual (SWMPDM), prepared by the Ministry of the Environment, Conservation and Parks (MECP, formerly MOE), dated March 2003.

Quantity Control

Per the District Municipality of Muskoka Engineering Design Criteria and Standards Manual, the stormwater quantity control is to be approached using source controls, conveyance controls, and end-of-pipe controls to achieve the following:

- Provide stormwater quantity controls as required to control post-development flows to pre-development levels for all storm events up to and including the 100 Year storm event;
- Provide safe conveyance of stormwater flows in excess of the 100 Year storm event via an emergency spillway designed with suitable erosion protection; and
- Except in extenuating circumstances, incorporate Low Impact Development (LID) principles, such as rainwater harvesting, constructed wetlands, bioretention swales, green roofs, permeable surfaces, clean water collection systems, and the preservation and enhancement of native vegetation cover, to achieve stormwater quantity control objectives.

Stormwater facilities are to be designed in accordance with the preferred criteria specified in the Ministry of the Environment, Conservation and Parks (MECP, formerly MOE) Stormwater Management Planning and Design Manual (2003).

A portion of the proposed site is located within a Ministry of Transportation (MTO) Controlled Area. As such, the proposed Site development, specifically the stormwater management controls, must adhere to the following documents:

- MTO Stormwater Management Requirements for Land Development Proposals, prepared by the Ontario Ministry of Transportation Standards and Contracts Branch within the Highway Design Office, dated 2009 (References Updated April 2022); and
- The MTO Drainage Management Manual Part 3, prepared by the Ministry of Transportation Ontario Drainage and Hydrology Section Transportation Engineering Branch Quality and Standards Division, dated 1997

MTO drainage standards align with those noted in the District Municipality of Muskoka's Engineering Design Criteria and Standards Manual (noted above), and follow the same design criteria for stormwater facilities as noted in the MECP's Stormwater Management Planning and Design Manual except for the following:

- The MTO does not recognize any benefit from the attenuation of stormwater runoff using parking lot or roof top storage, where the control is achieved through an orifice device or a roof top control device;
- The MTO does not accept the location of an infiltration facility, within a proposed land development area, where it may impact the structural integrity of the highway sub-grade; and
- In general, MTO does not accept the benefits from roof leader disconnection and cisterns if the continuing functioning and long-term reliability cannot be guaranteed.

To align with both Municipal and MTO design criteria, it is likely that a stormwater management pond will be utilized as the primary stormwater management infrastructure on the Site.

Quality Treatment

Per the MECP SWMPDM (2003), the stormwater quality treatment strategy for the proposed Site should achieve the following:

- Provide stormwater quality control to an Enhanced (formerly Level 1) standard of treatment (i.e., 80% TSS removal); and
- Where feasible, incorporate LID principles including treatment train measures to achieve water quality objectives.

Erosion Control

Per the Muskoka Official Plan, the stormwater management strategy for the proposed Site shall minimize changes in erosion. In accordance with the MECP SWMPGM (2003), erosion control will be provided via detention of the 25 mm design storm over a period of at least 24 hours.

Water Balance

Per the Muskoka Official Plan, the stormwater management strategy for the proposed Site shall minimize changes in water balance. As such the water balance strategy will attempt to replicate as closely as possible existing hydrologic conditions by maintaining a balance between infiltration, runoff, and evapotranspiration. On Sites in the Muskoka Region, a typical water balance target is 5 mm across the Site; this retention target has been utilized for costing purposes and is to be refined through Site design.

In addition, recent guidance provided by the Draft LID SWM Guidance Manual (MECP, 2022), has quantified a satisfactory retention volume equivalent to the region-specific 90th percentile storm event. The retained runoff volume target is independent of municipality-specific and/or climate adjusted on-site required detention volumes required to achieve stormwater quantity control. Stormwater retention strategies may consist of stormwater reuse, infiltration, or evapotranspiration. Per Figure 3.3 of the Draft LID SWM Guidance Manual (MECP, 2022), the 90th percentile storm event is equivalent to a rainfall depth range of 27 mm to 28 mm in the Town of Bracebridge. It is suggested that retention of the 90th percentile storm event be considered within the water balance strategy for the proposed Site to

ensure that the strategy is robust against projected future climate variance and to incorporate a level of sustainability within the Site infrastructure.

Flow Conveyance

Per Section 4.2 of the District Municipality of Muskoka Engineering Design Criteria and Standards Manual, drainage systems are to be designed to convey the year of the storm associated with the site road classifications without surcharge. Runoff rates in excess of the design capacity of drainage systems shall be conveyed via roadways, swales, walkways, drainage easements, and in special circumstances the storm sewer system, to a sufficient outlet to prevent unacceptable flooding damage to private property.

Furthermore, all new developments must demonstrate that the stormwater generated on-site is directed to a sufficient outlet such as a lake, river or permanently flowing watercourse. A sufficient outlet may also include a public right-of-way with prior approval from the Town of Bracebridge. An easement must be provided in favour of the Town of Bracebridge for any drainage that is directed over private land.

As the roadways within the proposed site are classified as industrial/commercial, the flow conveyance design standards listed in **Error! Reference source not found.** are applicable.

Table 8. Design Storm (Years) Conveyance Requirements

Road Classification	Bridges/Major Culverts	Road Culverts	Storm Sewers	Ditches/Channels
Industrial/Commercial	1:100	1:10	1:5	1:10

It is recommended that land adjacent to roadways be reserved for conveyance ditches/channels to maintain existing drainage patterns and minimize the use of subsurface infrastructure.

Stormwater Management Strategy

The proposed SWM plan is a high-level assessment of potential SWM controls that can be implemented on-site to achieve the required criteria while conforming to the site constraints and considerations described above.

Quantity Control

Per the current Site Plan **(Attachment B in Appendix 2-C),** increased stormwater runoff will be generated when existing pervious areas (e.g., woodlands) are replaced with predominantly impervious areas (e.g., paved or roof areas) which will require stormwater quantity control. Stormwater quantity control typically takes the form of

stormwater infrastructure designed to capture and slowly release the excess stormwater. The Site could utilize traditional stormwater infrastructure such as roof control flow drains, surface ponding, and a SWM pond. Based on the available geotechnical information for external adjacent lands, bedrock elevations were recorded at near existing ground surface elevations. Therefore, it is presumed that the same geotechnical condition exists for the Site. Given the potential presence of bedrock near existing ground, a below ground SWM strategy (i.e., underground tank) is not recommended for quantity control. Therefore, quantity control is recommended to be provided by a SWM pond.

Furthermore, it is noted that a portion of the proposed site is located within a Ministry of Transportation (MTO) Controlled Area. Underground stormwater quantity control systems are not permitted within MTO Controlled Areas; therefore, the stormwater quantity control strategy must be above ground. The potential for incorporation of surface-based LIDs as part of a quantity control treatment train strategy with a SWM pond will be further evaluated pending completion of the Site geotechnical and hydrogeological investigations.

The existing Site survey indicates that a natural peak in the topography occurs along the median of the property such that drainage generated by the Site will drain to the east and west. Per the grading plan provided in **Attachment A in Appendix 2-C**, it is recommended that the existing drainage pattern be maintained in the proposed condition in order to minimize the use of underground stormwater conveyance systems. To align with this development strategy, a potential SWM quantity control strategy would be to direct surface drainage to two SWM ponds located at the east and west limits of the Site.

Through assessing the Site Plan, two locations were identified within the Site has locations for potential SWM ponds. The first pond (herein referred to as the East SWM Pond) is located at the northeast corner of the property. The second pond (herein referred to as the West SWM Pond) is located at the southwest corner of the **property (Drawing C-101, Attachment A in Appendix 2-C).** The SWM ponds are discussed in further detail below.

East SWM Pond

The East SWM Pond block is approximately 0.35 ha in size and treats a contributing drainage area of 3.36 ha. To approximate a high-level SWM pond configuration, the following assumptions were made:

- The SWM pond normal water level was assumed to be 274.00 to promote positive drainage of the active storage volume to the receiving natural channel;
- The SWM pond permanent pool depth was assumed to be 1.5 m;
- An additional 2.0 m of active storage depth is assumed to be required for flood control.

The resulting top of SWM pond elevation is estimated to be 276.00 m (high-level approximation and subject to further refinement). As the surrounding existing grades within the potential pond block range from 276.00 m to 278.00 m, extensive fill works are not anticipated for the construction of a SWM pond. Next steps should include an overall site cut/fill analysis to confirm earthworks requirements for the Site. As demonstrated by the calculations provided in

Attachment E in Appendix 2-C, the anticipated storage volumes to achieve stormwater quality treatment and quantity control, respectively, are as follows:

- 151 m3 required permanent pool volume; and
- 1,464 m3 required active storage volume.

West SWM Pond

The West SWM Pond block is approximately 0.35 ha in size and treats a contributing drainage area of 4.84 ha. To approximate a high-level SWM pond configuration, the following assumptions were made:

- The SWM pond normal water level was assumed to be 274.00 to promote positive drainage of the active storage volume to the receiving natural channel;
- The SWM pond permanent pool depth was assumed to be 1.5 m;
- An additional 2.0 m of active storage depth is assumed to be required for flood control.

The resulting top of SWM pond elevation is estimated to be 276.00 m (high-level approximation and subject to further refinement). As the surrounding existing grades within the potential pond block range from 277.00 m to 282.50 m, extensive fill works are not anticipated for the construction of a SWM pond. Next steps should include an overall site cut/fill analysis to confirm earthworks requirements for the SWM Pond. As demonstrated by the calculations provided in Attachment E, the anticipated storage volumes to achieve stormwater quality treatment and quantity control, respectively, are as follows:

- 205 m^3 required permanent pool volume; and
- 828 m^3 required active storage volume.

Quality Treatment

Stormwater quality treatment is required to remove pollutants such as suspended solids and oil from stormwater generated by the Site. The bulk of stormwater quality treatment can be provided by the two SWM ponds to meet Municipality and MECP requirements, with a treatment train approach providing an additional polishing of stormwater runoff via low impact development (LID) techniques or Manufactured Treatment Devices (MTDs).

Erosion Control

Erosion control is recommended to be achieved by the SWM ponds and a downstream orifice control.

Water Balance

Should site conditions allow, pending the completion of Site geotechnical and hydrogeological investigations, the use of open bottom surface LIDs such as bioretention cells, rain gardens, and enhanced grass swales is preferred. For example, an enhanced bioswale receiving stormwater roof runoff can provide infiltration and filtration as well as conveyance and would reduce the storage volume requirement for the SWM Ponds. However, based on the inferred high bedrock elevation, it is unclear whether surface-based LIDs are feasible. Where possible, the use of surface-based LIDs that can be combined with the stormwater quantity control infrastructure is recommended.

As described in Section 2.4, it is suggested that retention of the 5 mm event be carried for costing purposes within the water balance strategy for the proposed Site which is a volume of 397 m^3 (5 mm over the Site area of 7.93 ha).

While it is understood that the target is to minimize changes in water balance (i.e., achieve pre-development infiltration volumes), due to high presumed high bedrock, anticipated servicing constraints, and poor soil conditions, a best-efforts approach to providing infiltration is likely the most feasible.

Based on the current Site Plan, a conceptual stormwater management strategy has been developed as follows. It is noted that this strategy is preliminary in nature and that additional studies as described in Section 2.4 are required to confirm the feasibility of the strategy.

- The stormwater strategy includes:
- The use of localized inlets and swales to capture and convey stormwater runoff;
- The use of two SWM ponds within the northeast and southwest corners of the Site to provide stormwater quantity control, quality treatment, and erosion control;
- The use of infiltration-based LIDs where feasible to provide retention of stormwater runoff; and
- The use of Oil-Grit Separator (OGS) units to provide stormwater quality pre-treatment upstream of infiltration LIDs (should they be feasible) and outfalls.

As described in Section 3.4, it is suggested that retention of the 90th percentile storm event be considered within the water balance strategy for the proposed Site. This is conservatively assumed as a 28 mm rainfall event over the Site area (7.93 ha), equivalent to a 2,220 m^3 required retention volume.

Climate Change

Due to Climate Change, it is expected that rainfall events will have increased intensity in the near future. An evaluation of the stormwater impacts of Climate Change on the South Muskoka Memorial Hospital development should be completed. The analysis should consider stormwater flow conveyance ensuring that the hospital building and critical

infrastructure such as the oxygen/fuel tanks, helipad, etc. are located away from major overland flow routes and outside of the floodplain associated with the watercourse along the to the northern boundary of the Site.

It is recommended that analysis for predicted 2050 and 2080 storm events be considered. The analysis should consider alternative pricing for additional on-site stormwater management conveyance, detention, and retention controls.

Specifically, stormwater management systems should be designed to safely convey proposed, future climate change adjusted, peak flows and follow mitigation recommendations of climate risk and resilience assessments carried out at the next stage of development.

Further to this, stormwater management systems should be designed to safely detain stormwater on-site by attenuating proposed, future climate change adjusted, peak flows to existing allowable release rates for all storm events up to and including the 100 Year event and follow mitigation recommendations of climate risk and resilience assessments carried out at the next stage of development.

In addition, stormwater management systems should be designed to safely retain stormwater runoff on-site such that the changes from the existing condition water balance are minimized. It is recommended to utilize on-site LID practices to achieve sufficient stormwater retention where site conditions allow; however, it is noted that the use of LIDs will be applied where feasible regardless of the Site sustainability metrics to achieve the water balance criteria as specified by municipal and provincial regulations.

It is also noted that the District of Muskoka is working towards the implementation of a “climate change lens” as the approval authority on Planning Act applications and as a commenting agency to maximize resiliency of ecosystems and communities, manage the risks associated with climate change and provide sustainable natural environmental services for future generations of residents and visitors to Muskoka. As such, the implementation of the climate change lens may result in:

- The implementation of green infrastructure (LIDs)
- Increased setbacks for development adjacent to wetlands, lakes, rivers, headwater areas, and groundwater recharge areas;
- Retention of natural vegetation; and
- More stringent requirements for stormwater management and flood abatement.

Conclusions and Recommendations

- [redacted]
- Approximately 130 m of off-site municipal sanitary sewer construction and upgrades to two (2) existing downstream pumping stations would be required to service the Site for sanitary;
- Approximately 180 m of off-site municipal watermain construction would be required to service the Site for domestic and fire support. On-site storage will be required for supplementary fire protection, as the municipal system does not have the capacity to provide full fire protection for the proposed hospital;
- There is no existing stormwater infrastructure within proximity to the site;
- Stormwater quantity control will be required to control all design events up to and including the 100 Year storm, plus erosion control. This can be achieved through implementation of two SWM ponds;
- Stormwater quality treatment is required to meet Enhanced Level 1 controls, which can be provided by the two proposed SWM ponds; and
- Water Balance requirements will need to be addressed via completion of a Hydrogeological Investigation, to confirm if soils are suitable for infiltration.

1.3.3.3 DESIGN OBJECTIVES

1.3.3.3.1 PROJECT VISION AND CONCEPT

An Architectural Visioning session was held on April 20, 2023, with a variety of Muskoka Algonquin Healthcare staff and partners in attendance. Groups that were represented included the CEO, clinicians, facilities, redevelopment, human resources, and foundation as well as the RPG programming team.

The session built on the Vision developed as part of the Stage 1 document from 2014, the Sustainability and ICAT Visioning sessions completed as part of this project (refer to Appendices A and B), the MAHC Strategic Plan 2019 – 2024 and Functional Programming Planning Principles developed by RPG and MAHC. The Functional Programming Planning Principles are:

- Community-based,
- Patient focused,
- Sustainable and affordable
- Reflects mission, vision and values.

The group was asked three questions around each of the Functional Programming Planning Principles:

- What about the project excites you?
- What are the challenges you see with the project?
- Imagine the future 10 years from now – what would success look like?

Participants were invited to discuss their ideas and a record of those discussions was collected on the poster boards below:

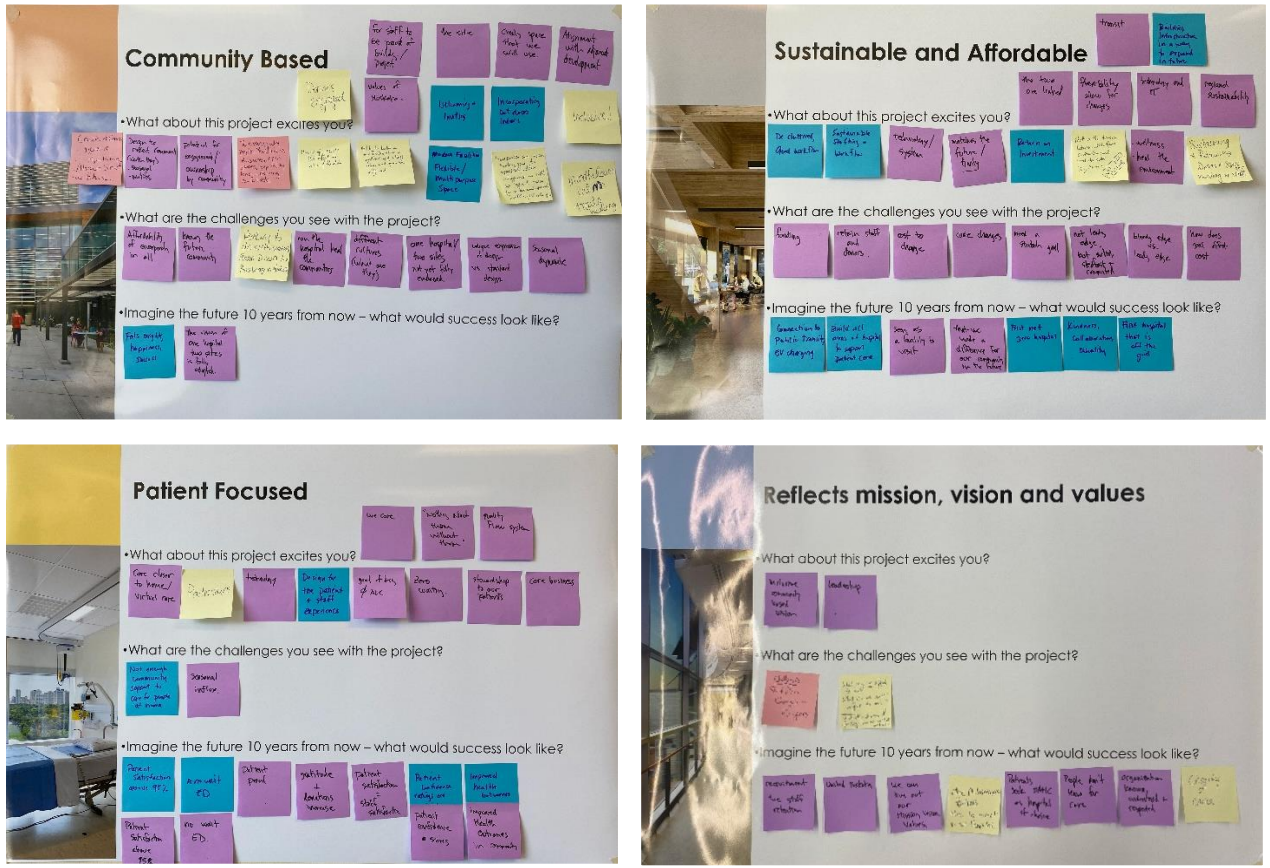


Figure 5. Visioning Poster Boards with Participant Ideas

When the ideas were consolidated after the meeting, three main themes emerged:

1. *Heal our community and environment*

   The idea of healing the local environment featured strongly across the four planning principles. The group felt this should be accomplished by pursuing sustainable initiatives, building with future flexibility in mind and using local materials.

   The group also felt that this project could heal the community through improved health outcomes for patients within the hospital as well as patients outside the hospital, by bringing care closer to home through the use of technology and expanded community partnerships. This project could also serve to unite Muskoka, specifically the communities of Huntsville and Bracebridge, and achieve the goal of "one hospital, two sites" by the time the hospitals are constructed in 2035.

2. *Be a leader in the healthcare community and Muskoka*

   The theme of leadership also recurred prominently across all four planning principles. A goal of MAHC is to be a leader in sustainability, especially among hospitals. This will be achieved by becoming a net zero hospital in the province with exemplary design that embodies the values and characteristics of Muskoka.

   MAHC will also strive to be a leader in the local healthcare community by building facilities that staff are proud to work at. This in turn will increase recruitment and improve retention to help mitigate the current challenges being faced with healthcare human resources.

   By building state-of-the-art facilities focused on sustainability, MAHC hopes to become the hospital and charity of choice with patient satisfaction rates at 95% by the time the new hospital opens.

3. *Build hospitals that are affordable for the community and the province*

   A primary concern right now across all sectors and communities is affordability, with both the costs of construction and operating buildings having increased exponentially over the last few years. Therefore, another theme that emerged from the discussions was that MAHC should build hospitals that are affordable at a provincial and local level. MAHC proposes to do this by leveraging local resources and strengthening local industries, including but not limited to lumber, stone, cement and aggregate, etc.

   A second way to build affordably is to leverage community partnerships and care closer to home, only building what is necessary. As a result, patients will receive certain treatments and types of care within their community without requiring travel, and the hospitals can be built for acute care services that have to take place in a hospital environment.

A third way to build affordably is to create systems that are operationally efficient. This extends beyond implementing efficient building management technology and practices but also includes efficient and effective patient care service delivery models. These construction and care efficiencies impact the initial capital construction cost, but also generate savings throughout the building's lifespan.

Concept

The conceptual design for the hospital was derived from the various visioning sessions that were held and the guiding principles of; “Heal our community and environment”, “Be a leader in the healthcare community and Muskoka”, and “Build hospitals that are affordable for the community and the province”.

Sustainability principles were incorporated into the overall massing and siting of the building to decrease the hospital’s negative impact on the environment without increasing the cost of the project. The building footprint was kept as small as possible with only the programs that needed to be located on the ground to minimize the development impact on the site. The massing was developed as a long rectangular bar that was oriented with the front door facing west to maximize views for the patients and visitors accessing the public facing programs along the mass timber front porch. The bar was placed on the site to minimize blasting of bedrock and to balance cut and fill on the site.

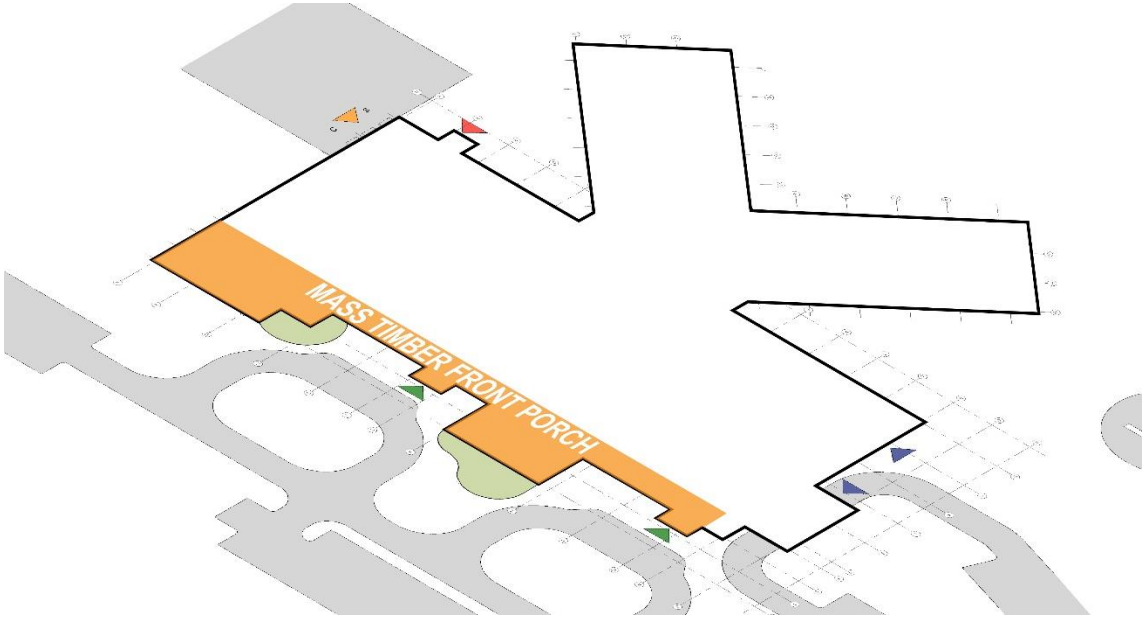


Figure 6. Mass timber front porch

Internally, the west face of the building was designed as the front porch of the hospital with public facing programs such as cafeteria, foundation and ambulatory care developed as pavilions in the landscape along the front porch with connections to the main public circulation and their own gardens. This front porch is intended to be built as mass timber, grounding the hospital in Muskoka, and incorporating elements of biophilia to enhance patient, visitor and staff experience. These areas are less constrained by IPAC requirements, allowing the opportunity to expose timber elements. In more clinical areas where timber cannot be exposed due to IPAC concerns, traditional construction (concrete and steel) would be used to maximize clinical efficiency with larger spans between columns and smaller columns. These areas of the hospital are located north of the public elevators.

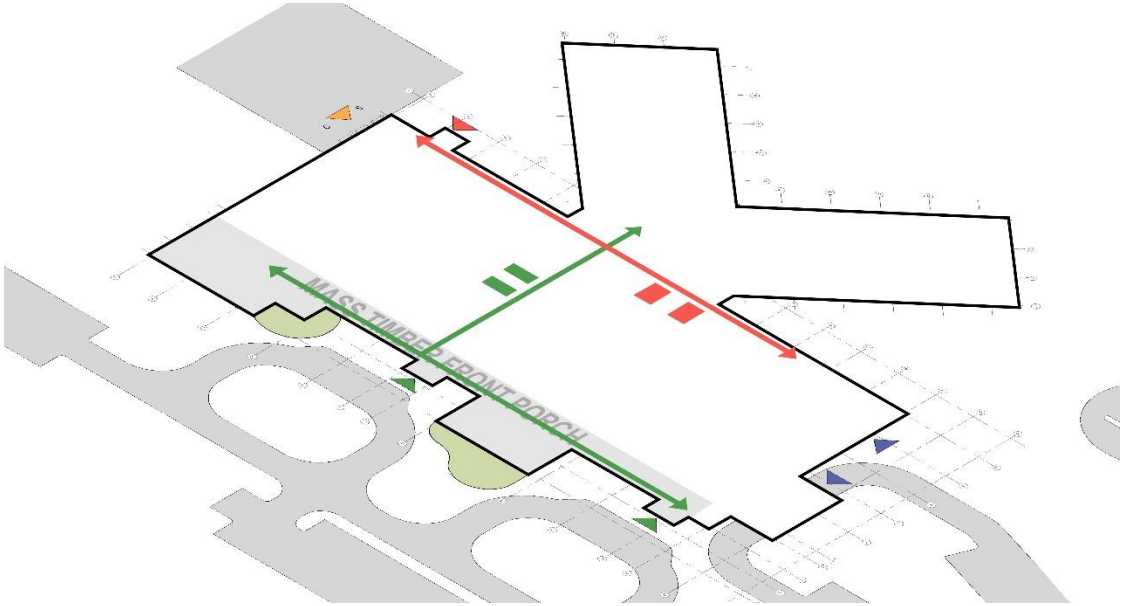


Figure 7. Circulation on main level

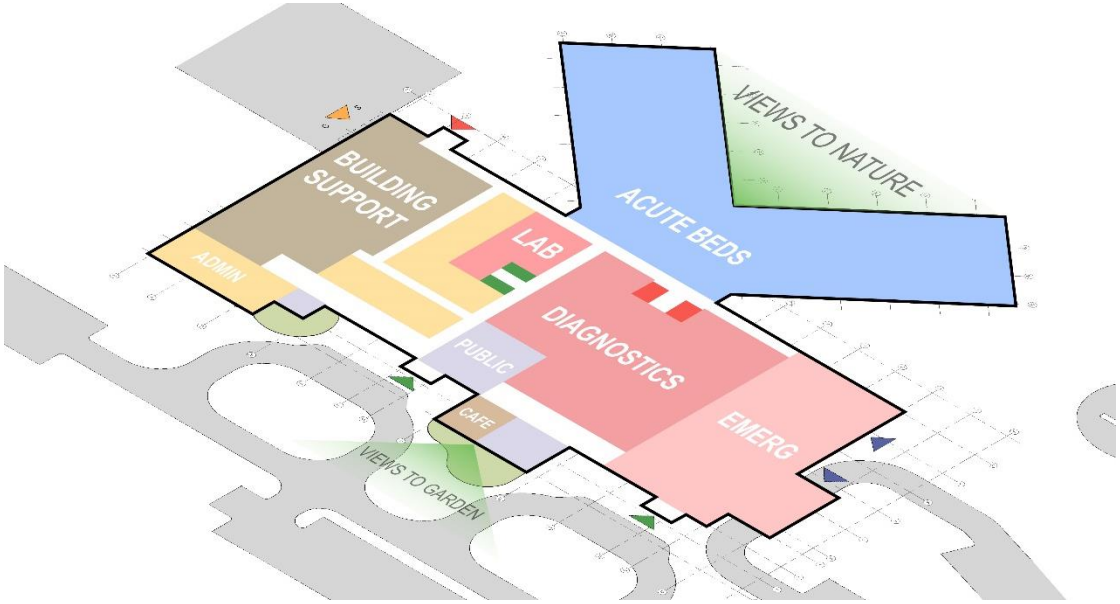


Figure 8. Program blocking on main level

Access to nature was important, and opportunities to connect with the landscape physically and visually were created. Programs such as cafeteria, foundation, and spiritual care each have access to their own garden specially designed for their needs. The ambulatory care garden could include outdoor space for infusions or treatments during the warm months. Walking trails and gardens for staff to grow vegetables were also envisioned for the remainder of the site. These walking trails will be for staff, patients and the community to use and enjoy.

Access to natural light and views for staff was incorporated wherever possible to increase staff wellness. In the inpatient unit, it was a goal of the project that the corridors that extend from the public and service entrances be designed to end in a large windows and staff lounges be located on the perimeter of the building in most instances.

The following sustainability strategies should be incorporated into the cost of SMMH, but will be included as part of the detailed design stages;

- green roofs,
- bird-friendly frit on all glazing to reduce the risk of bird collisions,
- the use of building products and finishes that contain high recycled contents and contain zero or ultra-low VOCs,

- the use of FSC-certified wood products, and
- enhanced stairwells to promote the use of stairs by staff.

1.3.3.3.2 PLANNING POLICY FRAMEWORK & MUNICIPAL APPROVALS

Regulatory Factors

Summary

The Town of Bracebridge is located within the District Municipality of Muskoka. The site at 300 Pine Street is subject to planning policies within the District Municipality of Muskoka Official Plan, and the Town of Bracebridge Official Plan and Zoning By-law.

This regulatory framework governing the 300 Pine Street site – discussed in more detail below - is supportive of a hospital use on the site, with the zoning requirements in Table 8 regulating future growth and development. All future development plans should seek to comply with these parameters to the greatest extent possible. Given that the land use designation and zoning is generally supportive of the use and intensity of development under consideration, if any relief from these requirements is needed, such as to permit off-site parking, this likely can be achieved via a Minor Variance at the Committee of Adjustment (as opposed to a more onerous Zoning By-law Amendment – see further discussion in Requirements for Planning and Building Approvals).

Official Plan Land Use Designation

The District Official Plan designates the site as Urban Centres. Major permanent residential growth and major employment generators are directed to Urban Centres to promote the efficient use of land and infrastructure to meet the needs of present and future residences and businesses and align growth and municipal services. The District Official Plan permits major public facilities (such as public hospitals) in Urban Centres, and states that major public facilities shall be located in Urban Centres. A hospital location within an Urban Centre boundary is also consistent with overarching provincial policy direction in the Provincial Policy Statement and conforms to the District's growth management objectives and land use planning policies. Locating a hospital in an Urban Centre will allow for the co-location of other community services and infrastructure and complementary uses, make use of existing infrastructure and services, and support active transportation and transit usage.

The Bracebridge Official Plan similarly anticipates that institutional facilities will locate within the existing Bracebridge Urban Centre area, which includes the site. The Bracebridge Official Plan designates the site as Business Area and Special Purpose Commercial. Community Facilities are permitted within all land use designations within the Urban Centre, subject to the provisions of the zoning by-law, and provided:

- The use is, or can be made, compatible with surrounding uses

- Adequate parking is provided, and
- The use is adequately buffered from residential uses (B7.2).

In addition, a public authority may use any land, erect, or use any building or structure for the purpose of public service in any land use designation. Any such building will be encouraged to comply with height, coverage and yard requirements prescribed in the Zoning By-law for the zone in which it is located, as well as other criteria related to parking standards, outdoor storage, and compatible design and maintenance if located in a residential area (B20.1). In additional to zoning requirements, if a site is determined to have potential for archaeological resources, further detailed considerations will be required.

Zoning

The Town of Bracebridge's Zoning By-Law regulates the use of land and must conform to the District of Muskoka Official Plan and Town of Bracebridge Official Plan. Hospitals are identified as permitted uses within institutional zones, so a zoning by-law amendment may be required to permit a hospital use in a non-institutional zone. The site is zoned for Business Park Industrial and Special Purpose Commercial, which does not explicitly permit Hospital uses. However, Policy 4.2.2 permits a public authority, such as MAHC, to establish a building or institution in all zone categories with the condition that it complies with all applicable regulations including parking and loading requirements for the zone it is located within.

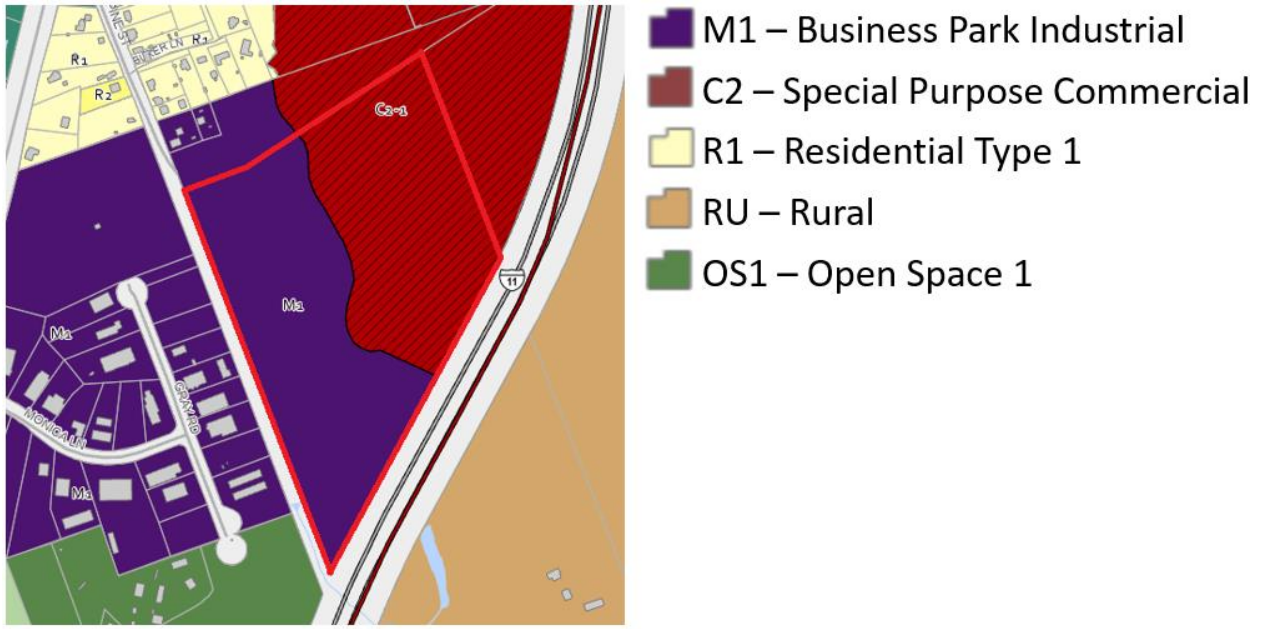


Figure 9. Town of Bracebridge Zoning Map

The regulations that apply to the Business Park Industrial and the Special Purpose Commercial Zones on the site are indicated in Table 9.

Table 9. . Key Zoning Parameters

Item	Business Park Industrial (M1)	Special Purpose Commercial (C2)
Minimum Lot Area	Not Specified	0 m2
Minimum Lot Frontage	Not Specified	24 m
Minimum Front and Exterior Side Yard Setback	15 m (+9 m if abutting a Residential Zone)	7.5 m
Minimum Interior Side Yard Setback	3 m (+9 m if abutting a Residential Zone)	3 m (9 m if abutting a Residential Zone)

Item	Business Park Industrial (M1)	Special Purpose Commercial (C2)
Minimum Rear Yard Setback	7.5 m (+9 m if abutting a Residential Zone)	7.5 m
Maximum Lot Coverage	50%	Not Specified
Minimum Landscaped Area	5%	Not Specified
Maximum Building Height	12 m	9 m
Minimum Setback from Centerline of Road	33.5 m Provincial 28 m District 25 m Other	26 m Provincial 20.5 m District 17.5 m Other
Minimum Parking Spaces	Hospital: 3 parking spaces for every 4 beds Parking spaces must be located on the same lot as the use.	

In addition to these zoning parameters, the new development will need to respond to other constraints, such as setbacks from the creek along the eastern portion of the property, which the team has factored in to the appropriate siting of the hospital. The site is also subject to a Ministry of Transportation (MTO) 14 m setback from Highway 11. Parking is permitted in this area, but this parking must be over and above what is required to satisfy zoning requirements, to ensure zoning is satisfied in a scenario where MTO requires this land in the future. The site is also within the MTO's Public Transportation and Highway Improvement Act (PTHIA) area. This will require MTO review of future applications for development on the site, and may require additional stormwater infrastructure (i.e. oversized storage). Additionally, MTO does not allow some stormwater infrastructure (e.g. rooftop storage) for sites within the PTHIA which will limit stormwater infrastructure opportunities.

Planning Approvals and Risks

The surrounding lands to the site are zoned for compatible uses (e.g. Commercial; Business Park Industrial), minimizing risks related to land use compatibility. In addition, the Town's executed agreement purchasing the site from Fowler Construction to accommodate a new hospital is indicative of the municipal support for a hospital use within this zoning context, similarly minimizing risk.

Other strengths associated with this site are that amendments to the District Official Plan and Bracebridge Official Plan would not be required to permit a hospital on the site. Amendments to the Zoning By-law should generally not be required, at least in terms of permitting the use on the site, so long as the proposed hospital complies with height and setback regulations, parking/access, and other zoning regulations, a public use of this nature is permitted in any zone. If zoning relief is required in relation to specific built form or parking regulations, zoning relief should generally be able to be advanced via minor variance as opposed to a full zoning by-law amendment. Zoning conformity and any related approvals to address zoning relief (Minor Variance or Zoning By-law Amendment application) will need to be reviewed and confirmed once the detailed design and location of the hospital on the site are confirmed.

Requirements for Municipal Planning and Building Approvals

Summary

Anticipated municipal planning and development permit approvals include:

1. Pre-Application Consultation
2. Minor Variance (only if zoning relief is required)
3. Site Plan Approval (SPA)
4. Building / Development Permits

It is anticipated that the project will be able to proceed directly to a SPA application (typically 9-18 months), with any minor zoning relief addressed via a Minor Variance application to the City's Committee of Adjustment (60-90 days, concurrent with preparation of a SPA application, prior to formally submitting the application). Following SPA, Building / Development Permits typically require 2-6 months.

Proactively engaging in ongoing pre-application consultation discussions with municipal staff at key project milestones is strongly recommended. [redacted].

Identifying and confirming the best approach to resolve these types of issues in a collaborative fashion as the project advances will help to inform detailed design, minimize related risks, build awareness and support for the project at the municipality, and will help the team develop a more comprehensive approvals strategy, providing clarity on current estimated requirements and timelines.

It should be noted that at this time, discussion of requirements for planning and building approvals have only considered the proposed new hospital and have not considered any other future additional uses on the land (such as addition of long-term care facilities, stand alone retail/pharmacy uses etc.). Should these become of interest at a later time, they will require further consideration and their own distinct approval processes.

Approvals Process Strategy

Initial informal meeting(s) with municipal staff as the project progresses are recommended, followed by a formal pre-consultation meeting, to be undertaken once project design and siting of the hospital on the property have been sufficiently advanced to support applications for Site Plan Approval (and any related zoning relief that may be required).

Informal Meeting(s) with Municipality: Urban Strategies recommends continuing to engage with municipal staff via initial informal meeting(s) to identify, discuss and resolve key considerations [redacted]

Formal Site Plan Approval Pre-Consultation Meeting: All of Bracebridge is designated as a 'Site Plan Control' area, where Site Plan Approval applications are required for significant new development activities, including new institutional development like a hospital. When the detailed design of the project has sufficiently advanced, a meeting should be held with municipal staff to confirm the requirements and scope for all of the deliverables that will need to be submitted to the municipality in support of a complete Site Plan Approval application. Requirements typically include a range of technical drawings including:

- Architectural drawings (site plan, floor plans, building elevations)
- Servicing plan
- Landscape plan
- Grading and drainage plan
- Stormwater management and construction mitigation plan,
- Fire route site plan
- Site survey
- Any other potential requirements to be confirmed by municipal staff (e.g. documentation related to the helipad)

While approval of changes to the location of the heliport and related modifications to the flight path are federally regulated, it is expected that some documentation of how these modifications are being advanced and approved will also be requested by the municipality as part of a complete Site Plan Application. It is recommended that MAHC and the consultant team advance planning and approvals for any changes to the heliport and flight path concurrent with or in advance of filing a Site Plan Application, to allow for coordinated planning.

As this pre-application consultation meeting will be held once project design is much closer to final, this meeting will also provide an opportunity to confirm whether any zoning relief is required, and the best process to obtain that relief.

Site Plan Application Process & Typical Timelines: following a pre-consultation meeting, MAHC will need to direct the consultant team to prepare and submit all materials required as part of complete Site Plan Application. Historically, this process typically unfolded over a 9-18 month process, allowing for review and staff comments, and resubmission of revised studies, plans and drawings to address staff comments. Site Plan Approval is a technical approval process, with no formal requirements for public consultation, and with the approval authority delegated to municipal staff by council. While MAHC may choose to engage with the public or stakeholders, this will not be required as part of the Site Plan Approval process.

With regards to timelines and process, through recent Bill 109, the province has made some fundamental changes to the Planning Act, where municipalities must now make a decision on a Site Plan Application within 60 days of when a complete Site Plan Application is received, after which municipalities are required to begin refunding Site Plan Approval fees:

Refund Amount	Type of Planning Application		
	Combined OPA/ZBA	ZBA	SPA
No Refund	Decision within 120 days	Decision within 90 days	Approval within 60 days
50% Refund	Decision within 121-179 days	Decision within 91-149 days	Approval within 61-89 days
75% Refund	Decision within 180-239 days	Decision within 150-209 days	Approval within 90-119 days
100% Refund	Decision 240 days and later	Decision 210 days and later	Approval 120 days and later

Figure 10. Site Plan Approval Fees

While intended to speed up related approvals process, these timelines are challenging for staff, particularly on complex projects. As a result, this new legislation has resulted in a fair degree of uncertainty as respective municipalities adjust their application review processes to ensure they can meet timelines. While approaches are still in flux and varied from one municipality to the next, we are finding that most municipalities are placing a much greater emphasis on the pre-application consultation process, and/or are becoming much stricter about deeming applications complete (at which point the 60-day review window kicks in).

Much of the iteration and refinement that previously took place during a longer site plan approval process - staff comments, refinements, resubmissions - no longer fit within these timelines. Opportunities for staff comment, refinement, and discussion are now increasingly being undertaken as part of the pre-consultation process, which can now include multiple meetings and workshops with municipal staff, along with receipt of formal pre-application staff comments, and related revision of application materials - prior to even filing a formal application, or prior to the municipality deeming an application complete.

In short, we have not noticed a significant change in length of time to advance complex Site Plan Approval applications and would still recommend that MAHC plan for a 9-18 month Site Plan Approval process to prepare, refine, submit, and secure Site Plan Approval.

Minor Variance Application, if required: as per discussion above, once the detailed design and location of the proposed hospital on the site has been confirmed, the team will be able to confirm if any zoning relief is required (e.g. in relation to permitted height, setbacks, and parking requirements in the zoning by-law). Based on our review of the current proposal, it is our understanding that if necessary, any zoning relief would generally be considered minor, and should be obtainable via a Minor Variance application. This is typically a 60-90 day process, involving:

- Preparation of an application detailing and justifying the variance (cover letter outlining rationale; plans and drawings)
- Notification sent to nearby landowners, who may make written submissions and/or attend hearing and voice support or concerns
- Preparation of related PowerPoint presentation
- Committee of Adjustment Hearing (5 minute presentation, followed by oral Committee decision)
- Formal written decision and notice + 21 day appeal period (under recent legislative changes, only the applicant or municipality can appeal the Committee's decision; third-party appeals from nearby landowners are no longer allowed)

Given municipal support for the project, we anticipate a straightforward approval of any variances, with very low risk of refusal, or municipal appeal of a favourable committee decision approving any variances.

With regards to timelines and process, minor variances should not add any significant time to the planning approvals process (this should fit within the 9-18 month Site Plan Approval process described above). It should be noted that the Bill 109 changes to Site Plan Approval applications are impacting strategic timing of when to file a Minor Variance application, which were typically filed concurrent with longer pre-Bill 109 Site Plan Approval processes. Now that Municipalities must make a decision on a Site Plan Approval process within 60 days, it is typical that a municipality will not deem a Site Plan Approval application complete until the proposal is fully compliant with applicable zoning, as it is not possible to approve a project that does not comply with zoning. In other words, if required – we anticipate that a Minor Variance Application will need to be filed and approved before a Site Plan Approval application can be filed. This application should be filed concurrent with preparation of the Site Plan Approval application, during pre-consultation discussion with the municipality, once MAHC and the consultant team are confident that the variances will not change (and/or build appropriate flexibility into requested variances).

Development Permits: Once Site Plan Approval is obtained, the project will be able to apply for building permits to allow for the construction of the hospital, as well as any other permits that may be required in relation to site servicing and preparation of the site for construction (clearing trees, regrading the site, etc.). It is possible that the municipality may permit some earlier construction and site preparation activities to proceed prior to full Site Plan Approval. A permitting and site preparation/construction strategy should be discussed with staff during informal and formal pre-consultation discussions.

Timelines

As outlined above, it is challenging to outline the schedule implications of required municipal approvals processes, until the proposal is further advanced, including arrangements related to land acquisition and parking. Approximate timeframes for related processes are summarized below to assist the team in determining the best path forward.

Site Plan Approval will be required for any new hospital development. This process typically requires 9-18 months from submission to approval, at which point applications for development permits can be advanced. If required, a Minor Variance Application should be able to advanced concurrent and within these timelines (a discrete 60-90 day process, to be undertaken concurrent with preparation of a Site Plan Approval application).

Development permit applications will also be required. These processes vary in length of time but can take up to 2-6 months for respective permits depending on the complexity of the project. As noted above, some municipalities will consider releasing conditional permits for some construction related activities earlier, allowing for initial site preparation and below-grade construction activities to be expedited. Permitting strategies should be explored further in conversation with municipal planning staff and can be confirmed during the Site Plan Approval stage as part of related construction management planning.

Conclusion

Given the outlined processes and considerations above, it is challenging to speak with certainty about required approvals processes for the new hospital at this stage in the project. As such, engaging in early consultation with municipal planning staff, along with follow-up discussions at key milestones is recommended as the project progresses. This will help to identify and troubleshoot any potential issues at the outset, build municipal awareness and support for the project, confirm approval processes and realistic timelines, and ultimately should help to streamline and expedite the process for municipal planning and building approvals. That said, given municipal support for locating the new hospital at this location, it is expected that municipal approvals will be able to advance collaboratively with the support of the Town. These efforts should be timed concurrently with Stage 2 of the Ministry of Health Capital Planning Process, allowing for the team to continue to proactively plan for these necessary approvals as part of the project schedule and work plan.

1.3.3.3.3 HELIPAD SITING AND FLIGHT PATH

Introduction

The establishment of a new heliport will be required as a component of the redevelopment of the Hospital on a greenfield site to ensure that this important function is established to serve the Hospital. Avia NG Inc. was retained by Stantec Architecture as part of this project to provide an assessment of the site and to determine the requirements for a new heliport facility. In this section, the outcome of the assessment is presented, and the new heliport requirements addressed in sufficient detail to inform the Functional Program for the project. Additional details are presented as part of a standalone report and this has been included for reference in Appendix 2-D.

Minimum Functional Requirements

The primary function of the new heliport is to cater to patient transfers from the Hospital or a land ambulance to an air ambulance that would then take the patient to a regional trauma centre with specialized care services. The secondary function will be for transfers to the Hospital or land ambulance from an air ambulance. This transfer in and out function is the defining characteristics of a hospital heliport, however a third function will be to facilitate urgent dispatch of specialized medical personnel as can be required from time to time such as with the need for stabilization of medical trauma case or the assessment of a patient before a decision to transfer is made. The heliport may also serve other functions, such as use by police, dignitaries or military personnel.

In order for the heliport to serve its function, it will require one Final Approach and Takeoff Area (FATO) with a collocated Touchdown and Lift-off Area (TLOF) from which a helicopter can arrive to and depart from. It is the TLOF and FATO that are readily identifiable as the Heliport - providing the landing area for helicopters. No additional parking positions are needed given the amount of traffic that the facility is anticipated to experience.

The heliport will need to be accessible by vehicles for maintenance as well as for transfer of patients between land ambulance and air ambulance. Similarly, the heliport should be accessible by a walkway to facilitate inspection by staff and patient transfer to/from Hospital and land ambulances that may not have the need or ability to drive to the edge of the helipad.

The facility will be used both during the day and at night, and during all seasons. Inclement weather conditions will prevent use of the heliport, but efforts should be made through careful site planning and facility design to minimize down time of the facility and recovery time from snow events. This can be accomplished through raising the helipad slightly above surrounding grade, landscaping considerations, and setbacks from roadways and snow dump areas.

Classification and Flight Path

Classification

A heliport, certified or not, is required to have at least one usable flight path to enable use by the helicopters it is intended to serve. The minimum size and shape of a certified heliport's flight path area(s) and associated obstacle limitation surfaces (OLS), as prescribed in Canadian Aviation Regulations (CARs) Standard 325 - Heliports, are determined by a combination of heliport classification and design aircraft parameters.

Since the new surface-level heliport will not have instrument approaches and will be used for both day and night operations, the heliport will have a day/night non-instrument classification. Transport Canada further subdivides non-instrument heliports, and specifically the flight path areas associated with the Heliport's Final Approach and Takeoff Area (FATO), into three (3) categories: H1, H2, and H3. These categories are defined by Transport Canada as follows:

1. A non-instrument heliport is classified as H1 if the heliport is located with an obstacle environment where:
    a. There is no emergency landing area within 625 metres from the FATO; and
    b. The helicopters using the heliport can be operated at a weight, and in such a manner that, in case of an engine failure at any time during the approach or takeoff, the helicopter can either
        i. Land and safely stop on the FATO or TLOF area, or
        ii. Safely continue the flight to an appropriate landing area.
2. A non-instrument heliport is classified as H2 if the heliport is located within an obstacle environment where:
    a. The height of the obstacles are infringing the first section slope of the approach and takeoff surface set out in Table 4-1(CARs 325); and
    b. There are reachable emergency landing or rejected takeoff areas within 625 metres of the FATO in relation to the altitude of the helicopter and its performance with one engine inoperative.

3. A non-instrument heliport is classified as H3 if the heliport is located within an obstacle environment where:
    a. The height of the obstacles do not penetrate any of the obstacle limitation surfaces (OLS) requirement set out in Table 10 (CARs 325); and
    b. There are reachable emergency landing areas or rejected takeoff areas within 625 metres of the FATO in relation to the altitude of the helicopter and its performance during autorotation.

The new heliport will need to be planned and established to support an initial classification of H2 whilst respecting the more stringent obstacle clearance requirements of an H1 classification. Preserving an ability to classify the heliport as H2 will allow aircraft operators the ability to accommodate a greater range of operating conditions with fewer restrictions to aircraft weight. Establishing flight paths that can also remain usable under an H1 classification will help to ensure that the heliport remains viable in the future should there be a loss in suitable emergency landing areas or despite the encroachment of built-up areas around the Hospital.

Flight Path Requirements

Flight paths are established to ensure the Heliport remains accessible to helicopters. The heliport owner is responsible to ensure the flight path's Obstacle Limitation Surfaces (OLS), typically a series of trapezoidal inclined planes, are maintained clear of obstacles. These surfaces, illustrated conceptually in Figure 11, extend outwards and upwards rising from the heliport, along the direction of the declared flight path centreline. The characteristics of these surfaces are based on applicable standards and vary depending on the heliport classification.

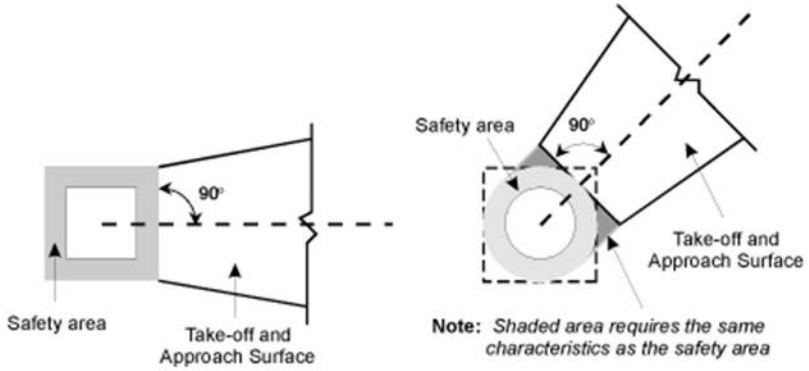


Figure 11. Example of Obstacle Limitation Surfaces for Non-Instrument FATO (CARs 325)

The OLS characteristics for the new heliport should be established based on an H2, day/night use, non-instrument classification in accordance with CARs Standard 325 and summarized in Table 10 below.

Table 10. *OLS Characteristics*

OLS Characteristics	Characteristics
Approach Surface	
Flight Path Inner Edge Length	Width of Safety Area
Divergence	15%
First Section	
Length	245 m
Slope	8%-16%
Second Section	
Length	730 m
Slope	16%
Total	1,075 m
Transitional Surface	
Slope	50%
Height	45 m

Heliport flight paths should be orientated such that arrivals and departures can be completed into the wind. Where feasible, multiple flight paths should be established and with reciprocal headings. Helicopters, similar to fixed-wing aircraft, generally land and takeoff into the wind. Each aircraft has operating limitations that dictate what wind speed and direction can be found acceptable during takeoff and landing. The classification of the heliport also has a bearing on what can be found acceptable. For these reasons, it is advantageous to establish flight paths that are generally aligned with the prevailing winds, given an increased probability that the heliport will be found usable. In Muskoka-

Algonquin, as with the majority of Ontario, flight paths aligned in west/northwesterly direction and an east/southeasterly direction will yield the greatest usability.

Physical Requirements

The physical characteristics of the new heliport should be in accordance with CARs Standard 325 – Heliports, so as to facilitate and enable heliport certification. The standard "outlines the minimum technical specifications for the physical characteristics, obstacle limitation surfaces, and technical services at a heliport necessary for the purposes of complying with Part III of the CARs". This includes the prescribed minimum requirements that inform helipad size, shape, strength, paint markings and lighting, as well as security and life safety systems.

As part of the review of the new heliport site, consideration has been given to what should be expected of the principal physical characteristics of the heliport that are relevant to the evaluation of site suitability and overall heliport feasibility. These characteristics are discussed further in subsequent sections, and the principal requirements are related to accommodating the design aircraft and the minimum size and shape of the heliport.

Design Aircraft

The new heliport required for this site will be a surface-level heliport for primary use by Ornge Air Ambulance and should be designed with the physical dimensions to accommodate a broad mix of helicopters typically used in medevac air ambulance services. Within Ontario, the primary helicopter engaged in medevac air ambulance service is the Augusta Westland AW-139 as operated by Ornge. In addition to the AW-139, other helicopters that may be routinely used in medevac service within Canada include the Bell 412 and Sikorsky S-76. Tables 11 and 12 provide a summary of the most relevant technical data for these helicopters which could be referenced in the preparation of a heliport design compatible with their use.

There are additional helicopters, such as the Airbus H135 and H145, that can also be considered in the heliport design stage, but in general these aircraft are of a smaller variety of helicopter and would be accommodated for within a facility designed for use by the primary three helicopters listed above.

Table 11. *Agusta Westland AW 139 Physical Characteristics*

Agusta Westland AW139		
Characteristics	Dimensions	Image
Maximum Takeoff Weight (MTOW)	6,800 kg	
Fuselage Length	13.49 m	

Agusta Westland AW139		
Overall Length	16.66 m	
Overall Height	4.98 m	
Main Rotor Diameter	13.8 m	
Wheel Base / Skid Length	N/A	
Wheel Track / Skid Width	N/A	
Engine(s)	2x PT6C-67C Turboshafts with FADEC	
Fuel Capacity	1,588 L main + 588 L auxiliary	
Source(s): Leonardo Aircraft Company, EASA and Transoft Solutions.		

Table 12. *Physical Characteristics for Additional Aircraft*

Sikorsky S76C		
Characteristics	**Dimensions**	**Image**
Maximum Takeoff Weight (MTOW), including IGW Kit	5,307 kg	
Fuselage Length	13.21 m	
Overall Length	16.00 m	
Overall Height	3.58 m	
Main Rotor Diameter	13.41 m	
Wheel Base / Skid Length	5.00 m	
Wheel Track / Skid Width	2.58 m	
Engine(s)	2x Turbomeca Arriel 2S1	
Fuel Capacity	1,030 L	
Source(s): Sikorsky Aircraft.		

Bell 412EPI		
Characteristics	**Dimensions**	**Image**
Maximum Takeoff Weight (MTOW)	5,398 kg	
MTOW with IGW Kit	5,534 kg	
Fuselage Length	12.91 m	
Overall Length	17.31 m	
Overall Height	4.54 m	
Main Rotor Diameter	14.02 m	
Wheel Base / Skid Length	3.27 m	
Wheel Track / Skid Width	2.89 m	
Engine(s)	PT6T-3D or PT6T-3DF Twin Pack	
Fuel Capacity	1,251 L	
Source(s): Bell Aircraft Corporation.		

TLOF/FATO Size and Shape

The minimum size and shape of the heliport is directly related to the size of the design helicopter and shall also consider the requirements outlined within the Helicopter's approved Rotorcraft Flight Manual (RFM). The size of the new heliport for the Site should therefore be based on the Bell 412 EPI as it has the largest overall length. Further consideration should be given to the requirements outlined in the RFMs for each aircraft as such can at times require a larger Touchdown and Lift-off area size than the minimum required in CARs to allow use of an H1 classified heliport. Table 13 summarizes the proposed requirements for the heliport based on the critical design aircraft and should be vetted again prior to proceeding with design.

Table 13. *Proposed Heliport Physical Characteristics*

Item	Minimum Dimensions	Minimum Criteria
Touchdown and Lift-Off Area (TLOF)	21.03 m dia. concrete/asphalt pad (Equal to with FATO recommended)	Greater of 1.0x Overall Length or CAT A requirements
Final Approach and Takeoff Area (FATO)	26.25 m dia. concrete/asphalt pad	1.5x Overall Length
Safety Area (SA)	35.00 m dia. asphalt or treated surface	Extending FATO by 0.166x Overall Length or 3.0 m, whichever is greater
Extent of Load Bearing Surface	21.03 m dia. (Equal to width of FATO recommended)	Based on minimum dimensions of TLOF
Extent of Graded Area	26.25m dia. (Equal to width of SA recommended)	Based on minimum dimensions of FATO
Safety Area Transitional Boundary	3.0 m from SA	Minimum 3.0 m
Note: Dimensions based on a circular landing surface.		

TLOF/FATO Grade and Elevation

Given that it is generally considered desirable to locate a surface-level hospital heliport as close to the emergency entrance of the hospital as possible without sacrificing safety and heliport usability, it is often found to be advantageous to raise slightly the elevation of the helipad (FATO) in relation to the surrounding grade and nearby lanes or roadways and parking lots. By increasing the height of the helipad above nearby obstacles, the helipad can often be located closer to the Hospital emergency entrance than would otherwise have been possible given the typical obstacle environment.

It is anticipated for the new heliport, that the FATO and associated Safety Area will need to be raised slightly above surrounding proposed grade to facilitate obstacle clearance, snow removal and maintenance activities. An elevation of approximately 1.5 to 2m above the ER exit lane may be appropriate subject to further evaluation of proposed grade changes. Restrictions on vehicular and pedestrian movements adjacent to the heliport will be required to ensure that appropriate obstacle clearances are maintained and consideration to rotor downwash hazards mitigated.

Heliport Visual Aids

All heliports certified in accordance with CARs 305 and Standard 325 that are intended for use at night are required to meet specific standards for visual aids and marking of the heliport, as well as nearby obstacles. The TLOF/FATO requires perimeter edge lighting to clearly delineate the limits of the area designated suitable for the takeoff and landing of helicopters. The perimeter lights, a total of twelve (12) based on a FATO diameter of 26.25m, will be required. These lights are specific to heliports and need to be omni-directional, medium intensity green and compatible with use of night vision googles. In addition, since it may be determined appropriate to identify visually the specific arrival/departure flight paths, two Approach/Takeoff Direction Indicators with lighting as set out in CARS 305.33(3) and Standard 325.33(2) will be required. Each Approach/Takeoff Direction Indicator lighting system will consist of up to 8 omni-directional yellow lights to give indication of flight path direction at night.

Complementary to the FATO and Approach/Takeoff Direction Indicator lighting systems will be the requirement for installation of an Aircraft Control of Aerodrome Lighting (ARCAL) system (Type K) to provide pilots with the ability to turn on and control the intensity of the lighting systems.

Supplementing the identification of the FATO by the perimeter edge lights, will be the installation of low-profile perimeter floodlighting. These will be required and installed around the periphery of the paved landing area to ensure adequate lighting is provided for hospital staff and medevac service personnel. The lighting should be designed to not distract or cause glare to pilots in the air or on the ground. It is anticipated that a minimum six flood lights providing 10 lux in uniformity ratio of not more than 8 to 1, will be required to illuminate the area.

Given the intended use of the heliport, it is recommended that heliport lighting be tied into the hospital's back-up emergency power supply.

Obstacles in the vicinity, such as buildings, and floodlight standards in parking lots, will need to be marked and lighted in accordance with CARs Standard 621. This standard will dictate that certain buildings or portions thereof and a limited number of other obstacles will need to be fitted with CL-810 red obstruction lights. Obstacles such as nearby power transmission lines will require additional marking and lighting specific to those facility when located in proximity to an aerodrome (heliport or airport).

The heliport itself will need to be provided paint markings in accordance with CARs to identify the FATO/TLOF and that the facility serve as a hospital heliport. The marking will consist of a white solid cross and a red capital H that is aligned in magnetic north. Since the pad may be concrete, a 15 cm red border or black boarder should be added line markings for increased conspicuity.

Additionally Transport Canada requires that all heliports to be equipped with a wind direction indicator (WDI) and if used at night to be illuminated and equipped with an obstruction light. The WDI or "Windsock" will need to be installed near the helipad. In some cases, due to the proximity to terrain or other obstacles that can have an effect on wind speed and direction, a second windsock may need to be installed atop the hospital building to provide pilots with an additional reference.

Location Options and Recommendations

[redacted]

1.3.3.3.4 SUSTAINABILITY AND BUILDING ENERGY

Refer to Appendix 2-B.

1.3.3.3.5 CIRCULATION

General

Circulation in the hospital will be clear and will provide intuitive wayfinding. Users will be able to navigate to their destination easily with clear access into the building, a central visual landmark being the public elevators, natural light throughout floor plates, and repetitive elements on e floor.

The building will be zoned to clearly delineate public space, patient care space, and staff and service space.

Public/visitor traffic and service/patient transfer traffic, as well as clean/soiled separation will be maintained, as much as possible, on all floors.

Entrances / Exits

All public visitors will enter through the public entrance on the west side of the hospital, except for those accessing the emergency department. Those visitors will enter through the southwest public entrance. Both entrances will have highly visible, accessible vehicular drop offs.

All Patient Transfers will occur through the door between the public entrance and the emergency department. This entrance will use the emergency department drop-off for patient transfer vehicles.

All ambulances will use the ambulance garage on the south side of the building. The garage will be designed to accommodate 4 ambulances with additional parking outside of the garage.

All police bringing in patients who are experiencing a mental health crisis will use the dedicated police entrance door east of the ambulance garage. This will allow for discreet transfer of patients experiencing distress and will separate them from the trauma patients.

A staff entrance is included on the northeast side of the building closest to the staff parking and the staff lockers, making it convenient for staff to enter and exit the building without passing through the public areas of the building.

The service entrance will be located on the north side of the building as part of the service yard. Service vehicles will enter the site from Depot Drive or from Gray Road and will drive around the hospital to the east. This entrance will also serve as the entrance for Meals on Wheels.

Public Circulation

Balance must be maintained between security, courtesy, and safety.

1. The Porch along the front of the building will be open to all public circulation. There will also be an east-west public corridor connecting the main entrance with the inpatient units.
2. Public circulation on the second floor will be along the east-west corridor of the building.
3. Unescorted inpatients and outpatients will use the public circulation routes.

Patient Circulation

1. From a patient perspective, the experience is intended to be clear and as time efficient as possible. Spaces to rest, to contemplate, and to look out will be provided at various locations.
2. Patient privacy, safety, convenience, and comfort will be a top priority.
3. Inpatient circulation will be separate from outpatient circulation.
4. All patients in service areas or circulation zones will be escorted by hospital staff.

Inpatient and Outpatient Floor Circulation

1. All public entrances to floors will be designed for controlled access.
2. The public egress route will be the same as the public access route.

Staff Circulation

1. The relationship of staff areas, support service rooms, and patient rooms will be designed to support maximum efficiency in workflow.
2. Staff will have controlled access to secured building stairs for internal circulation.
3. All staff entrances to floors will have ID secured access.

1.3.3.3.6 CLINICAL OBJECTIVES

The clinical design and planning of SMMH represents an opportunity to develop a high-level of excellence for the physical layout of the facility. One of the goals of MAHC is to heal the Muskoka region and be a leader in the healthcare community. It is imperative that, at this point in time, where the physical form of the hospital is being redeveloped, that extra care is taken to ensure that the clinical design supports and improves the high-level of clinical care provided. It needs to also ensure patient safety, support changing models of care, and improve patient outcomes. The facility will follow the latest edition of the CSA Z8000 as a minimum, in all aspects of the design of the facility.

Future Flexibility and Long-Term Planning

The most critical element is flexibility; allowing for services to grow or contract, for acuity to shift over time, for research, innovative therapy development and education to be incorporated, and for the seamless integration of technology in ways that will fundamentally change the hospital experience for staff, patients and their families. It is essential to consider not just the immediate planning horizon, but also a future state that allows for scalable change. New and non-envisioned technology and therapy may change service delivery methods and the planning should allow for additional beds.

Flexibility will be planned for in three ways:

Regular structure and standardized bed layouts

The underlying building arrangement will support future change through use of regular structural grids and contemporary floor-to-floor heights. Room design will prioritize standardized dimensions to allow for flexibility and adaptability of function. For example, medical surgical bedrooms can be designed to have the same footprint as ICU rooms so that beds can be easily converted in the future. Clear, primary circulation routes and careful placement of

vertical circulation elements will optimize potential departmental layout options and support intuitive wayfinding and future flexibility.

Soft Space

Rooms or departments that can easily be relocated such as administrative functions will be located in areas that could become inpatient units in the future. These departments can be planned such that corridor location and width could support conversion to an inpatient unit. Services required for inpatient units could also be roughed in behind the walls to allow for less disruptive renovations in the future. For example, a meeting room or lounge that is located beside an inpatient bedroom and sized appropriately could easily be renovated into a bedroom.



Figure 12. Level 1 Critical Care Incremental Expansion

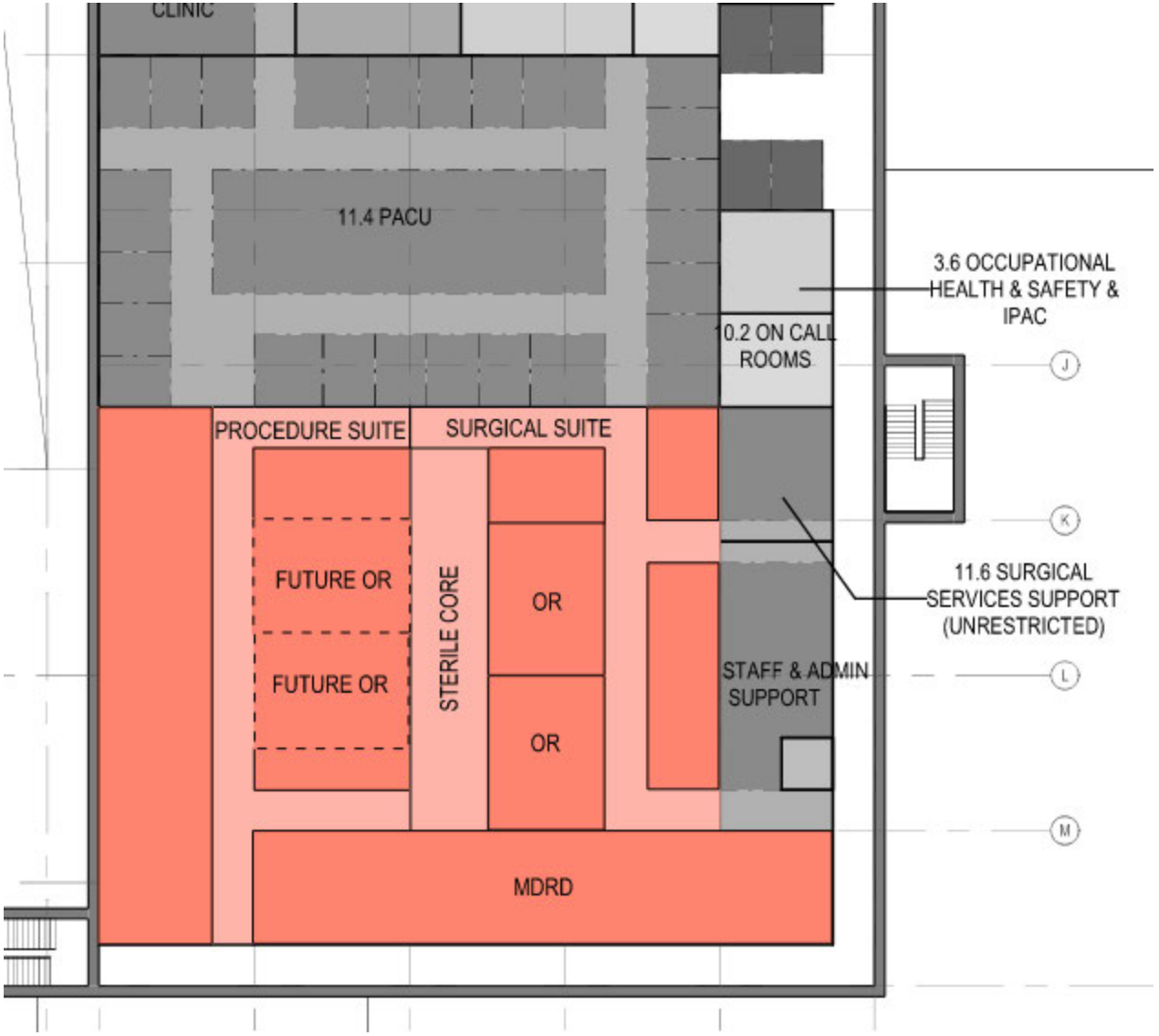


Figure 13. Level 2 Surgical Suite Incremental Expansion – Fit out of procedure rooms to ORs

Site Expansion

The site was planned to allow for a future addition to be added to the hospital on the north side. This addition could be multiple stories in height and could extend towards the west. There could also be an addition on the south side, but this would require relocating the ambulance garage. Finally, a second storey could be added on top of the bed wing on the east side.

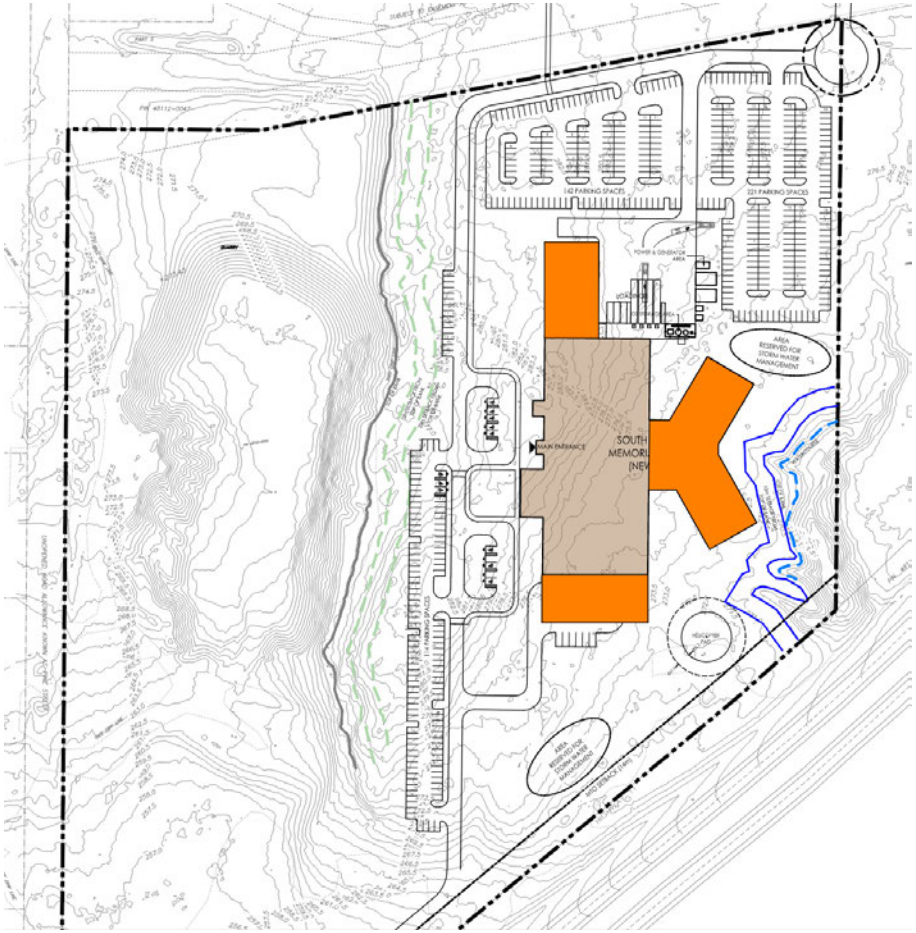


Figure 14. Site Expansion

When the hospital needs to be replaced, the new hospital could be located on the west side of the site. This may require some grading work in future.

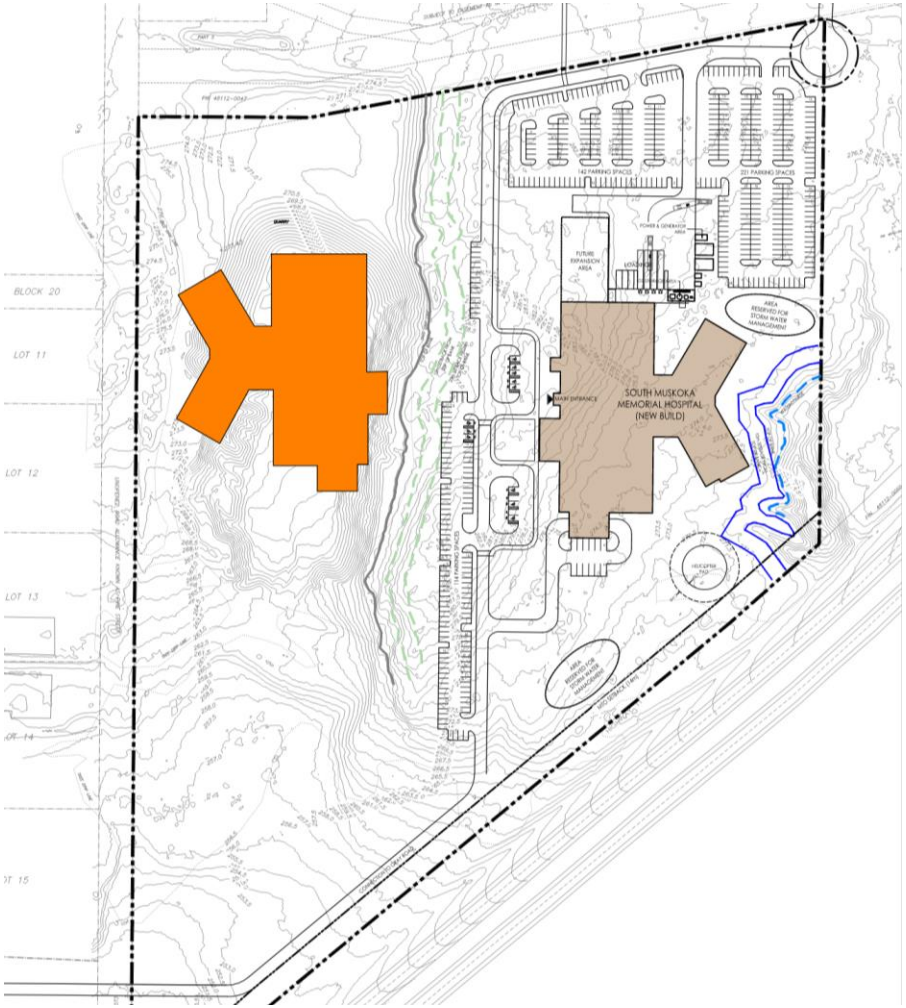


Figure 15. Future Regeneration

These measures will allow the facility to respond to various scales of change, including episodic surges, relocation of users, and ranges in magnitude and complexity of future renovations, from minor to comprehensive over time.

Mechanical and electrical systems will be designed with redundancy and zoned appropriately to accommodate changes in the future, refer to section 1.3.3.2 for further detail.

1.3.3.3.7 PROGRAM SPECIFIC OBJECTIVES

In addition to general objectives outlined in this document and the Functional Program, other program specific objectives are as follows:

- Adjacency of emergency department to surgery
- Adjacency of emergency department to acute inpatient unit
- Adjacency of foundation to the main entrance
- Inclusion of pharmacy within ambulatory care to directly transfer infusions to oncology
- Adjacency of spiritual care, foundation and cafeteria to outdoor space and the inclusion of exterior gardens
- Adjacency of emergency department to general radiology and CT
- Staff lockers on the main floor and close to staff entrance

1.3.3.3.8 INFECTION CONTROL DESIGN OBJECTIVES

The safety of all patients, healthcare providers, families, the public, and visitors will be a key focus of the design. The facility will be planned and designed with the goal of preventing and minimizing the spread of infections and to facilitate control of outbreaks.

Standards

The new building will be designed in accordance with the most current editions/addendums to the following Building Code and design standards at a minimum:

- CSA Z8000- Canadian Healthcare facilities
- CSA Z317 - Infection Control during Construction and Renovation of Health Care Facilities
- AIA 2006 Guidelines for Design and Construction of Health Care Facilities
- CDC Guidelines found at: http://www.cdc.gov/ncidod/dhqp/guidelines.html
- CHICA - Canada Position Statements
- Health Canada Guidelines pertaining to Infection Prevention and Control

- Public Health Ontario (PHO) Best Practices for Environmental Cleaning for Prevention and Control of Infections in All Health Care Settings
- Public Health Ontario (PHO) Best Practices for Hand Hygiene in all Health Care Settings.

Through all planning stages of the project, the project team will work closely with the hospital IPAC team to ensure that infection prevention and control measures are followed to the extent possible.

One basic principle of infection prevention and control is hygiene by point of contact elimination where possible, reduction of areas of potential contaminant accumulation, including difficult to reach areas above upper shelving units and lockers, or below built-in cabinetry and furniture, separation of potential sources of contamination through strategic planning, distinct visual cues to influence desired behaviours, design and material selection of surfaces to support ease of cleaning, and use of technology to reduce contamination. The design should aim to control the environment through:

- Appropriate placement and spacing of hand hygiene sinks.
- Engineering controls
    - Well designed and maintained heating, ventilation, and air conditioning (HVAC) systems with sufficient air changes and active contaminant monitoring such as demand-based ventilation systems that allow for increased ventilation when required.
    - UV filter or other in steam technologies
- Barriers and screens where required (such as plexiglass, FF&E layouts to support distancing)
- Point of care disposal, containers, and hand sanitizer dispensers
- Adequate and strategically located hand hygiene sinks.
- Incorporating emerging technologies, materials, and products.
- Infection control protocols and policies will be accommodated in:
- Design and planning decisions
- Finish and material selections
- Construction details and practices

To mitigate opportunities for pathogen growth, materials will be selected that are easy to clean and will not harbor microbes. Where possible, room design will minimize inside corners and rounded solid surfaces to help reduce the time and effort required to clean the patient room effectively and reduce joints in materials where a continuous surface can be provided. Patient room IPAC design is to be based on three primary goals: reduce touch, eliminate difficult to

clean spaces, and prevent splash and cross-contamination. Opportunities will be investigated to reduce or eliminate 'touch' with hands-free technology, such as automatic door openers and faucets, and design to support patient care while creating an easy to clean and disinfect environment.

1.3.3.3.9 SYSTEM DESIGN OBJECTIVES

Building Standards Systems Assumptions

1. Planning standards will be developed to ensure that rooms with similar functions are consistent throughout the various departments within the hospital and across both sites.

   Examples include:

   - Clean utility rooms
   - Nourishment rooms
   - Waiting rooms
   - Communication centres/care desks
   - Soiled utility rooms
   - Medication rooms
   - Lactation rooms.

2. Planning standards will promote consistency in maintenance, cleaning, safety, and infection control requirements during design.
3. Consistent standards for each room type will be established for items, such as finishes, casework, plumbing accessories, electric and low voltage systems, equipment, and furniture.

1.3.3.3.10 PARKING FACILITIES

1. Paid parking will be available for Staff, Patients, and Visitors in the at grade parking facilities.
2. A total parking count of 450 will be provided at grade.
3. Accessible parking in compliance with Code requirements will be provided.
4. Sustainability strategies will be explored during following stages, including review of bicycle parking for LEED v4, and MAHC projected bike parking needs, to determine which one is more appropriate for the new building.

5. Alternative fueling stations, such as electric vehicle supply equipment (EVSE), will be provided as is applicable at the time of the design, with the designation and management of preferred parking for carpool, green vehicles, and EVSE spaces.

1.3.3.4 PROJECTED SPACE REQUIREMENTS

Table 14. Projected Space Requirements

	Component	Stage 1.3 2024 Functional Program (cgsf)	G/N Ratio Used
	Totals	**123,510**	
1	Ambulatory		
	- Ambulatory Services	8,140	1.40
2	Acute Inpatient Unit		
	- Medical/Surgical beds (incl. Reactivation and LBRP)	28,270	1.55
	- ICU beds	3,985	1.55
3	Administrative Services		
	- Administrative Suite	3,035	1.25
	- Information Technology	1,790	1.25
	- Occupational Health & Safety & IPAC	440	1.25
	- Meeting Spaces	1,465	1.25
	- Northern Ontario School of Medicine	1,030	1.25
	- Switchboard/Scheduling	330	1.25
4	Diagnostics (incl. cardio respiratory)		
	- Diagnostic Services	13,290	1.50
	- Cardio Respiratory Services	1,470	1.50
5	Emergency Department	13,040	1.50
6	Facilities Support Services		
	- Environmental Services	825	1.15

Component		Stage 1.3 2024 Functional Program (cgsf)	G/N Ratio Used
	- Materials Management	6,035	1.15
	- Plant Operations & Maintenance	1,035	1.15
7	Food & Nutrition Services		
	- Kitchen	1,910	1.25
	- Cafeteria	1,465	1.25
8	Laboratory Services		
	- Core Lab	2,865	1.30
	- Pathology	1,305	1.30
9	Main Lobby		
	- Main Lobby	1,610	1.40
	- Auxiliary (incl. gift shop)	1,205	1.40
	- Foundation	1,500	1.40
	- Security	180	1.40
	- Spiritual Care	490	1.40
10	Pharmacy	2,040	1.30
11	Physician & Staff Amenities	3,190	1.35
12	Surgical Services & MDRD		
	- Surgical Services (incl. endo)	18,700	1.55
	- Medical Device Reprocessing	2,870	1.35

1.3.3.5 EQUIPMENT REQUIREMENTS

1.3.3.5.1 EXECUTIVE SUMMARY

This integrated design brief outlines the Furniture, Fixtures, and Equipment (FF&E) Selection approach followed in the preparation of the FF&E for the Muskoka Algonquin Healthcare - South Muskoka Memorial Hospital Project. The FF&E must meet certain requirements for optimal function in the space. The FF&E should be secure and durable, but FF&E should also be inviting and create an optimal healing environment. All Furniture, Fixtures, and Equipment will be reviewed and approved by MAHC and IO prior to inclusion in specifications. .

1.3.3.5.2 PROJECT OVERVIEW

Overview

The Muskoka Algonquin Healthcare - South Muskoka Memorial Hospital project consists of the development of a new acute care hospital to be built on a greenfield site. The new hospital will include spaces such as but not limited to ambulatory care, diagnostics, inpatient beds, administration, emergency, laboratory, pharmacy, surgery, physician amenities, facility and support services. All spaces will be furnished with appropriate furniture and equipment to meet the operational and functional needs of the project.

Responsibility Matrix

The equipment project requirements for procurement and alignment with the building design and implementation will be imported to a Responsibilities Matrix to associate each factor with an equipment type/s and procurement delivery model.

The matrix addresses all the requirements/deliverables that are related to FF&E within the project, starting from the early preparation work to develop the FF&E lists and related specification documents for the project, to installation, commissioning, and lifecycle.

This Responsibility Matrix, which is also essentially a process of managing collaboration and risk can be used to guide:

1. Planning,
2. Identification of parties contributing to achieving full FF&E and related system functionality,
3. Guidance to hold all parties accountable,
4. Risk identification,
5. Development of risk mitigation strategies,

6. Identify party coordination and interdependencies,
7. A live document to track changes, relationships and agreements as they are finalized during the various phases of a project.

1.3.3.5.3 RELATED CONSIDERATIONS FOR INTEGRATION

The following areas of design should be coordinated with this brief:

1. Accessibility Analysis
2. Architecture
3. AV & ICT
4. Infection Prevention and Control
5. Interior Design
6. Sustainability and Energy Efficiency

1.3.3.5.4 OBJECTIVES AND STRATEGIES

The planning, selection, procurement, and installation of FF&E should meet the following objectives and strategies:

1. Align with MAHC's Strategic Plan,
2. Inspire hope, healing, and a sense of being valued,
3. Support patient choice, autonomy, and personalized recovery,
4. Enable positive staff and family interactions and connections with patients and staff,
5. Provide spaces where privacy, dignity and safety are valued and managed for patients and staff,
6. Address of programming and operational initiatives,
7. Optimize long-term flexibility and adaptability,
8. Enhance the patient experience,
9. Enrich the staff experience through opportunities for collaboration, integration, and respite,
10. Align delivery of treatment and care,

11. Create an environment that supports the accessibility needs of all,
12. Create an environment that supports inclusivity and accessibility including health, equity, diversity, and anti-racism,
13. Adhere to Infection and Prevention Control policies and procedures,
14. Lead through sustainability.

1.3.3.6 BLOCK DIAGRAMS

These block diagrams represent high-level proof of concept representations of the Functional Program and outline departmental locations and adjacencies as well as high-level planning. Detailed design work will be deferred to future phases of the project.



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Liability Note
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Notes
1. THIS IS A COMPILED PLAN AND SHOULD NOT BE CONSIDERED A PLAN OF SURVEY.
2. ONTARIO BASE MAPPING USED FOR AREAS AND DIMENSIONS. LEGAL PLAN REQUIRED FOR PRECISE CALCULATIONS.
3. CONCEPT PLAN IS PRELIMINARY AND HAS NOT BEEN REVIEWED BY THE LOCAL MUNICIPALITY.
4. ZONING BY-LAW AMENDMENT MAY BE REQUIRED.

Revision	By	Appd.	YY.MM.DD

Issued	By	Appd.	YY.MM.DD

File Name: 140022038_r-sp_pine_street	RT	HS	RT	24.10.28
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

Client/Project
MUSKOKA ALGONQUIN HEALTHCARE

SOUTH MUSKOKA MEMORIAL HOSPITAL

Bracebridge, ON Canada

Title
CONCEPTUAL SITE PLAN
300 PINE STREET

Project No.	Scale	
140022038	HORZ — 1 : 1500	15 0 30m
Drawing No.	Sheet	Revision
1	1 of 1	0

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MUSKOKA ALGONQUIN HEALTHCARE

140022038

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MUSKOKA ALGONQUIN HEALTHCARE

STAGE 1.3 BLOCK DIAGRAM - LEVEL 1

SOUTH MUSKOKA MEMORIAL HOSPITAL

2024/09/17

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LEGEND

CIRCULATION ARROWS

- PUBLIC CIRCULATION
- SERVICE / STAFF / PATIENT CIRCULATION
- S — SOILED MATERIAL FLOW
- C — CLEAN MATERIAL FLOW
- TRAUMA CIRCULATION
- REGISTERED PATIENT CIRCULATION

ENTRANCE ARROWS

- PUBLIC ENTRANCE
- EMS / POLICE ENTRANCE
- STAFF & PATIENT TRANSFER ENTRANCE
- SERVICE ENTRANCE
- REHAB ENTRANCE

ELEVATORS

- PUBLIC
- SERVICE / PATIENT TRANSFER
- TRAUMA

ANNOTATION

- PATIENT REGISTRATION
- NURSING STATION
- CONTROL POINT
- PATIENT / FAMILY LOUNGE
- STAFF LOUNGE

DEPARTMENTS

- ADMINISTRATIVE SERVICES
- AMBULATORY SERVICES
- ELECTRICAL
- LABORATORY SERVICES
- PHARMACY SERVICES
- PHYSICIAN & STAFF AMENITIES
- SURGICAL SERVICES



MUSKOKA ALGONQUIN HEALTHCARE

140022038

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0 8' 16' 32'
1:400

MUSKOKA ALGONQUIN HEALTHCARE

STAGE 1.3 BLOCK DIAGRAM - LEVEL 2
SOUTH MUSKOKA MEMORIAL HOSPITAL
2024/09/17

Stantec

LEGEND

CIRCULATION ARROWS

- PUBLIC CIRCULATION
- SERVICE / STAFF / PATIENT CIRCULATION
- S — SOILED MATERIAL FLOW
- C — CLEAN MATERIAL FLOW
- TRAUMA CIRCULATION
- REGISTERED PATIENT CIRCULATION

ENTRANCE ARROWS

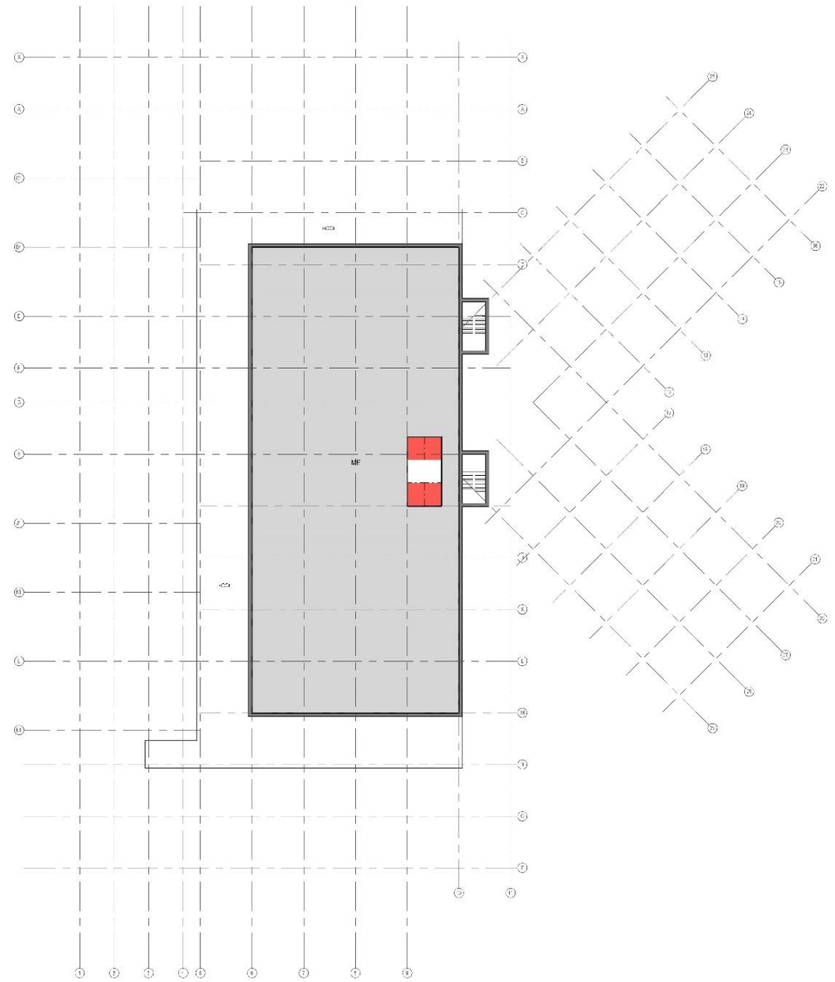
- PUBLIC ENTRANCE
- EMS / POLICE ENTRANCE
- STAFF & PATIENT TRANSFER ENTRANCE
- SERVICE ENTRANCE
- REHAB ENTRANCE

ELEVATORS

- PUBLIC
- SERVICE / PATIENT TRANSFER
- TRAUMA

ANNOTATION

- PATIENT REGISTRATION
- NURSING STATION
- CONTROL POINT
- PATIENT / FAMILY LOUNGE
- STAFF LOUNGE



MUSKOKA ALGONQUIN HEALTHCARE

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0 8' 16' 32'

MUSKOKA ALGONQUIN HEALTHCARE

STAGE 1.3 BLOCK DIAGRAM - PENTHOUSE
SOUTH MUSKOKA MEMORIAL HOSPITAL
2024/09/17

Area Summary

Departmental CGSF Comparison

Department Number	Department Name	PP Departmental Area (CGSF)	Designed Departmental Area (CGSF)	Area Variance	% Variance
1	Ambulatory	8,140	8,494	354	4%
2	Acute Inpatient Unit	32,255	32,222	- 33	0%
3	Administrative Services	8,090	8,131	41	1%
4	Diagnostics (incl. cardio respiratory)	14,760	15,316	556	4%
5	Emergency Department	13,040	13629	589	5%
6	Facilities Support Services	7,895	7,986	91	1%
7	Food & Nutrition Services	3,375	3,259	- 116	-3%
8	Laboratory Services	4,170	4,457	287	7%
9	Main Lobby	4,985	4,823	- 162	-3%
10	Pharmacy	2,040	2,147	107	5%
11	Physician & Staff Amenities	3,190	3,298	108	3%
12	Surgical Services & MDRD	21,570	21,843	273	1%
TOTAL		**123,510**	**125,604**	**2,094**	**2%**

Building Gross (GSF)

Department Number	Department Name	Area (sf)
	Mechanical and Electrical	31,448
	Architectural Gross Up	31,878

BGSF to CGSF

Total BGSF	Total Designed Departmental Area (CGSF)	Grossing Factor
188,930	125,604	1.50

Total BGSF

Level	Designed BGSF
Level 1	114,192
Level 2	45,747
Roof	28,991
TOTAL	**188,930**

Mechanical and Electrical Breakdown

Space	Area (sf)
Penthouse	25,991
Mech/Elec	5,457
TOTAL	**31,448**

1.3.4 STAGING / PHASING PLAN

1.3.4.1 SUMMARY

As SMMH is a greenfield hospital, standard project phasing will be followed. The site will require servicing and grading which should be completed as an early works project and should begin as soon as Stage 1.3 Approval is received from the Ministry of Health. Once construction is complete, MAHC will develop a plan to move all patients, staff and equipment to be reused from the current SMMH to the new hospital. Demolition of the existing hospital is not included as part of this project.

1.3.4.2 STAGING / PHASING PLAN

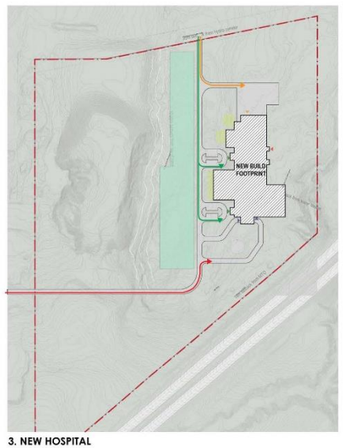
MUSKOKA ALGONQUIN HEALTHCARE



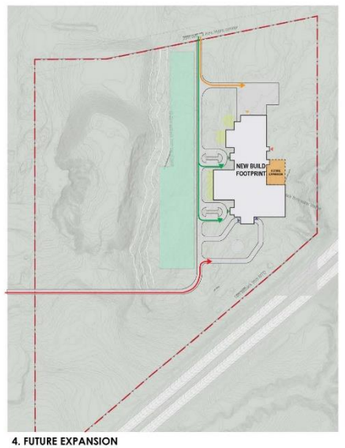
1. EXISTING SITE



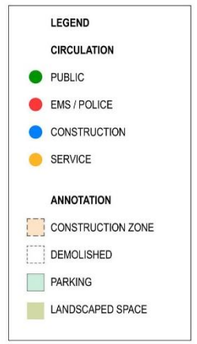
2. CONNECTION TO MAIN ROADS ON SITE



3. NEW HOSPITAL



4. FUTURE EXPANSION



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SOUTH MUSKOKA MEMORIAL HOSPITAL

SMMH PHASING DIAGRAM

Appendix 2-B

MUSKOKA ALGONQUIN HEALTHCARE
STAGE 1.3 SUSTAINABILITY PLAN

August 30, 2023

Prepared for:
Muskoka Algonquin Healthcare

Prepared by:
Stantec Consulting Ltd.

Project Number:
140022038

The conclusions in the Report titled Huntsville District Memorial Hospital and South Muskoka Memorial Hospital Redevelopment Sustainability Plan are Stantec's professional opinion, as of the time of the Report, and concerning the scope described in the Report. The opinions in the document are based on conditions and information existing at the time the scope of work was conducted and do not take into account any subsequent changes. The Report relates solely to the specific project for which Stantec was retained and the stated purpose for which the Report was prepared. The Report is not to be used or relied on for any variation or extension of the project, or for any other project or purpose, and any unauthorized use or reliance is at the recipient's own risk.

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Prepared by: Paulina Czajkowski, P. Eng, LEED AP BD+C, WELL AP
Cyrus Jeejeebhoy P. Eng, CEM, CMVP

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1 Introduction

The second decade of the 21st century presents humanity with some defining challenges. The United Nations' International Panel on Climate Change (IPPC) reports that, unequivocally, anthropogenic emissions of greenhouse gases (also known as carbon emissions) are changing the earth's climate with profound effects on ecosystems and human societies that depend on them.[1] In Canada, our healthcare system is responsible for 4.6% of our national greenhouse gas emissions.[2] As highlighted during the United Nations' 2022 Convention on Biological Diversity in Montreal, conventional development is driving biodiversity into decline. Construction and demolition waste is responsible for 10% of the total solid waste stream in Ontario[3]. And three years into the COVID-19 pandemic, healthcare workers are facing unprecedented levels of burnout.

Muskoka Algonquin Healthcare (MAHC) is in the process of planning redevelopments of their two acute care hospitals in Bracebridge and Huntsville - a monumental journey in the history of the organization. In response to the above-noted challenges, this significant investment presents an opportunity to deliver world-class sustainable healthcare design.

In the following report, we outline a sustainability plan for the redevelopment projects, covering the following components:

- Mitigating climate change: operational carbon emissions
- Mitigating climate change: embodied carbon emissions
- Adapting to climate change: resilience
- Protecting the natural environment: ecological stewardship
- Conserving natural resources: construction and demolition waste reduction
- Supporting healthcare human resources

This report is a summary of the ideas and recommendations presented by Stantec to the Muskoka Algonquin executive team during a visioning session on January 17th, 2023 in Huntsville, Ontario. More information on each of the concepts discussed has been included in Appendix A.

[1] IPCC Sixth Assessment Report. Working Group 1: The Physical Science Basis. Summary for Policy Makers. https://www.ipcc.ch/report/ar6/wg1/chapter/summary-for-policymakers/

[2] Eckelman, M.J., Sherman, J.D., MacNeill, A.J. Life cycle environmental emissions and health damages from the Canadian healthcare system: an economic-environmental epidemiological analysis. PLOS Medicine. July 31, 2018. https://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.1002623

[3] Statistics Canada. Human Activity and the Environment, 2005. Table 1.1. https://www150.statcan.gc.ca/n1/pub/16-201-x/16-201-x2005000-eng.pdf

2 Mitigating Climate Change: Operational Carbon Emissions

Operational greenhouse gas emission (also known as carbon emissions) are those generated through the operation of the facility. They are an ongoing source of carbon emissions associated with the facility's energy systems. Over the life of the building, operation emissions will likely greatly exceed the facility's embodied carbon emissions.

Canada is a signatory to the United Nations Paris Agreement, committing to a net zero carbon emissions economy by 2050. In 2018, the federal Greenhouse Gas Pollution Pricing Act came into law, setting a federal backstop price on carbon pollution. In 2023, the carbon price (leveraged on fossil fuels like natural gas) is $65 / ton of CO_2e and will be increasing to $170 / ton of CO_2e by 2030.[4] In 2021, the federal Canadian Net-Zero Emissions Accountability became law, setting a schedule of milestone years, associated national emissions reduction targets and associated emission reduction plans. The momentum towards decarbonization of the Canadian economy is building.

In Ontario, carbon intensity of grid electricity has fallen significantly since the last coal power generating station was taken offline in 2013. As of 2020, the average grid emissions intensity was 28 g CO_2e / kWh, thanks to emissions-free nuclear, hydro, wind and solar making up most of Ontario's generation mix, with natural gas-fired plants providing peaking generation. By comparison, the emissions intensity of a kWh of natural gas (a fuel commonly used for heating in Ontario) is significantly higher, approximately 180 g CO_2e (although the exact value depends on the calorific value of the gas composition, which varies). Therefore, low carbon building designs should be all-electric.

However, there are challenges associated with electrification of buildings, related to capital, operational and maintenance costs. Further, electrical demand on the Ontario grid is increasing and projected to continue to increase as electrification of heating systems continues. To address this demand, a significant build-out of the electrical distribution and generation capacity will be required. The cost of these upgrades will be passed onto the rate payers, which will result in higher electrical costs in the future. Accordingly, it is critical that electrified building systems be designed to be as energy efficient as possible.

Implementation of renewable energy systems such as solar photovoltaics (PV) does have economic benefits. However, as part of the 2030 Emissions Reduction Plans, the federal government has committed to achieving zero-emissions grid electricity across Canada by 2035. Assuming that the electrical grid will eventually become fully decarbonized, the use of renewable onsite generation to offset emissions will not be required in the long term.

[4] Government of Canada. Greenhouse Gas Pollution Pricing Act. Schedule 4: Excess Emissions Charge. https://laws-lois.justice.gc.ca/eng/acts/g-11.55/page-29.html#h-247156

2.1 Recommendations

The following are recommendations for the overall design to reduce operational carbon emissions. The design concept should incorporate electrification of heating systems to the extent possible and prioritize energy efficiency. It should also be holistic and consider long-term utility costs.

The design should include the typical measures found within contemporary high performance healthcare facilities:

- Energy efficient lighting
- Advanced heat recovery: recovery of heat from exhaust air to heat incoming outdoor air; recovery of heat year-round from cooling to offset heating
- High granularity of thermal / HVAC zones enabling zone-level HVAC system scheduling
- Highly efficient chillers to generate chilled water.
- Low-temperature heating water
- Minimize the use of steam

Further, the design should include the following advanced features to reduce carbon emissions:

- Geo-exchange system for heating and cooling
- Air source heat pumps with supplemental electric boilers for the heating water plant
- Electric heaters for service water heating
- Advanced filtration and recirculated air except where required by code or by best practices, such as in emergency rooms
- Displacement ventilation for type 2 and 3 spaces
- Ultra-low and zero-global warming potential (GWP) refrigerants

The following should be further evaluated for incorporation at time of detailed design, given rapid advancements expected in the future:

- Passive air heating
- Thermal storage
- Green fuels, if available in sufficient continuous volumes for this type of facility
- Air source heat pumps (without electric resistance back-up) for the heating water plant
- Heat pumps instead of electric water heaters for domestic water heating
- Alternative low carbon options for the central steam plant such as heat pumps

Natural gas should only be considered for strategic applications (such as emergency heating) or uses where there is no feasible electric alternative (such as steam generation).

3 Mitigation Climate Change: Embodied Carbon

Embodied carbon refers to those carbon emissions associated with the raw material supply, transport, building product manufacturing and construction process; any maintenance, repair, refurbishment and replacement during the use phase; and deconstruction / demolition, transport, waste processing and disposal of building components at end-of-life. Compared to operational emissions, embodied carbon emissions can be significant, and especially more so as operational carbon emissions are reduced. Embodied carbon plus operational carbon (discussed in the previous chapter) together make up a building's whole life carbon footprint.

The most significant fraction of a building's embodied carbon lies in the structure (concrete, steel, etc.) and the enclosure (façade, insulation, windows, etc.). Accordingly, strategies to reduce embodied carbon focus on these building elements. Today, these industries are heavy polluters. Cement and concrete are responsible for 6%, and iron and steel, 8%, of global carbon emissions.[5]

The best way to reduce embodied carbon in a building is to re-use an existing building structure. However, according to the Stage 1: Proposal Part B Report (November 2019), a renovation is not possible at either facility due to limitations of floor-to-floor heights and density of the structural grid, which are not conducive to modern healthcare programming and planning, among other reasons.

3.1 Recommendations

The following measures should be implemented to reduce embodied carbon at the new facilities.

- Specify ultra-low or zero carbon ready-mix and pre-cast concrete for the project
- Specify 'green' steel products: with high fraction of recycled content, made in EAF operations and ideally made in jurisdictions with low electricity grid emissions intensity such as Ontario, Manitoba or Quebec.
- Incorporate locally sourced, sustainable harvested wood into the projects, to the extent permitted by AHJs
- As part of future development phases, develop and set a low embodied carbon target for the projects

[5] Bataille, C. Greening Heavy and Extractive Industries. Low and Zero emissions in the Steel and Cement Industries: Barriers, Technologies and Policies. 2019 GGSD Forum Issue Paper.

4 Adapting to Climate Change: Resilience

According to the Climate Atlas of Canada,[6] the Huntsville area will experience a warmer and wetter climate over future decades, as summarized in the following table.

Climate Parameter	1976-2005	2021-2050	2051-2080
Number 30°C+ days	4.7	17.4	40.1
Average warmest maximum temperature	31.5°C	33.9°C	36.3°C
Cooling degree days (CDD)	137.8	286.7	501.0
Number of -30°C days	4.6	1.6	0.3
Average coolest minimum temperature	-34.3°C	-30.3°C	-25.6°C
Heating degree days (HDD)	4870	4221	3607
Maximum 1-day precipitation	38 mm	41 mm	44 mm
Maximum 5-day precipitation	64 mm	70 mm	75 mm

In the past, building systems (mechanical, structural, envelope and site) have been designed based on historical weather conditions, as outlined in the Ontario Building Code. However, given that the climate is changing, buildings must be designed to withstand future climate conditions. Historical weather data is no longer appropriate for the design of buildings today. Future weather conditions must be used.

Under Infrastructure Ontario's current project development process, climate risk and resilience assessments (CRRAs) are commissioned at Stage 2.1 (PDC) and involve the owner, owner stakeholder team and design team. The climate horizons studied are 2011-2040, 2040-2069 and 2070-2099. These studies assess future climate hazards, asset vulnerabilities and likelihood and consequence of impacts, and recommend risk mitigation measures tailored to the facilities' design and operations.

4.1 Recommendations

The following measures should be pursued to protect the facilities from hazards associated with future climate conditions:

- Building systems (including energy systems) should be designed to accommodate future climate and follow mitigation recommendations of climate risk and resilience assessments carried out at the next stage of development.
- For the new Bracebridge site, avoid sites located on floodplains which are less than 1.5 m below the 1:100-year flood.

[6] Created by the Prairie Climate Center, University of Winnipeg.

5 Protecting Natural Environments: Ecological Stewardship

Biodiversity experts estimate that 30% of species have been threatened or driven to extinction since the year 1500, and global biodiversity loss will likely decrease ecosystem functioning, and associated contributions to human society.[7] Increasing conservation efforts and protecting existing ecosystems is greatly needed. In support of conservation efforts, new buildings should be designed to tread lightly and minimize impact on neighboring ecosystems.

5.1 Recommendations

The following measures should be pursued to reduce impact on surrounding ecosystems:

- Facilities should be developed on previously developed land, and ideally not greenfield land
- Best practices in design for ecological stewardship as they relate to:
    - Site design (ecology, landscaping, urban heat island effect mitigation, light pollution reduction, stormwater management)
    - Façade design (bird collision deterrence measures including and beyond window frit; setting LEED Bird Collision Deterrence credit as mandatory)
    - Building materials (responsible sourcing, recycled content, extended producer responsibility / take-back programs, ultra-low VOC emissions)
    - Mechanical plumbing systems and landscaping (water efficiency)

[7] Isbell, F. et al., Expert perspectives on global biodiversity loss and its drivers and impacts on people. Frontiers in Ecology and Environment. 18 July 2022. https://esajournals.onlinelibrary.wiley.com/doi/full/10.1002/fee.2536

6 Conserving Natural Resources: Construction and Demolition Waste Reduction

The traditional, linear resource economy model consists of raw material extraction, manufacturing, usage, and landfilling. By contrast, the circular economy eliminates the waste step, with products made into new products (and designed to facilitate such) at their end-of-life. The lifecycle of products in a linear economy can be described as cradle-to-grave, whereas the lifecycle of products in a circular economy can be described as cradle-to-cradle. Transition to a circular economy is necessary to reduce environmental impacts associated with both raw material extraction and landfilling.

6.1 Recommendations

It is recommended that a deconstruction process be pursued on the existing facility in Huntsville, as well as at South Muskoka (if demolition of the facility is part of the scope of the project), to divert as much waste from landfill as possible, and to conserve resources as well as landfill space.

The new facilities should incorporate salvaged materials and new building products with high recycled content. The new facilities should be designed for disassembly. A high construction waste diversion target should be set on both projects, at minimum 80%.

7 Supporting Healthcare Human Resources: WELL Building Standard

Humans spend upwards of 90% of their time inside buildings. While our genes and social surroundings are strong determinants of health, our physical environment also plays a significant role. This is particularly important when we consider vulnerable groups, such as those experiencing high levels of workplaces stress (such as hospital staff), and those who are sensitive to environmental stressors (such as individuals experiencing physical ailments).

The WELL Building Standard building rating system consists of 108 best practices (called 'features') for the design, operation and maintenance of the built environment to support human health and well-being. Launched in 2014 after a 6-year development process by the International WELL Building Institute (IWBI), it is evidence-based and third-party reviewed. It has ten areas of focus (known as 'concepts'): air quality, water quality, nourishment, light, movement, thermal comfort, sound, materials, mind and community.[8]

While WELL has a history of application within the commercial and retail sector, it is relatively new to the healthcare sector with few certified projects. In Canada, Niagara Health has announced that their new South Niagara Hospital, currently in development, will be the first hospital in Canada to achieve WELL certification.[9]

Many features within WELL are written for the regular building occupant, which is defined as those who spend at least 30 hours per month across at least five days within the project boundary. This means that in the context of a hospital, WELL is written for hospital staff. At a time when healthcare human resources are experiencing unprecedented levels of burnout, the improvements to the working environment that can be gained from pursuing full WELL certification or a WELL-inspired design are valuable.

7.1 Recommendations

It is recommended that Muskoka Algonquin Healthcare create a WELL committee, composed of representatives across the organization, and with a designated leader, to investigate organizational interest and capacity to pursue a WELL certification. While the WELL features discussed in this section are physical in nature, many WELL features within the standard will affect future organizational policies and practices. While this evaluation process is carried out, a draft WELL strategy should be developed, selecting desired features for implementation. Any features selected by the committee should be communicated to the Stage 1.3 consultant team, so that they can be included in the planning documents.

At minimum, it is recommended that the requirements of WELL's minimum daylighting precondition (L01 Light Exposure) be included in the functional program and architectural planning at this stage of development.

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[8] The WELL Building Standard is available for review online: https://v2.wellcertified.com/en/wellv2/concepts
[9] WELL Project Directory. https://account.wellcertified.com/directories/projects/

Appendix A Further Reading

A.1 Mitigating Climate Change: Operational Carbon Emissions

Operational carbon emissions are an ongoing source of carbon emissions associated with operations of a facility's energy systems. Over the life of the building, operational emissions will likely greatly exceed the facility's embodied carbon emissions.

Operational carbon emissions can be dramatically reduced by making strategic decisions during the design phase of the project. The opportunities and risks to long term emissions reductions and flexibility are directly linked to the initial design decisions. Design decisions need to be made holistically and consider factors such as:

- **Potential for emissions reductions**. What is the scale of potential reductions offered by a design option?
- **Possibility of future retrofit**. Can this opportunity only be implemented during initial construction, or is there potential for future retrofit? For example, a geo-exchange installation typically can only be done during construction, while replacement of a boiler with an air source heat pump could be a retrofit at a future date.
- **Long term economic sustainability**. The annual utility costs over the life of a building will greatly exceed the capital cost of construction. As such, it is critical that long-term operational costs are part of the design decision process.
- **Flexibility and futureproofing**. Design decisions made during initial construction will have long ranging implications and could limit future retrofit potentials or limit the potential for optimization. Every major design decision should consider how the given option could support future system flexibility. This should apply to both future programing changes and the ability to reach net zero emissions by 2050.

The answers to the above questions form the basis of the operational carbon reduction concept for this project.

A.1.1 FEDERAL LEGISLATION

Canada is a signatory to the UN Paris Agreement, committing to a 30% reduction in carbon emissions relative to 2005 by 2030 and a net zero emissions economy by 2050. To support this commitment, the Canadian Government has passed the Greenhouse Gas Pollution Pricing Act (2018) and Net-Zero Accountability Act (2021).

It should be noted that net zero emissions means that only emissions that can be absorbed by the natural environment will be allowed. It is expected that, beyond 2050, carbon emissions will be limited to those uses with no alternatives (such as high temperature thermal manufacturing processes) or limited usage (such as emergency use fossil fuel generators).

The Greenhouse Gas Pollution Pricing Act placed a price on carbon emissions. The price of carbon increases yearly, starting from $10 per ton CO_2e in 2018 to $170 per ton CO_2e in 2030. Increases

beyond 2030 have not been announced but are possible. The result of the carbon tariff is an increase in the long-term operational costs of fossil fuel-fired equipment.

The carbon tariff will also impact the cost of electricity generated by natural gas. In the Ontario context, natural gas generation is utilized more over the summer months than the winter months, when there is more demand on the grid due to electric cooling. Natural gas fired generators allow for the electrical grid to respond quickly to changing power demands, but also result in more emissions. Other forms of electricity generation on Ontario's power grid are nuclear, hydropower, wind, solar PV and biofuels, all of which have zero emissions.

Canada's net zero commitment and the carbon tariff have two implications for the new hospital designs. First, the use of natural gas-fired equipment should be minimized. Second, energy efficiency will be critical in managing operational costs and maintaining economic sustainability.

Under the Net-Zero Accountability Act, the Government of Canada has and will set targets for milestone years 2030, 2035, 2040 and 2045. The target set for milestone year 2030 is 40-45% reduction below 2005 emissions by 2030. As part of the emissions reduction target for 2030, the Government of Canada will release a Canada Green Building Strategy, which will drive retrofits of the existing building stock; changes to building codes and standards for drive energy efficiency and emissions reductions in new buildings; and federal funding to support the transition. In addition, the Government of Canada is also planning to achieve Canada-wide emission-free electricity generation by 2035.

The immediate implication of the above legislation is that within the operational life of this facility there will be a requirement for the building to be carbon neutral. Other implications are that the National Building Code and National Energy Code for Buildings will be updated to require incremental improvements in energy performance with the goal of requiring only net-zero ready buildings by 2030. It is expected the Ontario Building Code will be updated to align with the National Energy Code for Buildings. As such, in the planning for the new facilities, high level (i.e., significantly higher than current codes) of energy performance should be planned in the concept design and budget, to align with future, more stringent codes.

A.1.2 UTILITY PRICING

Canada and the US have a highly integrated network of pipeline for delivery of natural gas and overall are a net exporter of natural gas to the world. However, natural gas is a global commodity and as such, pricing is sensitive to global events. Current global events have drastically increased the cost of natural gas over the last year. While in the short-term gas has dropped to a lower price point, in the longer term it is likely that the price point will increase again, or at minimum remain unpredictable. In addition, as noted previously, natural gas is subject to an annually increasing carbon tariff.

The Independent Electrical System Operators (IESO) manages the electrical grid for Ontario which operates as a marketplace. In this marketplace, electrical generators submit bids for electrical generation to the IESO who then select generators based on lowest cost of generation to the highest cost of generation. Historically in Ontario electrical demands are lower in the winter (hence lower costs) while the highest demands occur in summer (hence highest costs). This trend is expected to be reversed, with the Ontario electrical grid becoming a winter peaking grid within the next 5 years. The summertime peak will remain, however, it is expected that the wintertime peak will be larger. This

trend is due to increased electrical demand from electrification of heating systems and expected wider adaptation of electric vehicles. To address this demand a significant build out of the electrical distribution and generation capacity will be required. The cost of these changes will be passed onto the rate payers which will result in higher electrical costs in the future.

From a design perspective, the upward trends in both electricity and natural gas costs mean an ever more critical focus on energy efficiency in the design will be key to long term economic sustainability. The ongoing future increases in the carbon tariff and potential further increases along with the volatility in natural gas costs mean that use of natural gas should be limited to strategic uses.

A.1.3 STRATEGIES FOR EMISSIONS REDUCTION

Modern hospital energy design strategies are based on three core concepts: reduce energy, re-use waste heat and generate energy efficiently. Modern hospitals in Ontario typically incorporate the following features:

- Energy efficient lighting systems and controls
- Advanced heat recovery systems: recovering heat from exhaust air to heat incoming outdoor air; recovering heat from all year cooling to offset heating
- High granularity of thermal / HVAC zones enabling zone-level HVAC system scheduling: scheduling HVAC setpoints in healthcare facilities is allowed by code but additional controls are required to ensure pressurization are maintained.
- Highly efficient chillers to generate chilled water.
- Condensing boilers to generate heating water, with water temperatures set to ensure efficient boiler operation.

The above makes a modern hospital by default more energy efficient and have lower emission intensities then older facilities. While the typical design has elements to support decarbonization, there are some challenges associated with a full conversion to zero carbon operation. These include:

- Outdoor air rates that exceed CSA 317.2 “Special requirements for heating, ventilation, and air-conditioning (HVAC) systems in health care facilities” requirements.
- Peak wintertime heating loads
- High storage temperatures required by code for domestic water
- Generation of steam for humidification and sterilizations

There are solutions to each of these challenges, as discussed in the following sections.

A.1.4 OUTDOOR AIR CONDITIONING

Conditioning of incoming outdoor air is a major energy end use within any facility. Due to the high ventilation rates required by code in healthcare facilities, this challenge is a lot larger and is a critical item that will have a large impact on energy efficiency.

Outdoor air does not always necessarily mean “fresh air”. By the same token, recirculated air does not necessarily mean poor air quality. When using advanced filtration, it is possible to have

recirculated air which has higher quality then outdoor air. It is recommended in general as allowed by CSA 317.2 that the design use recirculated air with advanced filtration. The exception would be sensitive areas where best practices recommend 100% outdoor air, such as emergency rooms.

Passive solutions for pre-heating and pre-cooling of outdoor ventilation air such as thermal labyrinths have been successfully deployed in healthcare facilities. The feasibility of implementing a thermal labyrinth or similar system will be linked to project details not yet available. As such it is recommended that this technology is considered by the design team and further reviewed in a future project stage.

Displacement ventilation is a strategy which introduces air at low levels within the space and exhausts air above the occupied zone, normally at ceiling height. Due to the way the air flows through the space, it is possible to supply air at lower temperatures and velocities then conventional overhead systems, which results in energy savings. In addition, the air moves through the space more effectively, with less short circuiting, resulting in better indoor air quality. It is recommended that the design utilizes displacement ventilation in Type II and II spaces, which is permitted by CSA 317.2.

A.1.5 HEATING

Heating plants are typically based on natural gas-fired boilers which makes heating an area of focus for decarbonization. In modern hospitals, due to digitalization and associated computers and servers, there is a large cooling load which will produce waste heat which can be re-purposed by the space heating system. This waste heating load can offset the space heating needs of the facility, although a back-up heating plant will still be needed, since waste heat is rarely expected to be consistently sufficient to provide the totality of a hospital's heating loads.

Geo-exchange is a technology which uses the ground to store waste heat from cooling in summer for use in building heating in winter. This is a mature technology with many successful applications. The most common system configuration in Ontario is a closed loop design which can be configured as either horizontal or vertical loops. In a vertical system, the loops are in a series of wells between 500-850' deep. In a horizontal system, the loops are positioned horizontally. The capacity of a geo-exchange is linked to the linear footage of piping in the ground. The implication of this is vertical systems have a smaller footprint when compared to horizontal systems. Due to the smaller footprint, the vertical configuration is a more common technology. In consultation with a local driller, it was indicated that the ground in the area is typically granite, which is consistent with the expected geology for the area. When compared to the geology of an area like the Greater Toronto Area, the installation of a vertical geo-exchange system into granite will be more expensive, but fewer wells would be required owing to the thermal properties (increased storage capacity) of granite. As a result, the expected increased drilling costs may be offset.

Typically, modern geo-exchange systems are installed under the building to allow for greater flexibility for the site around the building and to reduce the risk of damage to the system during maintenance activities for site works. The challenge with this strategy is installation is only feasible during initial construction. Large cooling loads in modern hospitals are a source of waste heat which could be stored in the ground. As such it is recommended that the design includes a geo-exchange system to achieve emission reductions.

Heat pumps push and pull heat from one source to another using the refrigerant cycle. Due to the nature of the refrigerant cycle, heat pumps are more efficient for heating then conventional boilers. Water source heat pumps push and pull heat between different water streams. Air source heat pumps pushes and pulls energy from the air to produce heating and chilled water. Air source heat pumps have the potential of becoming a drop-in replacement for natural gas fired boilers. At this time there are technical limitations on air source heat pumps which may require a supplemental electric boiler for the heating water plant. Due to the required temperature setpoint for DHW heat pumps may have challenges. Heat pumps are an area of focus for manufacturers. It is expected heat pumps will become more efficient, versatile, and compatible with a wider range of applications. It is recommended that the design includes air source heat pumps for the heating water plant. At this time, it should be assumed a supplemental electric boiler will be required and this should be revisited at time of facility design. It is recommended the design should consider an electric resistance boiler for DHW. At the time of design, the potential for heat pumps for DHW should be reviewed.

Thermal storage uses a medium to store thermal energy to reduce costs. Thermal energy is generated when costs are low and used when energy is more expensive. Traditionally the storage medium has been water. Currently thermal storage is an area of growth with different storage medias being developed. In a decarbonization strategy heating water could be generated at night when electricity has a lower cost and used during the day when it is more expensive. It is recommended during the design phase the potential for thermal storage is explored.

A.1.6 STEAM

In healthcare facilities, steam is required for humidification and sterilization. Due to volumes required, typically central steam plants are needed. In Ontario, steam boilers are typically natural gas fired. This is due to regulatory requirements covering steam boiler operation. If a steam boiler plant exceeds a total capacity or a boiler is not classified as low water volume, there are supervision requirements which carry additional operational costs for the facility. Currently in Ontario there are a limited number of steam electric boilers available which would not trigger this supervision requirement. In addition, electric steam boilers are based on electric resistance technology which will impact the electrical demand of the facility and carry a higher operational cost.

Developing low carbon solutions for steam generation is currently an area of focus in the industry. There are efforts to reclassify existing electric steam boiler designs, improve steam boiler designs and develop heat pumps capable of producing steam. Heat pumps capable of generating steam would be significantly more efficient than the current electric resistance boiler design. It is expected that there will be developments in this area and by the time of design, lower carbon steam generation options will likely be available. As such, a contingency for deployment of future technologies should be considered within the plans for the two new hospitals.

A.1.7 ELECTRIFICATION AND NATURAL GAS

While electrification does offer opportunities for emission reductions compared to natural gas being consumed on site, the level of emissions is tied to the decarbonization of the electrical grid. The emissions of the electricity grid are outside the control of MAHC.

It is predicted that the electricity demand in Ontario will continue to increase as more facilities electrify and electric vehicles increase in popularity. Currently there are capacity limits on the electrical grid,

and it is expected these challenges will remain the same or increase. The local grid may not have sufficient capacity for a large electricity end-uses such as a hospital. As such, it is recommended that the expected potential electrical demand of the facility be communicated to the local electrical provider well in advance to ensure electrical capacity is available in future, and/or to determine what capacity is available.

Electrification can also carry addition capital and maintenance costs. Emergency generators will have to be larger, and associated fuel consumption and emissions during generator testing are higher. There would also be increased electrical maintenance costs due to safety requirements. While there is a need to be mindful of these costs, these should not be considered a reason not to reduce emissions.

Natural gas can have a role to address some the challenges presented by electrification. For example, natural gas fired boilers could be used for emergency heating, thereby reducing the size of the emergency generators since the electric boilers will not be required during a power failure. Alternatively, gas generators could be used as part of a demand reduction strategy or for other strategic applications.

It is recommended that the design for the facility eliminate natural gas where possible but allow for natural gas to used in strategic applications. Strategic applications would include uses such as emergency heating.

A.1.8 REFRIGERANTS

There are many different types of refrigerants available on the market, each with its own usage and unique properties. From a sustainability perspective, the key properties are the Global Warming Potential (GWP) and Ozone Depletion Potential (ODP). Historically the focus on refrigerant regulations has been elimination of ODP, under the Montreal Protocol. However, the Kigali Amendment to the Montreal Protocol also added elimination of GWP. Commonly used refrigerants today have very high GWP.

Like their predecessors, the last generation of refrigerants with low ODP but high GWP are in the process of being phased out. The current focus is on developing and deploying refrigerants that have a low to zero GWP as well as ODP. While low GWP refrigerants are available on the market for low pressure applications, a complete shift to this next generation of refrigerants for other applications will not only require technological developments but regulator changes to address different types and refrigerant properties. It is recommended that the design requires the use of ultra-low and/or zero GWP refrigerants.

A.1.9 RENEWABLE ENERGY

If the electrical grid will eventually become fully decarbonized, the use of renewable onsite generation to offset emissions will not be required in the long term.

However, the incorporation of renewable energy generation systems such as solar photovoltaics (PV) does have some potential benefits. The generation capacity of solar PV peaks during the summer at the same time the electrical grid demand peaks due to demands associated with electric cooling. The coincidence between these peaks would mean that there are potential economic savings in long-term

and in short-term emission reduction opportunities. As such, solar PV should be considered within the design concept.

Green fuels are typically developed from renewable resources such as biomass or renewable natural gas. The burning of these fuels is considered carbon neutral because it is from a rapidly renewable resource such as sustainably harvested wood, or form sources of emissions which would be normally released such as methane from wastewater treatment.

Within Ontario there are challenges with obtaining sufficient continuous volumes of green fuels to meet the needs of larger facilities such as this. As part of wider decarbonization planning there are early plans to potentially increase production of green fuels. At this time, it is unknown if these plans will move to implementation, the potential price point associated with these fuels or the availability.

As such it is recommended green fuels are not considered as part of a design solution at this time. In later design stages this strategy could be revisited to review the availability and cost at that time.

A.2 Mitigation Climate Change: Embodied Carbon

Recently published research on embodied carbon in recently constructed buildings in the Greater Toronto and Hamilton Area (GTHA) found an average of 423 kg CO_2e / m^2 for conventionally constructed concrete and steel structures. To illustrate the significance of embodied carbon relative to operational carbon, the proposed new Huntsville hospital is planned to have an area of 31,000 m^2, for a total embodied carbon of 13,000 tons CO_2e. If Huntsville is designed to operate with a modern hospital greenhouse gas emissions intensity (GHGI) of 22.8 kg CO_2e/m^2/year, this is the same amount as its operational emissions over 18 years of the hospital's operation. In summary, low carbon design must place focus on embodied carbon as well as operational carbon emissions.

A.2.1 CONCRETE

Ontario's concrete industry is committed to reducing its carbon footprint.[10] Concrete manufacturers are developing measures to reduce the carbon footprint of concrete. Measures such as reducing cement fraction using supplementary cementitious materials, use of portland limestone (GUL) cement, recycled aggregate and carbon mineralization / sequestration can have a significant impact. At least one major concrete manufacturer operating in Ontario is planning to have zero carbon concrete available within the near future.

A.2.2 STEEL

The global steel industry is also investing in decarbonization. ArcelorMittal is currently in the process of a CAD $1.8 billion project at its Hamilton plant, with government support, to convert existing processes to direct reduced iron-electric arc furnace (DRI-EAF) process, which will remove coal from the ironmaking process and significantly reduce carbon emissions.[11] Algoma Steel is similarly replacing its existing blast furnace and basic oxygen steelmaking plant with electric-arc-furnace (EAF) facilities at its Sault Ste. Marie operations, reducing emissions reduction by 70%.[12] Similar decarbonization conversions are taking place at many other steel plants around the world. Specifying embodied carbon limitations on steel products is not yet practical due to the global nature of this market, however, this could change in the future as supply of 'green' steel increases with ongoing infrastructure conversion.

A.2.3 ENGINEERED WOOD

Another strategy to reduce embodied carbon in buildings which has gained momentum in recent years is the use of engineered wood products such as cross-laminated timber (CLT) or glue-laminated timber (glulam). Wood is 50% carbon by mass. Trees sequester carbon during their life – pulling carbon dioxide out of the atmosphere through the process of photosynthesis – and storing it in their mass. The carbon remains sequestered in the wood until it burns or decomposes.

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[10] Concrete Ontario. Guideline for Specifying Low Carbon Ready Mixed Concrete in Ontario. November 2022.

[11] ArecelorMittal. Transition to DRI-EAF steelmaking set to reduce carbon emissions at ArcelorMittal Dofasco in Canada by 3 million tonnes and remove coal from the Company's North American flat steel franchise. Media Release. October 13, 2022. https://corporate.arcelormittal.com/media/press-releases/arcelormittal-breaks-ground-on-first-transformational-low-carbon-emissions-steelmaking-project

[12] Algoma Steel. Algoma Steel Announces Final Investment Decision for Electric Arc Steelmaking. Media Release. https://ir.algoma.com/news-releases/news-release-details/algoma-steel-announces-final-investment-decision-electric-arc

The embodied carbon research on GTHA buildings referenced previously found that, in timber-based structures, the average embodied carbon was 355 kg CO_2e/m^2, with 183 kg CO_2e/m^2 of biogenic carbon (carbon sequestered within the wood). If biogenic carbon is subtracted, the net average embodied carbon is significantly lower.

When considering mass timber for a new construction project, it is imperative that wood is harvested sustainably, with minimal impact on forest ecosystems and in such a way that does not threaten healthy future forest regrowth. Certifications from reputable responsible forestry schemes are advised, and the owner should source the wood from known, responsible forestry operations. Muskoka is located within the French-Severn Forest Management Unit, managed by Westwind Forest Stewardship. There is an opportunity for the wood to be harvested locally for the new facilities, providing economic support to the local community. If wood can not be harvested sustainably from known sources, pursuit of mass timber is not recommended.

There are some challenges with the use of mass timber in healthcare construction. Firstly, to accommodate clinical needs, acute healthcare design requires large spans of 9 m x 9 m structural grids or more. To accommodate the requisite depth of beams, buildings would require additional height between floors. Secondly, IPAC would require the wood to be encapsulated in smooth non-porous materials in sensitive clinical areas to enable thorough cleaning. Thirdly, mass timber buildings incur higher insurance premiums than traditionally constructed buildings. And finally, the Ontario Building Code currently requires that Group B Division 2 buildings be non-combustible. The use of mass timber would require a code variance and associated consultation with the authority having jurisdiction (AHJ). However, there is precedent for use of timber in healthcare buildings in Ontario: The North Bay Regional Health Center (completed in 2010) includes significant wood elements.

A.2.4 OTHER STRATEGIES

Other strategies to reduce embodied carbon include use of salvaged materials, low global warming potential (GWP) insulation and recycled aluminum (and aluminum used sparingly in general). Environmental Product Declarations (EPDs) are documents that report on environmental attributes of an increasing number of products as manufacturers make them available. EPDs should be consulted by designers when selecting products, with specific attention to product GWP. Similarly to the way operational energy targets are in project specific output specifications (PSOS) documents in Infrastructure Ontario’s development process, setting an embodied carbon target/limit is recommended.

A.3 Protecting Natural Environments: Ecological Stewardship

A.3.1 DEVELOPMENT FOOTPRINT

Buildings influence their local environmental in many ways. Development of greenfields contributes directly to loss of ecosystems. The development footprints for both new facilities should be limited to previously developed land to the greatest extent possible, protecting previously undeveloped land.

A.3.2 URBAN HEAT ISLAND EFFECT

Paved, dark surfaces generate and contribute to the urban heat island effect. Remote sensing thermal imagery shows that, on a summer day, land surface temperatures in urban areas can be as much as 20°C warmer than neighboring undeveloped and more vegetated rural locations.[13] Warmer temperatures strain local flora, fauna, and people. Given increasing temperatures because of climate change, mitigating urban heat islands is especially important. Facility designs should incorporate green and/or high-albedo roofs, site shading structures, plenty of shade trees (with adequate soil volumes to facilitate growth of healthy root systems) and high-albedo site pavements.

A.3.3 STORMWATER RUNOFF

Paved surfaces also generate stormwater runoff during precipitation events. Stormwater runoff contains pollutants from pavement deterioration, tire and brake pad wear, vehicle emissions and spills, and other pollutants.[14] Without capture and treatment, contaminated stormwater flows into receiving waterways and groundwater aquifers. Facility designs should include measures to reduce and treat stormwater runoff from paved surfaces, ideally using low-impact development (LID) measures, before runoff is released into receiving waters.

A.3.4 LIGHT POLLUTION

Nighttime exterior lighting disrupts plant, wildlife and human circadian rhythms, predator hunting, breeding, bird navigation and insect behavior, and creates light pollution, obscuring the night sky.[15] The Muskoka area is home to the Torrance Barrens Dark-Sky Preserve, a conservation reserve with good visibility of the night sky. Grassroots efforts convinced the governments of the Township of Muskoka Lakes and the Town of Gravenhurst to enact Dark Sky Bylaws, requiring exterior light fixtures to be compliant with Dark Sky Approved rules, per the International Dark Sky Association. Such fixtures are full cut-off (no up-lighting) and the fixtures emit light at a color temperature of 3000K or lower. Further, any rooftop or exterior façade illumination should be turned off between the hours of 10 pm and 6 pm.[16]

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[13] Natural Resources Canada. Land Surface Temperatures for the Greater Toronto Area, July 7, 2010.

[14] Government of Ontario. Understanding Stormwater Management: An Introduction to Stormwater Management Planning and Design. https://www.ontario.ca/page/understanding-stormwater-management-introduction-stormwater-management-planning-and-design

[15] International Dark Sky Association. Light Pollution Effects of Wildlife and Ecosystems. https://www.darksky.org/light-pollution/wildlife/

[16] Ecology & Biodiversity 5.4: Exterior Lighting. Toronto Green Standard Version 4.

A.3.5 BIRD BUILDING COLLISIONS

Buildings are also deadly to birds. Glazed facades can be imperceptible to birds, causing fatal bird-building collisions. Each year in Canada, it is estimated that 25 million migratory birds are killed in this way.[17] Some municipalities in Canada, such as the City of Toronto, have enacted bird collision deterrence requirements into development bylaws, requiring that visual markers be applied to the 1st surface of glass with a maximum spacing of 50 mm x 50 mm for the first 16 m of building façade above grade or to the height of the mature tree canopy, and above rooftop vegetation. Reflective glass is prohibited. The American Bird Conservatory has developed the Material Threat Factor to assign scores to various materials, providing a relative measure of how well materials cause avoidance by birds in a standard, controlled environment.[18] The Material Threat Factor system has been adopted in the LEED Green Building Rating System's Bird Collision Deterrence credit, and is a valuable tool informing selection of glass and solid envelope finishes.

A.3.6 SUSTAINABLE BUILDING PRODUCTS

Volatile organic compounds (VOCs) from paint, coatings, roofing and other materials will off-gas upon application and pollute indoor and outdoor air.[19] Low VOC-containing and low VOC-emitting alternatives are increasingly available on the market. Interior and exterior building products and finishes should be carefully selected and third-party certified for VOC content and emissions, leveraging product certifications such as Greenguard Gold, Floorscore, Greenseal and others; emissions testing per the California Department of Public Health (CDPH); Standard Method and South Coast Air Quality Management District (SCAQMD) rules 1113 and 1168 for VOC content; and California Air Resources Board (CARB) Suggested Control Measures (SCMs). The LEED Green Building Rating System's Low Emitting Materials credit lays out a comprehensive framework of requirements for low-emitting building products and is recommended for implementation.

Building materials should be selected for low environmental impact and lack of toxic and/or environmentally polluting compounds. Similar to the low-emissions certification schemes referenced in the previous section, numerous certification schemes exist for sustainable building materials, promoting design for circularity, a high degree of recycled content, sustainably-sourced wood, and materials free of toxic or polluting compounds. A sustainable building materials strategy should be developed for the project, reviewing availability of building products appropriate.

A.3.7 WATER EFFICIENCY

Raw water for potable water treatment systems in the Muskoka District is sourced mostly from surface water from surrounding lakes as well as ground water. While water is a renewable resource, its pumping/distribution and treatment has an energy and utility cost.

The 2021 update to CSA Z317.1 'Special requirements for plumbing installation in healthcare facilities' set a new requirement that non-clinical lavatory faucets within healthcare facilities must have

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[17] FLAP Canada. https://flap.org/about/

[18] American Bird Conservancy. About ABC's Threat Factor Rating System. https://abcbirds.org/glass-collisions/threat-factor-rating/

[19] McDonald, B.C., et al. Volatile chemical products emerging as largest petrochemical sources of urban organic emissions. Science. February 16, 2018.

flow rates no lower than 5.7 Lpm / 1.5 gpm. Clinical handwash fixtures have always been regulated. However, there remains an opportunity to economize on toilet and urinal flush water, and fixtures should be selected accordingly.

Landscape irrigation should rely on rainwater only beyond the establishment period, with plantings selected for drought tolerance.

A.4 Conserving Natural Resources: Construction and Demolition Waste Reduction

A.4.1 DECONSTRUCTION

Currently, the existing Huntsville Hospital is planned to be demolished. South Muskoka Hospital will be sold and may be demolished. This means that the redevelopment project will generate high volumes of waste.

Traditional demolition is the process of removal of a building by destructive methods. Ontario's Environmental Protection Act Regulations 102/94 and 103/94 require a waste reduction work plan and source separation program on building construction and demolition projects exceeding 2,000 m^2. Brick and portland cement concrete, steel and unpainted / untreated wood, at minimum, expected to be diverted. Even with these regulations in place, construction and demolition waste is responsible for 10% of the total solid waste stream in Ontario.[20]

The District of Muskoka currently operates a single active landfill site, which is the Rosewarne Landfill. Opened in November 2016, the 950,000-tonne facility is on track for closure in 2041 if not sooner on account of waste diversion rates being lower than anticipated. As of 2018, the District did not have an alternative landfill option planned for when the currently used facility reaches capacity. [21] The long-term waste management strategy relies on increasing levels of waste diversion.[22]

To foster a system of resource recovery and waste reduction to protect the natural environment and the continued growth and development of the circular economy, the provincial government passed the Waste-Free Ontario Act in 2016. The associated Strategy for a Waste-Free Ontario calls for an 80% diversion rate by 2050.

To conserve natural resources, landfill space and help prevent new greenfield land from being converted to landfill, it is recommended that a deconstruction effort be pursued on any facilities required to be removed. Deconstruction is the less destructive disassembly of building components for re-use. A deconstruction project would require a salvage survey by a specialized contractor, a plan for potential buyers of each salvaged product and storage space for salvaged materials.

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[20] Statistics Canada. Human Activity and the Environment, 2005. Table 1.1. https://www150.statcan.gc.ca/n1/pub/16-201-x/16-201-x2005000-eng.pdf

[21] Brownlee, Alison. "Diversion woes leave Muskoka mega-landfill on schedule for 2041 closure." Bracebridge Examiner. November 2, 2018.

[22] Hendry, Michelle. "District of Muskoka Comprehensive Long Term Waste Management Strategy". Memo. November 22, 2017.

Uptake of deconstruction ordinances (and demolition bans) is growing. Portland, Oregon passed the first deconstruction ordinance in 2016, followed by Milwaukee, Wisconsin in 2018 and Palo Alto, California in 2020. Deconstruction ordinances are in development in Pittsburgh and San Antonio.

A.4.2 SALVAGED MATERIALS

All opportunities to re-use building products and materials (such as furniture, bathroom hardware, doors and door hardware, ceiling tiles, etc) from the existing site(s) at the new sites should be duly considered. Additionally, reclaimed, salvaged materials should be considered for use within the new facilities, to create demand for and help build a circular economy. An example of a vendor specializing in reclaimed building products is Doors Unhinged in Pittsburgh, Pennsylvania, who salvage doors and door hardware from demolition projects, then warehouse, catalog, and store products for resale. Local and regional vendors of salvaged building materials should be contacted, and their inventories investigated for potential materials. In addition to environmental benefits, a notable advantage of using salvaged materials is significant cost savings.

A.4.3 RECYCLED CONTENT

To create demand for waste diversion and recycling, building products and materials should be preferentially selected on the basis of recycled content (and ideally, post-consumer recycled content). Inclusion of recycled content within concrete and steel is a measure which reduces the embodied carbon of these materials; efforts to reduce building embodied carbon will likely already push for a high degree of recycled content in the building structure. However, other building products which can be made with recycled content and include other metals, glass, carpet, insulation, rubber flooring, wall base, gypsum board.

A.4.4 DESIGN FOR DISASSEMBLY

While in the early planning stages of the new facilities, their end of life is many decades away. However, to reduce future environmental impact and to support a circular economy, the new facilities should be designed and constructed to facilitate future disassembly of components to facilitate future salvage and re-use.

A.4.5 CONSTRUCTION WASTE DIVERSION TARGET

Ontario Regulation 102/94 requires that a waste reduction workplan be developed as part of large construction projects, to achieve diversion from landfill. It is recommended that the projects further set aggressive waste diversion targets to incent efficient use of resources during the construction process. A diversion rate of 80% or higher is recommended.

A.5 Supporting Healthcare Human Resources: WELL Building Standard

Examples of WELL features include:

- Activated carbon filters and UV lamps in air handling units to remove VOCs, microbes and mold from supply air – contributing to a high level of air quality.
- High quality lighting design, with very high color rendering, low glare and zero flicker.
- Enhanced stairwells, connecting all levels of the building, encouraging occupants to be more active and take the stairs instead of the elevators.
- Interior design follows principles of biophilia, giving a sense of connection to nature even when far from a window
- Sit/stand adjustable desks and ergonomic workstation furniture, plus staff ergonomics education, consults, audits and adjustments.
- Free, on-site exercise facilities with ample lockers and showers, to remove barriers to and encourage physical fitness
- Air and water quality tested annually and compared to quality thresholds, with any deficiencies promptly resolved.
- Annual staff survey addressing the experience of the building and health and wellness, and commitment to improve outcomes in future surveys.
- For patient and vendor food: fruits, vegetables and whole food prioritized; promotion of drinking water; clear labelling of sugar content and limits per serving; ban on partially hydrogenated oils
- Design for thermal comfort outside the building – including features for shading and wind dissipation.

Pursuit of WELL Certification requires payment of a registration fee, and a certification fee once documents are ready to be submitted for evaluation. The certification process involved a third-party review of measures implemented, including on-site testing of air quality, water quality, illumination levels, thermal comfort and acoustics. Once certification is achieved, it is valid for 3 years. To maintain certification, annual reporting must be filed with the IWBI, and recertification must be pursued every 3 years, indicating that features originally pursued are still in place, or that new features have been added.

Certain WELL features are mandatory (known as ‘preconditions’) while others are optional (known as ‘optimizations’). Optimizations are each worth varying numbers of points and contribute to the project’s total point score. Depending on the number of total points achieved by the project, a Bronze (40 points), Silver (50 points), Gold (60 points) or Platinum (80 points) rating is awarded.

WELL is a holistic framework and its features influence a building’s functional program, architectural design, interior design, mechanical systems, lighting design, human resource policies, food services, cleaning program and others. Accordingly, pursuit of WELL would require the development of a steering committee with representatives from across the MAHC organization.

Certain WELL elements should be considered at Stage 1.3, to ensure that they are included in the functional program, site selection and early architectural design. Efficiencies (such as interdepartmental shared meeting rooms) may have to be incorporated into the functional program to ensure that there is minimal impact on total floor area. These features are described in the following sections.

A.5.1 DAYLIGHT EXPOSURE

A precondition within the 'Light' category is L01 Light Exposure. This feature promotes adequate daily exposure to daylight to maintain circadian rhythms. The precondition permits several pathways to compliance as follows: [23]

- Regularly occupied areas approach: At least 30% of regularly occupied areas are adequately daylit (sDA $_{200,40\%}$) or, within a 6 m horizontal distance of envelope glazing on each floor.
- Common spaces approach: Sufficient daylit common spaces are provided, with unassigned seating for at least 15% of regular occupants (staff), and at least 75% of the area of each common space is adequately daylit (sDA $_{300,50\%}$), or within 5 m horizontal distance of envelope glazing.
- Building design approach: The envelope glazing area is no less than 7% of the regularly occupied floor area for each floor level, or the floor plate is no more than 20 m between opposite walls that each have transparent envelope glazing, and there are no opaque obstructions higher than 1m within a 6m horizontal distance of the transparent glazing.
- Circadian lighting approach: Artificial lights provide at least 150 equivalent melanopic lux (EML) for at least 4 hours at a height of 45 cm above the work-plane for all workstations.

In hospitals, the need to meet critical departmental adjacencies drives deep floorplates, with a lot of floor area away from the perimeter. Accordingly, it may be challenging to achieve the regular occupied areas approach, or the building design approach. The circadian lighting approach may not serve those occupants on different body clocks due to shift work, nor does this daylighting approach yield the benefit of views to nature outside the building. The most suitable approach to achieving L01 in a hospital is likely the common areas approach. This approach requires that sufficient common areas be provided with unassigned seating to accommodate at least 15% of regular building occupants (staff) at any given time, and that these areas be located such that sufficient levels of daylight is achieved for most of the floor area.

The functional program should thus be reviewed to ensure that sufficient common areas for staff exist, and the architectural planning should be reviewed to ensure that these common areas can be placed adjacent to envelope glazing. The peak staff occupancy will have to be determined.

A.5.2 PROMOTION OF PHYSICAL ACTIVITY AND FITNESS

It has been well established that physical activity is positively correlated with health outcomes. WELL devotes a whole concept ('Movement') to promotion of physical activity, including building program

[23] L01 Light Exposure. WELL v2, Q4 2022. https://v2.wellcertified.com/en/wellv2/light/feature/1

and design elements. The following are optional features within WELL which should be considered for incorporation early during the planning stages.

Optimization V04 Facilities for Active Occupants requires provision of amenities to support active commuting and staff who choose to be active when at work. This feature requires that, in addition to short-term bicycle parking for 2.5% of daily expected visitors, the facility includes protected storage for bicycle parking for at least 5% of staff. In addition, shower and change facilities, with co-located lockers, must be provided. For facilities with 101 – 999 staff, provide at least one shower and change facility for the first 100 staff, and then one additional facility for each additional 150 staff. At least 5 lockers are required for every shower, to be co-located with the shower and change facility.

Optimization V08.1 Provide Indoor Activity Space requires provision of a dedicated indoor fitness facility that includes at least two types of exercise or sporting equipment in sufficient quantities to support at least 5% of regular occupants at any time, or sized at least 25 m^2 plus 0.1 m^2 per regular occupant or 930 m^2, whichever is smaller. Alternatively, there is an off-site indoor fitness facility within a 200 m walking distance of the project.

Optimization V08.2 Provide Outdoor Activity Space requires provision of at least one outdoor physical activity space within a 400 m walk distance of the project boundary, such as a green space (park, walking or biking trail), blue space (swimming area), a recreational field or court, or a fitness zone with all-weather fitness equipment.

A.5.3 RESTORATIVE SPACES

Within the ‘Mind’ concept, WELL promotes building features which support cognitive and emotional well-being.

Optimization M07.1 Provide Restorative Space requires provision of at least one space designated for relaxation and restoration, where work is not permitted. The space must be at least 7 m^2 plus 0.1 m^2 per regular occupant, or 186 m^2, whichever is smaller. The space must be designed to be calming and comfortable. While WELL permits this space to be indoors or outdoors, an indoor space would better serve occupants in our climate.

Another requirement for a similar space type lies within optimization M06.2 Provide Nap Space, which requires that at least one acoustically and visually separated environment be provided, equipped with at least one fully reclining furniture option for every 100 employees.

A.5.4 NOURISHMENT

Within the Nourishment concept, WELL promotes the creation of food environments where the healthiest choice is the easiest choice. Several features within this concept could influence the program, as follows.

N08 Mindful Eating requires that a sufficient space be provided to encourage occupants to eat mindfully. This feature requires provision of dedicated eating space(s) that contain tables and chairs to accommodate at least 25% of regular occupants (staff) at peak occupancy.

N12 Gardening Space promotes access to locally grown food, while providing opportunities for social cohesion and mental health benefits, as well as a connection to nature, through the requirement for a

permanent and accessible place for food production, including food-bearing plants, sized at minimum 0.09 m^2 per regular building occupant. It is understood that the Huntsville site already has a staff gardening area on site; it is recommended that this facility be maintained at the new site.

And finally, N13 Local Food Environment promotes facilitation of healthy dietary patterns by requiring that the building be sited within 400 m walking distance of a vendor of fresh fruit and vegetables. While the Huntsville site is set, there may be an opportunity to site the new South Muskoka project such that it is located within close proximity to food vendors.

A.5.5 SUPPORT FOR PARENTS

Within its Community concept, WELL promotes accommodation of diverse population needs. This concept includes two features which could influence the facility programs and designs.

Optimization C09.2 Design Lactation Room requires provision of a comfortable, calm, private space for staff use for breastfeeding. The space must be at least 2.1 m x 2.1 m, designed for sound minimization, ambient lighting and thermal comfort, and a number of other features.

Optimization C10.1 Offer Childcare Support requires provision of accommodation to staff with child caretaking responsibilities. The feature requires implementation of at least three of five options, one of which is an on-site, licensed childcare center.

Appendix 2-C

Stantec

Memo

To:	Hellen Scott Stantec	From:	Guy Taylor Stantec
Project/File:	140022038	Date:	December 1, 2023

Reference: South Muskoka Memorial Hospital Site Selection Due Diligence

1 Introduction

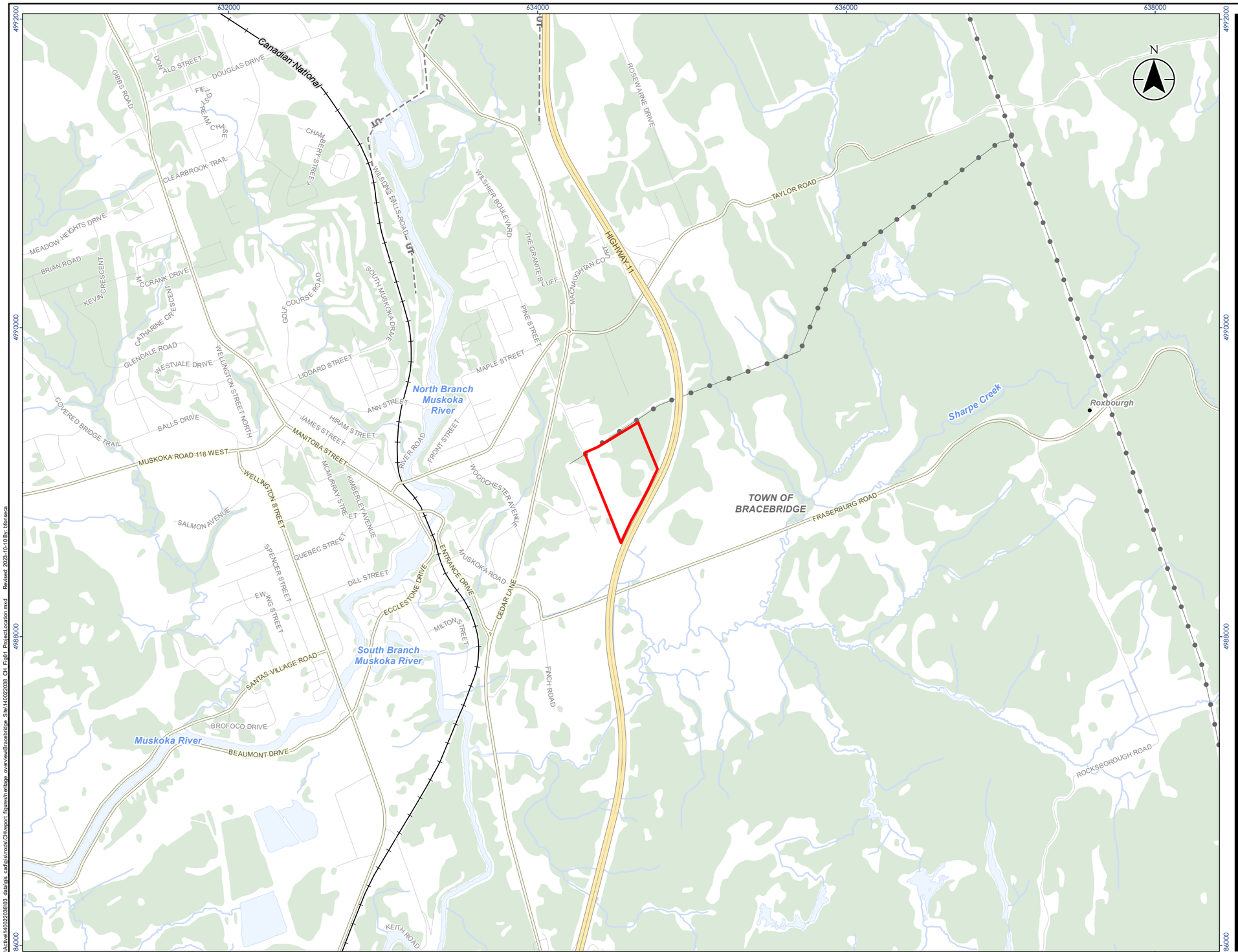
The Muskoka Algonquin Healthcare Group is conducting a site selection exercise for the South Muskoka Memorial Hospital in Bracebridge, Ontario. Two properties are under consideration: 300 Pine Street and 1975 Muskoka Beach Road, both in Bracebridge (the Study Area) (Figure 1 and Figure 2). These properties, forming the "Project Location", are located in the following Lots and Concessions in the former Macaulay Township, now part of the Township of Bracebridge, District of Muskoka:

- Lot 6, Concession 1
- Lot 4, Concession 11
- Lot 5, Concession 11

As part of the due diligence process, Muskoka Algonquin Healthcare retained Stantec Consulting Ltd. (Stantec) to undertake a *Cultural Heritage Screening Report* (CHSR). The CHSR follows the Ministry of Citizenship and Multiculturism's (MCM) *Criteria for Evaluating Potential for Built Heritage Resources and Cultural Heritage Landscapes* (2016). The CHSR aims to identify known and potential built heritage resources or cultural heritage landscapes within the Study Area. Where heritage resources are identified, the CHSR includes recommendations for further cultural heritage reporting, such as a *Cultural Heritage Report: Existing Conditions and Preliminary Impact Assessment* (CHR) or site-specific *Cultural Heritage Evaluation Reports* (CHERs) or *Heritage Impact Assessments* (HIAs).

2 Scope and Method

The scope for a CHSR is outlined in the Ministry of Citizenship and Multiculturalism (MCM) Criteria for Evaluating Potential for Built Heritage Resources and Cultural Heritage Landscapes: A Checklist for the Non-Specialist (2016; the MCM Checklist). The MCM Checklist provides a tool to identify known or recognized built heritage resources and cultural heritage landscapes in the project area, as well as commemorative plaques, cemeteries, Canadian Heritage River watersheds, properties with buildings 40 or more years old, or potential cultural heritage landscapes. Under the Ontario Heritage Act, cultural heritage is linked to real property. The MCM Checklist is typically used in the context of Environmental Assessments but has been used here as a guiding document to identify potential heritage concerns during the due diligence process.



Stantec

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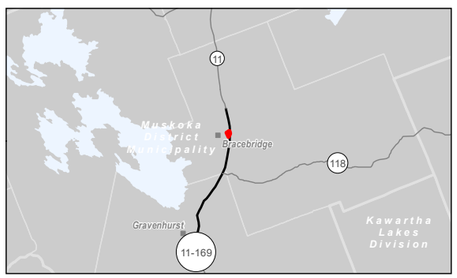
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- Highway
- Major Road
- Minor Road
- Railway
- Hydro Line
- Unknown Transmission Line
- Watercourse
- Waterbody
- Wooded Area

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Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2023.



Project Location
Muskoka, ON

140022038 REV1
Prepared by BF on 2023-10-10
Technical Review by DH on 2023-10-10

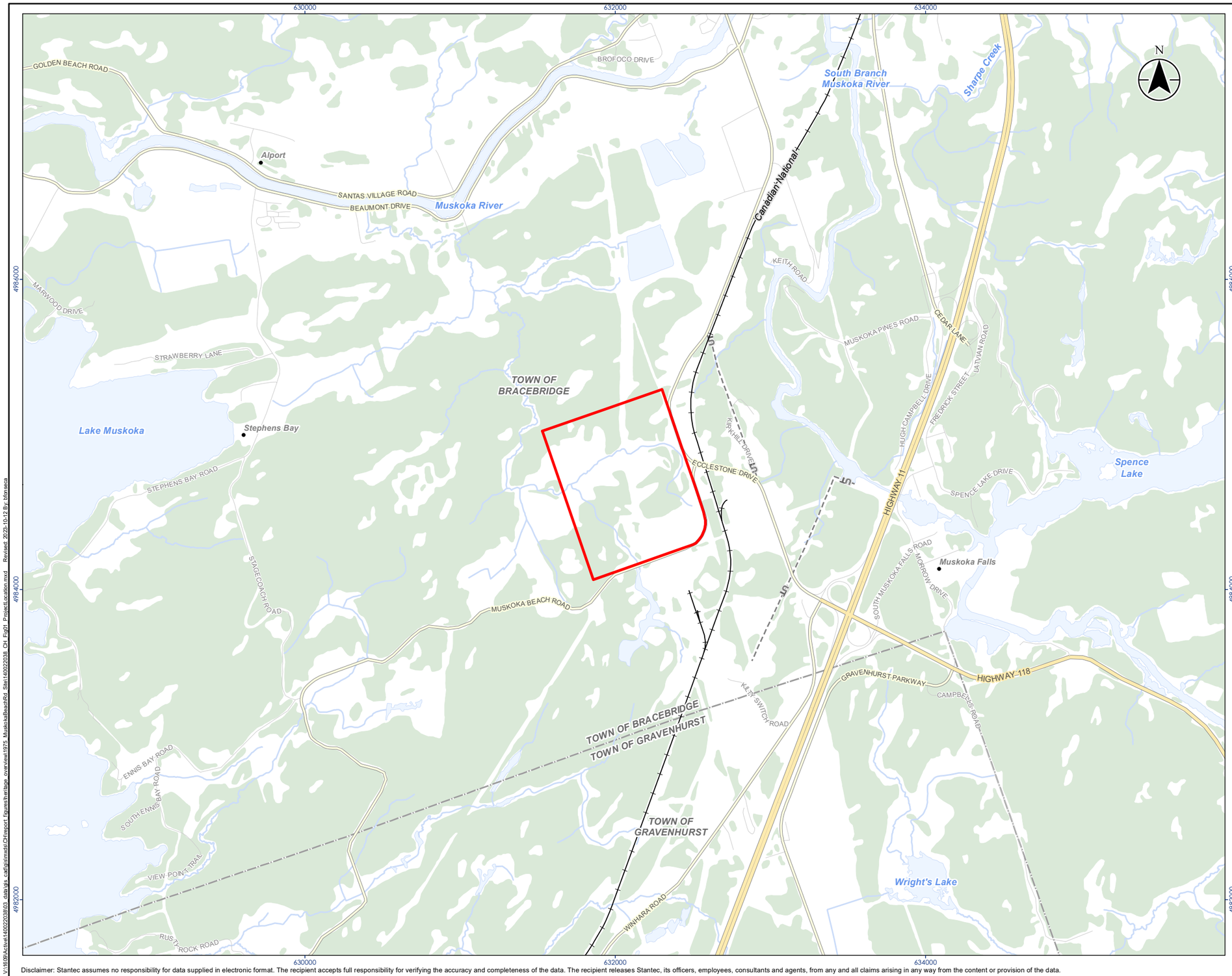
Client/Project
MUSKOKA ALGONQUIN HEALTHCARE
CULTURAL HERITAGE OVERVIEW
SOUTH MUSKOKA MEMORIAL HOSPITAL DUE DILIGENCE

Figure No.
1

Title
Location of the Study Area

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Stantec

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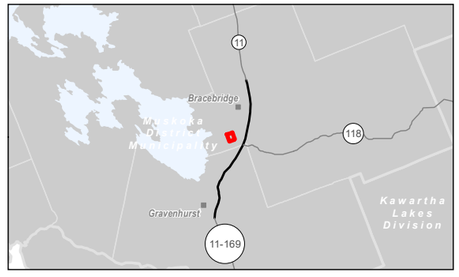
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- Highway
- Major Road
- Minor Road
- Railway
- UT Unknown Transmission Line
- Watercourse
- Municipal Boundary, Lower
- Waterbody
- Wooded Area

0 250 500 m

1:25,000 (At original document size of 11x17)

Notes

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Project Location
Muskoka, ON

140022038 REV1
Prepared by BF on 2023-10-12

Client/Project
MUSKOKA ALGONQUIN HEALTHCARE
CULTURAL HERITAGE OVERVIEW
SOUTH MUSKOKA MEMORIAL HOSPITAL DUE DILIGENCE

Figure No.
1

Title
Location of the Study Area

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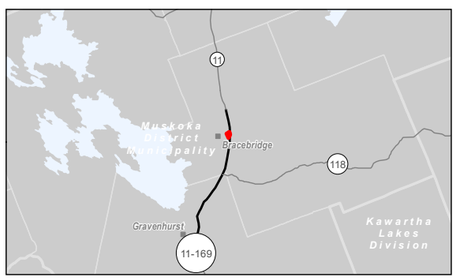
Stantec

Legend
- Site Boundary
- Study Area (50 m)

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Notes
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3. Orthoimagery © First Base Solutions, 2023. Imagery Date, unknown.



Project Location
Muskoka, ON

140022038 REV1
Prepared by BF on 2023-10-10
Technical Review by DH on 2023-10-10

Client/Project
MUSKOKA ALGONQUIN HEALTHCARE
CULTURAL HERITAGE OVERVIEW
SOUTH MUSKOKA MEMORIAL HOSPITAL DUE DILIGENCE

Figure No.
2

Title
Study Area

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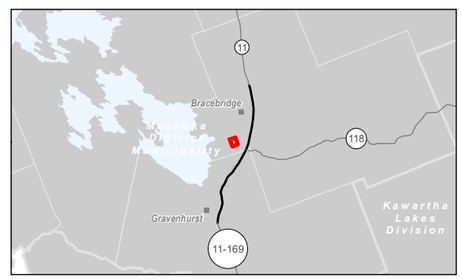
Stantec

Legend
- Site Boundary
- Study Area (50 m)

0 100 200 m

1:8,000 (At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 17N
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Project Location
Muskoka, ON

140022038 REV1
Prepared by BF on 2023-10-12

Client/Project
MUSKOKA ALGONQUIN HEALTHCARE
CULTURAL HERITAGE OVERVIEW
SOUTH MUSKOKA MEMORIAL HOSPITAL DUE DILIGENCE

Figure No.
2

Title
Study Area

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This CHSR was composed of a program of agency consultation and documentary research in accordance with the scope outlined in the MCM Checklist (MCM 2016).

To complete the MCM Checklist, the following tasks were undertaken:

- **Task 1:** Review available desktop sources for applicable aerial imagery, historical maps, and municipal, provincial and federal registers, inventories or databases. Sources used include:
  - The Parks Canada Directory of Federal Heritage Designations (http://www.pc.gc.ca/apps/dfhd/search-recherche_eng.aspx)
  - The Canadian Register of Historic Places (https://www.historicplaces.ca/en/home-accueil.aspx)
  - The UNESCO World Heritage List (https://whc.unesco.org/en/statesparties/CA)
  - The Ontario's Historic Plaques website (https://www.ontarioplaques.com/)
  - The Ontario Heritage Trust's Inventory of Provincial Plaques (https://www.heritagetrust.on.ca/user_assets/documents/Inventory-of-provincial-plaques-ENG.pdf)
  - CanadaGenWeb's Cemetery Project Map (https://cemetery.canadagenweb.org/map-project/)
  - Canadian Heritage Rivers System (https://chrs.ca/en)
  - Google Earth Pro and Google Streetview
  - The Ontario Council of University Libraries' Historical Topographic Map Digitization Project (https://ocul.on.ca/topomaps/collection/)
  - Ontario Trails Council (https://www.ontariotrails.on.ca/index.php?url=trails)
- **Task 2:** Consultation with planners or heritage officers from the Town of Bracebridge was undertaken

  to identify known or potential properties of cultural heritage value or interest (CHVI) within the Study Area.
- **Task 3:** Identify known (i.e., designated, listed, inventoried) and potential built heritage resources and cultural heritage landscapes in the Study Area, and recommend further studies, if required.

2.1 Results of Engagement

Agency consultation included both provincial and municipal consultation. Consultation occurred via email and included mapping of the Study Area. At the provincial level, Sammy Bayefsky, Property Coordinator with the Ontario Heritage Trust (OHT), reported that there are no OHT easement sites in the vicinity of the Study Area. Karla Barboza, Team Lead, Heritage, with the MCM, confirmed that there are no provincial heritage properties in the Study Area.

At the municipal level, Cheryl Kelley, Director of Planning and Development with the Town of Bracebridge, was consulted to determine the presence of municipally protected properties. The municipality confirmed that there are no municipal heritage properties in the Study Area.

2.2 Overview of Study Results

Tasks 1 to 3 identified the following within or adjacent to the Study Area:

- No properties of provincial heritage interest
- No protected heritage properties designated under Part IV of the *Ontario Heritage Act*
- No protected heritage properties designated under Part V of the *Ontario Heritage Act*
- No properties listed on the Municipal Heritage Register
- No National Historic Sites or UNESCO sites
- No municipal or provincial heritage plaques
- No known cemeteries or burial sites within or adjacent to the Study Area
- No watersheds associated with the Canadian Heritage River System
- No potential Cultural Heritage Landscapes within the Study Area

There are no existing structures on either site.

3 Recommendations

Based on a review of applicable background data, historical mapping, and consultation with regulatory bodies, there are no known or potential heritage resources within the Study Area. Based on the results of this CHSR, Stantec recommends that no further heritage studies are required.

STANTEC CONSULTING LTD.



Guy Taylor
Cultural Heritage Specialist
Mobile: (437) 882-6248
Guy.Taylor@stantec.com

Reference: **South Muskoka Memorial Hospital Site Selection Due Diligence**

Attachment A MCM Checklist – 300 Pine Street

Ontario

Ministry of Tourism, Culture and Sport

Programs & Services Branch
401 Bay Street, Suite 1700
Toronto ON M7A 0A7

Criteria for Evaluating Potential for Built Heritage Resources and Cultural Heritage Landscapes

A Checklist for the Non-Specialist

The **purpose of the checklist** is to determine:

- if a property(ies) or project area:
  - is a recognized heritage property
  - may be of cultural heritage value
- it includes all areas that may be impacted by project activities, including – but not limited to:
  - the main project area
  - temporary storage
  - staging and working areas
  - temporary roads and detours

Processes covered under this checklist, such as:

- *Planning Act*
- *Environmental Assessment Act*
- *Aggregates Resources Act*
- *Ontario Heritage Act* – Standards and Guidelines for Conservation of Provincial Heritage Properties

Cultural Heritage Evaluation Report (CHER)

If you are not sure how to answer one or more of the questions on the checklist, you may want to hire a qualified person(s) (see page 5 for definitions) to undertake a cultural heritage evaluation report (CHER).

The CHER will help you:

- identify, evaluate and protect cultural heritage resources on your property or project area
- reduce potential delays and risks to a project

Other checklists

Please use a separate checklist for your project, if:

- you are seeking a Renewable Energy Approval under Ontario Regulation 359/09 – separate checklist
- your Parent Class EA document has an approved screening criteria (as referenced in Question 1)

Please refer to the Instructions pages for more detailed information and when completing this form.

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Project or Property Name

300 Pine Street

Project or Property Location (upper and lower or single tier municipality)

Bracebridge, ON

Proponent Name

South Muskoka Memorial Hospital

Proponent Contact Information

Screening Questions

	Yes	No
1. Is there a pre-approved screening checklist, methodology or process in place?	☐	☑

If Yes, please follow the pre-approved screening checklist, methodology or process.

If No, continue to Question 2.

Part A: Screening for known (or recognized) Cultural Heritage Value

	Yes	No
2. Has the property (or project area) been evaluated before and found **not** to be of cultural heritage value?	☐	☑

If Yes, do **not** complete the rest of the checklist.

The proponent, property owner and/or approval authority will:

- summarize the previous evaluation and
- add this checklist to the project file, with the appropriate documents that demonstrate a cultural heritage evaluation was undertaken

The summary and appropriate documentation may be:

- submitted as part of a report requirement
- maintained by the property owner, proponent or approval authority

If No, continue to Question 3.

	Yes	No
3. Is the property (or project area):		
a. identified, designated or otherwise protected under the *Ontario Heritage Act* as being of cultural heritage value?	☐	☑
b. a National Historic Site (or part of)?	☐	☑
c. designated under the *Heritage Railway Stations Protection Act*?	☐	☑
d. designated under the *Heritage Lighthouse Protection Act*?	☐	☑
e. identified as a Federal Heritage Building by the Federal Heritage Buildings Review Office (FHBRO)?	☐	☑
f. located within a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site?	☐	☑

If Yes to any of the above questions, you need to hire a qualified person(s) to undertake:

- a Cultural Heritage Evaluation Report, if a Statement of Cultural Heritage Value has not previously been prepared or the statement needs to be updated

If a Statement of Cultural Heritage Value has been prepared previously and if alterations or development are proposed, you need to hire a qualified person(s) to undertake:

- a Heritage Impact Assessment (HIA) – the report will assess and avoid, eliminate or mitigate impacts

If No, continue to Question 4.

Part B: Screening for Potential Cultural Heritage Value

	Yes	No
4. Does the property (or project area) contain a parcel of land that:		
a. is the subject of a municipal, provincial or federal commemorative or interpretive plaque?	☐	☑
b. has or is adjacent to a known burial site and/or cemetery?	☐	☑
c. is in a Canadian Heritage River watershed?	☐	☑
d. contains buildings or structures that are 40 or more years old?	☐	☑

Part C: Other Considerations

	Yes	No
5. Is there local or Aboriginal knowledge or accessible documentation suggesting that the property (or project area):		
a. is considered a landmark in the local community or contains any structures or sites that are important in defining the character of the area?	☐	☑
b. has a special association with a community, person or historical event?	☐	☑
c. contains or is part of a cultural heritage landscape?	☐	☑

If Yes to one or more of the above questions (Part B and C), there is potential for cultural heritage resources on the property or within the project area.

You need to hire a qualified person(s) to undertake:

- a Cultural Heritage Evaluation Report (CHER)

If the property is determined to be of cultural heritage value and alterations or development is proposed, you need to hire a qualified person(s) to undertake:

- a Heritage Impact Assessment (HIA) – the report will assess and avoid, eliminate or mitigate impacts

If No to all of the above questions, there is low potential for built heritage or cultural heritage landscape on the property.

The proponent, property owner and/or approval authority will:

- summarize the conclusion
- add this checklist with the appropriate documentation to the project file

The summary and appropriate documentation may be:

- submitted as part of a report requirement e.g. under the *Environmental Assessment Act, Planning Act* processes
- maintained by the property owner, proponent or approval authority

Instructions

Please have the following available, when requesting information related to the screening questions below:

- a clear map showing the location and boundary of the property or project area
  - large scale and small scale showing nearby township names for context purposes
- the municipal addresses of all properties within the project area
- the lot(s), concession(s), and parcel number(s) of all properties within a project area

For more information, see the Ministry of Tourism, Culture and Sport's Ontario Heritage Toolkit or Standards and Guidelines for Conservation of Provincial Heritage Properties.

In this context, the following definitions apply:

- **qualified person(s)** means individuals – professional engineers, architects, archaeologists, etc. – having relevant, recent experience in the conservation of cultural heritage resources.
- **proponent** means a person, agency, group or organization that carries out or proposes to carry out an undertaking or is the owner or person having charge, management or control of an undertaking.

1. Is there a pre-approved screening checklist, methodology or process in place?

An existing checklist, methodology or process may already be in place for identifying potential cultural heritage resources, including:

- one endorsed by a municipality
- an environmental assessment process e.g. screening checklist for municipal bridges
- one that is approved by the Ministry of Tourism, Culture and Sport (MTCS) under the Ontario government's Standards & Guidelines for Conservation of Provincial Heritage Properties [s.B.2.]

Part A: Screening for known (or recognized) Cultural Heritage Value

2. Has the property (or project area) been evaluated before and found not to be of cultural heritage value?

Respond 'yes' to this question, if all of the following are true:

A property can be considered not to be of cultural heritage value if:

- a Cultural Heritage Evaluation Report (CHER) - or equivalent - has been prepared for the property with the advice of a qualified person and it has been determined not to be of cultural heritage value and/or
- the municipal heritage committee has evaluated the property for its cultural heritage value or interest and determined that the property is not of cultural heritage value or interest

A property may need to be re-evaluated, if:

- there is evidence that its heritage attributes may have changed
- new information is available
- the existing Statement of Cultural Heritage Value does not provide the information necessary to manage the property
- the evaluation took place after 2005 and did not use the criteria in Regulations 9/06 and 10/06

Note: Ontario government ministries and public bodies [prescribed under Regulation 157/10] may continue to use their existing evaluation processes, until the evaluation process required under section B.2 of the Standards & Guidelines for Conservation of Provincial Heritage Properties has been developed and approved by MTCS.

To determine if your property or project area has been evaluated, contact:

- the approval authority
- the proponent
- the Ministry of Tourism, Culture and Sport

3a. Is the property (or project area) identified, designated or otherwise protected under the *Ontario Heritage Act* as being of cultural heritage value e.g.:

i. designated under the *Ontario Heritage Act*

- individual designation (Part IV)
- part of a heritage conservation district (Part V)

Individual Designation – Part IV

A property that is designated:

- by a municipal by-law as being of cultural heritage value or interest [s.29 of the *Ontario Heritage Act*]
- by order of the Minister of Tourism, Culture and Sport as being of cultural heritage value or interest of provincial significance [s.34.5]. **Note**: To date, no properties have been designated by the Minister.

Heritage Conservation District – Part V

A property or project area that is located within an area designated by a municipal by-law as a heritage conservation district [s. 41 of the *Ontario Heritage Act*].

For more information on Parts IV and V, contact:

- municipal clerk
- Ontario Heritage Trust
- local land registry office (for a title search)

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ii. subject of an agreement, covenant or easement entered into under Parts II or IV of the *Ontario Heritage Act*

An agreement, covenant or easement is usually between the owner of a property and a conservation body or level of government. It is usually registered on title.

The primary purpose of the agreement is to:

- preserve, conserve, and maintain a cultural heritage resource
- prevent its destruction, demolition or loss

For more information, contact:

- Ontario Heritage Trust - for an agreement, covenant or easement [clause 10 (1) (c) of the *Ontario Heritage Act*]
- municipal clerk – for a property that is the subject of an easement or a covenant [s.37 of the *Ontario Heritage Act*]
- local land registry office (for a title search)

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iii. listed on a register of heritage properties maintained by the municipality

Municipal registers are the official lists - or record - of cultural heritage properties identified as being important to the community.

Registers include:

- all properties that are designated under the *Ontario Heritage Act* (Part IV or V)
- properties that have not been formally designated, but have been identified as having cultural heritage value or interest to the community

For more information, contact:

- municipal clerk
- municipal heritage planning staff
- municipal heritage committee

---

iv. subject to a notice of:

- intention to designate (under Part IV of the *Ontario Heritage Act*)
- a Heritage Conservation District study area bylaw (under Part V of the *Ontario Heritage Act*)

A property that is subject to a **notice of intention to designate** as a property of cultural heritage value or interest and the notice is in accordance with:

- section 29 of the *Ontario Heritage Act*
- section 34.6 of the *Ontario Heritage Act.* **Note**: To date, the only applicable property is Meldrum Bay Inn, Manitoulin Island. [s.34.6]

An area designated by a municipal by-law made under section 40.1 of the *Ontario Heritage Act* as a **heritage conservation district study area**.

For more information, contact:

- municipal clerk – for a property that is the subject of notice of intention [s. 29 and s. 40.1]
- Ontario Heritage Trust

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v. included in the Ministry of Tourism, Culture and Sport's list of provincial heritage properties

Provincial heritage properties are properties the Government of Ontario owns or controls that have cultural heritage value or interest.

The Ministry of Tourism, Culture and Sport (MTCS) maintains a list of all provincial heritage properties based on information provided by ministries and prescribed public bodies. As they are identified, MTCS adds properties to the list of provincial heritage properties.

For more information, contact the MTCS Registrar at registrar@ontario.ca.

3b. Is the property (or project area) a National Historic Site (or part of)?

National Historic Sites are properties or districts of national historic significance that are designated by the Federal Minister of the Environment, under the *Canada National Parks Act*, based on the advice of the Historic Sites and Monuments Board of Canada.

For more information, see the National Historic Sites website.

3c. Is the property (or project area) designated under the *Heritage Railway Stations Protection Act*?

The *Heritage Railway Stations Protection Act* protects heritage railway stations that are owned by a railway company under federal jurisdiction. Designated railway stations that pass from federal ownership may continue to have cultural heritage value.

For more information, see the Directory of Designated Heritage Railway Stations.

3d. Is the property (or project area) designated under the *Heritage Lighthouse Protection Act*?

The *Heritage Lighthouse Protection Act* helps preserve historically significant Canadian lighthouses. The Act sets up a public nomination process and includes heritage building conservation standards for lighthouses which are officially designated.

For more information, see the Heritage Lighthouses of Canada website.

3e. Is the property (or project area) identified as a Federal Heritage Building by the Federal Heritage Buildings Review Office?

The role of the Federal Heritage Buildings Review Office (FHBRO) is to help the federal government protect the heritage buildings it owns. The policy applies to all federal government departments that administer real property, but not to federal Crown Corporations.

For more information, contact the Federal Heritage Buildings Review Office.

See a directory of all federal heritage designations.

3f. Is the property (or project area) located within a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site?

A UNESCO World Heritage Site is a place listed by UNESCO as having outstanding universal value to humanity under the Convention Concerning the Protection of the World Cultural and Natural Heritage. In order to retain the status of a World Heritage Site, each site must maintain its character defining features.

Currently, the Rideau Canal is the only World Heritage Site in Ontario.

For more information, see Parks Canada – World Heritage Site website.

Part B: Screening for potential Cultural Heritage Value

4a. Does the property (or project area) contain a parcel of land that has a municipal, provincial or federal commemorative or interpretive plaque?

Heritage resources are often recognized with formal plaques or markers.

Plaques are prepared by:

- municipalities
- provincial ministries or agencies
- federal ministries or agencies
- local non-government or non-profit organizations

For more information, contact:

- municipal heritage committees or local heritage organizations – for information on the location of plaques in their community
- Ontario Historical Society's Heritage directory – for a list of historical societies and heritage organizations
- Ontario Heritage Trust – for a list of plaques commemorating Ontario's history
- Historic Sites and Monuments Board of Canada – for a list of plaques commemorating Canada's history

4b. Does the property (or project area) contain a parcel of land that has or is adjacent to a known burial site and/or cemetery?

For more information on known cemeteries and/or burial sites, see:

- Cemeteries Regulations, Ontario Ministry of Consumer Services – for a database of registered cemeteries
- Ontario Genealogical Society (OGS) – to locate records of Ontario cemeteries, both currently and no longer in existence; cairns, family plots and burial registers
- Canadian County Atlas Digital Project – to locate early cemeteries

In this context, adjacent means contiguous or as otherwise defined in a municipal official plan.

4c. Does the property (or project area) contain a parcel of land that is in a Canadian Heritage River watershed?

The Canadian Heritage River System is a national river conservation program that promotes, protects and enhances the best examples of Canada's river heritage.

Canadian Heritage Rivers must have, and maintain, outstanding natural, cultural and/or recreational values, and a high level of public support.

For more information, contact the Canadian Heritage River System.

If you have questions regarding the boundaries of a watershed, please contact:

- your conservation authority
- municipal staff

4d. Does the property (or project area) contain a parcel of land that contains buildings or structures that are 40 or more years old?

A 40 year 'rule of thumb' is typically used to indicate the potential of a site to be of cultural heritage value. The approximate age of buildings and/or structures may be estimated based on:

- history of the development of the area
- fire insurance maps
- architectural style
- building methods

Property owners may have information on the age of any buildings or structures on their property. The municipality, local land registry office or library may also have background information on the property.

Note: 40+ year old buildings or structure do not necessarily hold cultural heritage value or interest; their age simply indicates a higher potential.

A building or structure can include:

- residential structure
- farm building or outbuilding
- industrial, commercial, or institutional building
- remnant or ruin
- engineering work such as a bridge, canal, dams, etc.

For more information on researching the age of buildings or properties, see the Ontario Heritage Tool Kit Guide Heritage Property Evaluation.

Part C: Other Considerations

5a. Is there local or Aboriginal knowledge or accessible documentation suggesting that the property (or project area) is considered a landmark in the local community or contains any structures or sites that are important to defining the character of the area?

Local or Aboriginal knowledge may reveal that the project location is situated on a parcel of land that has potential landmarks or defining structures and sites, for instance:

- buildings or landscape features accessible to the public or readily noticeable and widely known
- complexes of buildings
- monuments
- ruins

5b. Is there local or Aboriginal knowledge or accessible documentation suggesting that the property (or project area) has a special association with a community, person or historical event?

Local or Aboriginal knowledge may reveal that the project location is situated on a parcel of land that has a special association with a community, person or event of historic interest, for instance:

- Aboriginal sacred site
- traditional-use area
- battlefield
- birthplace of an individual of importance to the community

5c. Is there local or Aboriginal knowledge or accessible documentation suggesting that the property (or project area) contains or is part of a cultural heritage landscape?

Landscapes (which may include a combination of archaeological resources, built heritage resources and landscape elements) may be of cultural heritage value or interest to a community.

For example, an Aboriginal trail, historic road or rail corridor may have been established as a key transportation or trade route and may have been important to the early settlement of an area. Parks, designed gardens or unique landforms such as waterfalls, rock faces, caverns, or mounds are areas that may have connections to a particular event, group or belief.

For more information on Questions 5.a., 5.b. and 5.c., contact:

- Elders in Aboriginal Communities or community researchers who may have information on potential cultural heritage resources. Please note that Aboriginal traditional knowledge may be considered sensitive.
- municipal heritage committees or local heritage organizations
- Ontario Historical Society's "Heritage Directory" - for a list of historical societies and heritage organizations in the province

An internet search may find helpful resources, including:

- historical maps
- historical walking tours
- municipal heritage management plans
- cultural heritage landscape studies
- municipal cultural plans

Information specific to trails may be obtained through Ontario Trails.

Reference: **South Muskoka Memorial Hospital Site Selection Due Diligence**

Attachment B MCM Checklist – 1975 Muskoka Beach Road

Ontario

Ministry of Tourism, Culture and Sport

Programs & Services Branch
401 Bay Street, Suite 1700
Toronto ON M7A 0A7

Criteria for Evaluating Potential for Built Heritage Resources and Cultural Heritage Landscapes

A Checklist for the Non-Specialist

The **purpose of the checklist** is to determine:

- if a property(ies) or project area:
  - is a recognized heritage property
  - may be of cultural heritage value
- it includes all areas that may be impacted by project activities, including – but not limited to:
  - the main project area
  - temporary storage
  - staging and working areas
  - temporary roads and detours

Processes covered under this checklist, such as:

- *Planning Act*
- *Environmental Assessment Act*
- *Aggregates Resources Act*
- *Ontario Heritage Act* – Standards and Guidelines for Conservation of Provincial Heritage Properties

Cultural Heritage Evaluation Report (CHER)

If you are not sure how to answer one or more of the questions on the checklist, you may want to hire a qualified person(s) (see page 5 for definitions) to undertake a cultural heritage evaluation report (CHER).

The CHER will help you:

- identify, evaluate and protect cultural heritage resources on your property or project area
- reduce potential delays and risks to a project

Other checklists

Please use a separate checklist for your project, if:

- you are seeking a Renewable Energy Approval under Ontario Regulation 359/09 – separate checklist
- your Parent Class EA document has an approved screening criteria (as referenced in Question 1)

Please refer to the Instructions pages for more detailed information and when completing this form.

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Project or Property Name

1975 Muskoka Beach Road

Project or Property Location (upper and lower or single tier municipality)

Bracebridge, ON

Proponent Name

South Muskoka Memorial Hospital

Proponent Contact Information

Screening Questions

	Yes	No
1. Is there a pre-approved screening checklist, methodology or process in place?	☐	☑

If Yes, please follow the pre-approved screening checklist, methodology or process.

If No, continue to Question 2.

Part A: Screening for known (or recognized) Cultural Heritage Value

	Yes	No
2. Has the property (or project area) been evaluated before and found **not** to be of cultural heritage value?	☐	☑

If Yes, do **not** complete the rest of the checklist.

The proponent, property owner and/or approval authority will:

- summarize the previous evaluation and
- add this checklist to the project file, with the appropriate documents that demonstrate a cultural heritage evaluation was undertaken

The summary and appropriate documentation may be:

- submitted as part of a report requirement
- maintained by the property owner, proponent or approval authority

If No, continue to Question 3.

	Yes	No
3. Is the property (or project area):		
a. identified, designated or otherwise protected under the *Ontario Heritage Act* as being of cultural heritage value?	☐	☑
b. a National Historic Site (or part of)?	☐	☑
c. designated under the *Heritage Railway Stations Protection Act*?	☐	☑
d. designated under the *Heritage Lighthouse Protection Act*?	☐	☑
e. identified as a Federal Heritage Building by the Federal Heritage Buildings Review Office (FHBRO)?	☐	☑
f. located within a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site?	☐	☑

If Yes to any of the above questions, you need to hire a qualified person(s) to undertake:

- a Cultural Heritage Evaluation Report, if a Statement of Cultural Heritage Value has not previously been prepared or the statement needs to be updated

If a Statement of Cultural Heritage Value has been prepared previously and if alterations or development are proposed, you need to hire a qualified person(s) to undertake:

- a Heritage Impact Assessment (HIA) – the report will assess and avoid, eliminate or mitigate impacts

If No, continue to Question 4.

Part B: Screening for Potential Cultural Heritage Value

	Yes	No
4. Does the property (or project area) contain a parcel of land that:		
a. is the subject of a municipal, provincial or federal commemorative or interpretive plaque?	☐	☑
b. has or is adjacent to a known burial site and/or cemetery?	☐	☑
c. is in a Canadian Heritage River watershed?	☐	☑
d. contains buildings or structures that are 40 or more years old?	☐	☑

Part C: Other Considerations

	Yes	No
5. Is there local or Aboriginal knowledge or accessible documentation suggesting that the property (or project area):		
a. is considered a landmark in the local community or contains any structures or sites that are important in defining the character of the area?	☐	☑
b. has a special association with a community, person or historical event?	☐	☑
c. contains or is part of a cultural heritage landscape?	☐	☑

If Yes to one or more of the above questions (Part B and C), there is potential for cultural heritage resources on the property or within the project area.

You need to hire a qualified person(s) to undertake:

- a Cultural Heritage Evaluation Report (CHER)

If the property is determined to be of cultural heritage value and alterations or development is proposed, you need to hire a qualified person(s) to undertake:

- a Heritage Impact Assessment (HIA) – the report will assess and avoid, eliminate or mitigate impacts

If No to all of the above questions, there is low potential for built heritage or cultural heritage landscape on the property.

The proponent, property owner and/or approval authority will:

- summarize the conclusion
- add this checklist with the appropriate documentation to the project file

The summary and appropriate documentation may be:

- submitted as part of a report requirement e.g. under the *Environmental Assessment Act, Planning Act* processes
- maintained by the property owner, proponent or approval authority

Instructions

Please have the following available, when requesting information related to the screening questions below:

- a clear map showing the location and boundary of the property or project area
  - large scale and small scale showing nearby township names for context purposes
- the municipal addresses of all properties within the project area
- the lot(s), concession(s), and parcel number(s) of all properties within a project area

For more information, see the Ministry of Tourism, Culture and Sport's Ontario Heritage Toolkit or Standards and Guidelines for Conservation of Provincial Heritage Properties.

In this context, the following definitions apply:

- **qualified person(s)** means individuals – professional engineers, architects, archaeologists, etc. – having relevant, recent experience in the conservation of cultural heritage resources.
- **proponent** means a person, agency, group or organization that carries out or proposes to carry out an undertaking or is the owner or person having charge, management or control of an undertaking.

1. Is there a pre-approved screening checklist, methodology or process in place?

An existing checklist, methodology or process may already be in place for identifying potential cultural heritage resources, including:

- one endorsed by a municipality
- an environmental assessment process e.g. screening checklist for municipal bridges
- one that is approved by the Ministry of Tourism, Culture and Sport (MTCS) under the Ontario government's Standards & Guidelines for Conservation of Provincial Heritage Properties [s.B.2.]

Part A: Screening for known (or recognized) Cultural Heritage Value

2. Has the property (or project area) been evaluated before and found not to be of cultural heritage value?

Respond 'yes' to this question, if all of the following are true:

A property can be considered not to be of cultural heritage value if:

- a Cultural Heritage Evaluation Report (CHER) - or equivalent - has been prepared for the property with the advice of a qualified person and it has been determined not to be of cultural heritage value and/or
- the municipal heritage committee has evaluated the property for its cultural heritage value or interest and determined that the property is not of cultural heritage value or interest

A property may need to be re-evaluated, if:

- there is evidence that its heritage attributes may have changed
- new information is available
- the existing Statement of Cultural Heritage Value does not provide the information necessary to manage the property
- the evaluation took place after 2005 and did not use the criteria in Regulations 9/06 and 10/06

Note: Ontario government ministries and public bodies [prescribed under Regulation 157/10] may continue to use their existing evaluation processes, until the evaluation process required under section B.2 of the Standards & Guidelines for Conservation of Provincial Heritage Properties has been developed and approved by MTCS.

To determine if your property or project area has been evaluated, contact:

- the approval authority
- the proponent
- the Ministry of Tourism, Culture and Sport

3a. Is the property (or project area) identified, designated or otherwise protected under the *Ontario Heritage Act* as being of cultural heritage value e.g.:

i. designated under the *Ontario Heritage Act*

- individual designation (Part IV)
- part of a heritage conservation district (Part V)

Individual Designation – Part IV

A property that is designated:

- by a municipal by-law as being of cultural heritage value or interest [s.29 of the *Ontario Heritage Act*]
- by order of the Minister of Tourism, Culture and Sport as being of cultural heritage value or interest of provincial significance [s.34.5]. **Note**: To date, no properties have been designated by the Minister.

Heritage Conservation District – Part V

A property or project area that is located within an area designated by a municipal by-law as a heritage conservation district [s. 41 of the *Ontario Heritage Act*].

For more information on Parts IV and V, contact:

- municipal clerk
- Ontario Heritage Trust
- local land registry office (for a title search)

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ii. subject of an agreement, covenant or easement entered into under Parts II or IV of the *Ontario Heritage Act*

An agreement, covenant or easement is usually between the owner of a property and a conservation body or level of government. It is usually registered on title.

The primary purpose of the agreement is to:

- preserve, conserve, and maintain a cultural heritage resource
- prevent its destruction, demolition or loss

For more information, contact:

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Registers include:

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A property that is subject to a **notice of intention to designate** as a property of cultural heritage value or interest and the notice is in accordance with:

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- section 34.6 of the *Ontario Heritage Act.* **Note**: To date, the only applicable property is Meldrum Bay Inn, Manitoulin Island. [s.34.6]

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Currently, the Rideau Canal is the only World Heritage Site in Ontario.

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Part B: Screening for potential Cultural Heritage Value

4a. Does the property (or project area) contain a parcel of land that has a municipal, provincial or federal commemorative or interpretive plaque?

Heritage resources are often recognized with formal plaques or markers.

Plaques are prepared by:

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For more information on known cemeteries and/or burial sites, see:

- Cemeteries Regulations, Ontario Ministry of Consumer Services – for a database of registered cemeteries
- Ontario Genealogical Society (OGS) – to locate records of Ontario cemeteries, both currently and no longer in existence; cairns, family plots and burial registers
- Canadian County Atlas Digital Project – to locate early cemeteries

In this context, adjacent means contiguous or as otherwise defined in a municipal official plan.

4c. Does the property (or project area) contain a parcel of land that is in a Canadian Heritage River watershed?

The Canadian Heritage River System is a national river conservation program that promotes, protects and enhances the best examples of Canada's river heritage.

Canadian Heritage Rivers must have, and maintain, outstanding natural, cultural and/or recreational values, and a high level of public support.

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- your conservation authority
- municipal staff

4d. Does the property (or project area) contain a parcel of land that contains buildings or structures that are 40 or more years old?

A 40 year 'rule of thumb' is typically used to indicate the potential of a site to be of cultural heritage value. The approximate age of buildings and/or structures may be estimated based on:

- history of the development of the area
- fire insurance maps
- architectural style
- building methods

Property owners may have information on the age of any buildings or structures on their property. The municipality, local land registry office or library may also have background information on the property.

Note: 40+ year old buildings or structure do not necessarily hold cultural heritage value or interest; their age simply indicates a higher potential.

A building or structure can include:

- residential structure
- farm building or outbuilding
- industrial, commercial, or institutional building
- remnant or ruin
- engineering work such as a bridge, canal, dams, etc.

For more information on researching the age of buildings or properties, see the Ontario Heritage Tool Kit Guide Heritage Property Evaluation.

Part C: Other Considerations

5a. Is there local or Aboriginal knowledge or accessible documentation suggesting that the property (or project area) is considered a landmark in the local community or contains any structures or sites that are important to defining the character of the area?

Local or Aboriginal knowledge may reveal that the project location is situated on a parcel of land that has potential landmarks or defining structures and sites, for instance:

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- complexes of buildings
- monuments
- ruins

5b. Is there local or Aboriginal knowledge or accessible documentation suggesting that the property (or project area) has a special association with a community, person or historical event?

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- traditional-use area
- battlefield
- birthplace of an individual of importance to the community

5c. Is there local or Aboriginal knowledge or accessible documentation suggesting that the property (or project area) contains or is part of a cultural heritage landscape?

Landscapes (which may include a combination of archaeological resources, built heritage resources and landscape elements) may be of cultural heritage value or interest to a community.

For example, an Aboriginal trail, historic road or rail corridor may have been established as a key transportation or trade route and may have been important to the early settlement of an area. Parks, designed gardens or unique landforms such as waterfalls, rock faces, caverns, or mounds are areas that may have connections to a particular event, group or belief.

For more information on Questions 5.a., 5.b. and 5.c., contact:

- Elders in Aboriginal Communities or community researchers who may have information on potential cultural heritage resources. Please note that Aboriginal traditional knowledge may be considered sensitive.
- municipal heritage committees or local heritage organizations
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An internet search may find helpful resources, including:

- historical maps
- historical walking tours
- municipal heritage management plans
- cultural heritage landscape studies
- municipal cultural plans

Information specific to trails may be obtained through Ontario Trails.

Stage 1 Archaeological Assessment: Bracebridge Hospital – 300 Pine Street

Part of Lot 6, Concession 1, Geographic Township of MacAulay, former Muskoka County, now the Town of Bracebridge, District Municipality of Muskoka, Ontario

December 1, 2023

Prepared for:
Muskoka Algonquin Healthcare
100 Frank Miller Drive
Huntsville, Ontario P1H 1H7

Prepared by:
Stantec Consulting Ltd.
300W-675 Cochrane Drive
Markham, Ontario L3R 0B8

Project Number:
140022038
Licensee: Ragavan Nithiyanantham
License Number: P390
Project Information Form Number:
P390-0404-2023

ORIGINAL REPORT

Limitations and Sign-off

The conclusions in the Report titled Stage 1 Archaeological Assessment: Bracebridge Hospital – 300 Pine Street are Stantec's professional opinion, as of the time of the Report, and concerning the scope described in the Report. The opinions in the document are based on conditions and information existing at the time the scope of work was conducted and do not take into account any subsequent changes. The Report relates solely to the specific project for which Stantec was retained and the stated purpose for which the Report was prepared. The Report is not to be used or relied on for any variation or extension of the project, or for any other project or purpose, and any unauthorized use or reliance is at the recipient's own risk.

Stantec has assumed all information received from Muskoka Algonquin Healthcare (the "Client") and third parties in the preparation of the Report to be correct. While Stantec has exercised a customary level of judgment or due diligence in the use of such information, Stantec assumes no responsibility for the consequences of any error or omission contained therein.

This Report is intended solely for use by the Client in accordance with Stantec's contract with the Client. While the Report may be provided to applicable authorities having jurisdiction and others for whom the Client is responsible, Stantec does not warrant the services to any third party. The report may not be relied upon by any other party without the express written consent of Stantec, which may be withheld at Stantec's discretion.

Prepared by: Digitally signed by O'Shaughnessy, Andrew Date: 2024.11.12 18:08:35 -05'00'

Signature

Andrew O'Shaughnessy, Hons. BA
Project Archaeologist

Printed Name and Title

Reviewed by: Date: 2024.11.12 16:41:32 -05'00'

Signature

Ragavan Nithiyanantham, MA CAHP,
Senior Archaeologist/Cultural Heritage Specialist

Printed Name and Title

Approved by: Digitally signed by Dickson, Parker Date: 2024.11.12 16:51:20 -05'00'

Signature

Parker Dickson, MA,
Senior Associate, Senior Archaeologist

Printed Name and Title

Executive Summary

Muskoka Algonquin Healthcare (MAHC) retained Stantec Consulting Ltd. (Stantec) to provide architectural and engineering services in support of their Ministry of Health Capital Redevelopment Stage 1.3 Functional Program (the Project). The Project involves the redevelopment of the South Muskoka Memorial Hospital, which will be developed on a new property. As part of the site selection process for the Project, two short-listed sites are being considered, 300 Pine Street and 1975 Muskoka Beach Road in the Town of Bracebridge, District Municipality of Muskoka.

To facilitate the Project, Stantec is conducting Stage 1 archaeological assessment for the 300 Pine Street site (the study area). The study area is in part of Lot 6, Concession 1, Geographic Township of Macaulay, former Muskoka County, now in the Town of Bracebridge, District Municipality of Muskoka, Ontario. The study area spans roughly 18.21 hectares, predominantly covered by dense mixed forest, indicative of its natural vegetation, with an aggregate pit in its northwest section. The Project is subject to the Provincial Policy Statement (PPS), issued under Section 3 of the *Planning Act* (Government of Ontario 1990a).

The Stage 1 archaeological assessment was completed under Project Information Form (PIF) number P390-0404-2023 issued to Ragavan Nithiyanantham, of Stantec, by the Ministry of Citizenship and Multiculturalism (MCM). An optional Stage 1 property inspection was not conducted for this assessment.

The background research identified that the study area is in the Muskoka River watershed. The closest navigable water source is more than 150 metres away. An examination of the MCM's *Ontario Archaeological Sites Database* did not identify any registered archaeological site in or within 150 metres of the study area (Government of Ontario 2023b). Additionally, a review of the Ontario Heritage Trust *Plaque Database* and Government of Ontario *Ontario Heritage Act Register* (Ontario Heritage Trust 2023a, 2023b; Government of Ontario 2023a) did not identify any commemorative plaques or cultural heritage resources within 150 metres of the study area. The Town of Bracebridge does not have an online registry of cultural heritage resources (Town of Bracebridge 2023). An examination of historical mapping demonstrates that a 19th century transportation route is adjacent to the study area's western limit.

However, a negative indicator of archaeological potential is extensive and deep land alterations that have severely damaged the integrity of any archaeological resources. This may include quarrying, major landscaping involving grading below topsoil, building footprints, and sewage and infrastructure development. The review of topographic maps and aerial imagery shows notable disturbances in the terrain in the northwest part of the study area linked to quarrying activities. However, defining the extent of these disruptions is challenging based on topographic maps and aerial images alone and would require an on-site property inspection for accurate determination. Furthermore, parts of the study area located more than 50 metres from a modern water source and 150 metres from features of archaeological potential other than a modern water source, per Section 2.1.5, are considered to have no to low archaeological potential.

When the above-listed criteria are applied, parts of the study area are evaluated to have archaeological potential.

Based on the findings presented in this report, Stantec recommends:

1. Lands evaluated as having no or low archaeological potential should be visually inspected to confirm existing ground conditions.
2. Stage 2 archaeological assessment of lands evaluated to have archaeological potential. The Stage 2 archaeological assessment will involve a test pit survey per Section 2.1.5 of the MCM's *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011):

- Where the identified feature of archaeological potential is a modern water source, test pitting (Stage 2 archaeological assessment) is required between 0 and 50 metres from the feature. Space test pits at maximum intervals of five metres. Survey is not required beyond 50 metres.
- For features of archaeological potential other than modern water sources (e.g., historical water sources such as glacial shorelines), test pitting (Stage 2 archaeological assessment) is required as follows:
    - Space test pits at maximum intervals of five metres between 0 and 50 metres from the feature of archaeological potential.
    - Space test pits at maximum intervals of 10 metres between 50 and 150 metres from the feature of archaeological potential.

The MCM is asked to enter this report into the *Ontario Public Register of Archaeological Reports*.

The Executive Summary highlights key points from the report only; for complete information and findings, the reader should examine the complete report.

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Acronyms / Abbreviations

BCE	Before Common Era
ca.	Circa
CE	Common Era
GIS	Geographic Information Services
M.Sc.	Master of Sciences
MA	Master of Arts
MAHC	Muskoka Algonquin Healthcare
MCM	Ministry of Citizenship and Multiculturalism
n.d.	No date
P.Eng.	Professional Engineer
PIF	Project Information Form
PPS	Provincial Policy Statement
RPA	Registered Professional Archaeologist
Stantec	Stantec Consulting Ltd.

Project Personnel

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Acknowledgement

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1 Project Context

1.1 Development Context

Muskoka Algonquin Healthcare (MAHC) retained Stantec Consulting Ltd. (Stantec)to provide architectural and engineering services in support of their Ministry of Health Capital Redevelopment Stage 1.3 Functional Program (the Project). The Project involves the redevelopment of the South Muskoka Memorial Hospital, which will be developed on a new property. As part of the site selection process for the Project, two short-listed sites are being considered, 300 Pine Street and 1975 Muskoka Beach Road in the Town of Bracebridge, District Municipality of Muskoka.

To facilitate this Project, Stantec is conducting Stage 1 archaeological assessment for the 300 Pine Street site (the study area). The study area is in part of Lot 6, Concession 1, Geographic Township of Macaulay, Muskoka County, now in the Town of Bracebridge, District Municipality of Muskoka, Ontario (Figure 1). The study area spans roughly 18.21 hectares, predominantly covered by dense mixed forest, indicative of its natural vegetation, with an aggregate pit in its northwest section (Figure 2).

The Project is subject to the Provincial Policy Statement (PPS), issued under Section 3 of the *Planning Act* (Government of Ontario 1990a). The PPS states that decisions affecting planning matters may be affected by other legislation; for archaeological work, that would include the *Ontario Heritage Act* (Government of Ontario 1990b). Section 2.6.2 of the PPS states, “development and site alteration shall not be permitted on lands containing archaeological resources or areas of archaeological potential unless significant archaeological resources have been conserved” (Government of Ontario 1990a).

1.1.1 Objectives

In compliance with the provincial standards and guidelines set out in the Ministry of Citizenship and Multiculturalism’s (MCM) *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011), the objectives of Stage 1 archaeological assessment are to:

- Provide information about the study area’s geography, history, previous archaeological fieldwork and current land conditions
- Evaluate the study area’s archaeological potential, which will support recommendations for Stage 2 survey for all or parts of the property
- Recommend appropriate strategies for the Stage 2 survey

To meet these objectives, Stantec archaeologists:

- Reviewed relevant archaeological, historical, and environmental literature pertaining to the study area
- Reviewed land use history, including pertinent historical maps
- Examined the *Ontario Archaeological Sites Database* to determine the presence of registered archaeological sites in and around the study area

- Queried the *Ontario Public Register of Archaeological Reports* to determine if previous archaeological assessments have occurred within the study area or 50 metres of the study area.

1.2 Historical Context

The term “contact” is commonly employed as a temporal reference point in discussions concerning Indigenous archaeology in Canada, specifically referring to encounters between Indigenous and European cultures. It signifies a continuous and evolving process rather than a distinct moment. Contact in what is now the province of Ontario is broadly assigned to the 16th century (Loewen and Chapdelaine 2016).

1.2.1 Pre-Contact Indigenous Period

Generally, southwestern Ontario has been occupied by Indigenous peoples since the retreat of the Wisconsin glacier approximately 12,000 years ago. Much of what is understood about the lifeways of Indigenous peoples is derived from archaeological evidence and ethnographic analogy. In Ontario, Indigenous culture prior to contact with European peoples has been distinguished into cultural periods based on observed changes in material culture. These cultural periods are largely based on observed changes in formal lithic tools and are separated into the Early Paleo, Late Paleo, Early Archaic, Middle Archaic, and Late Archaic periods. Following the advent of ceramic technology in the Indigenous archaeological record, cultural periods are separated into the Early Woodland, Middle Woodland, and Late Woodland periods, based primarily on observed changes in formal ceramic decoration. It should be noted that these cultural periods do not necessarily represent specific cultural identities but are a useful paradigm for understanding changes in Indigenous culture through time. The following summary of the pre-contact occupation of southern Ontario is based on syntheses in Ellis and Ferris (1990) and Sutton (1990). The provided periods are based on the “Common Era” calendar notation system, i.e., Before Common Era (BCE) and Common Era (CE).

Table 1.1: Generalized Overview of Pre-contact Indigenous Cultural Chronology

Archaeological Period	Time Period	
Early Paleo	10000 – 8400 BCE	Fluted projectile points; caribou and extinct Pleistocene mammal hunters, small camps
Late Paleo	8400 – 8000 BCE	Hi-Lo projectile points; smaller but more numerous sites
Early Archaic	8000 – 6000 BCE	Nettling and bifurcate projectile points; slow population growth, development of specialized tools
Middle Archaic	6000 – 2500 BCE	Brewerton-like projectile points; environment similar to present, hunting and nut processing, decreased residential mobility

Table 1.1: Generalized Overview of Pre-contact Indigenous Cultural Chronology

Archaeological Period	Time Period	Characteristics
Late Archaic	2500 – 1800 BCE	Lamoka (narrow projectile points), increasing site size
	1800 – 1500 BCE	Broad projectile points, large chipped lithic tools
	1500 – 1100 BCE	Small projectile points, introduction of bow hunting
Terminal Archaic	1100 – 950 BCE	Hind projectile points, emergence of true cemeteries, seasonal mobility patterns
Early Woodland	950 – 400 BCE	Meadowood complex; introduction of pottery, polished stone tools, diverse subsistence
Middle Woodland	400 BCE – 500 CE	Dentate/pseudo-scallop pottery, increased sedentism, seasonal mobility patterns, more elaborate mortuary ceremonialism
Transitional Woodland	550 – 900 CE	Princess Point complex, cord-wrapped stick pottery decoration, introduction of corn
Late Woodland	900 – 1300 CE	Early Late Woodland, emergence of agricultural villages
	1300 – 1400 CE	Middle Late Woodland, large longhouses (100+ metres)
	1400 – 1650 CE	Late Late Woodland, group warfare and displacement

Identifiable human occupation of Ontario begins just after the end of the Wisconsin Glacial period. The first human settlement can be traced back approximately 12,000 years when this area was settled by Indigenous groups living south of the emerging Great Lakes. This initial occupation is referred to as the “Paleo” archaeological culture.

Early Paleo (circa [ca.] 10000 to 8400 BCE) settlement patterns suggest that small groups, or “bands,” followed a pattern of seasonal mobility extending over large territories. Many (although by no means all) of the Early Paleo sites were located on former beach ridges associated with glacial lakes such as Lake Algonquin and Lake Iroquois. Vegetative cover of these areas would have consisted of open spruce parkland, given the cool climatic conditions. Sites tend to be located on well-drained, loamy soils and elevations in the landscape, such as knolls. Large game, such as caribou, mastodon, and mammoth, appears to be of central importance to the sustenance of these early inhabitants.

The Late Paleo period (ca. 8400 to 8000 BCE) is relatively poorly understood, resulting from less research focus. As the climate warmed, the spruce parkland was gradually replaced from south to north with closed coniferous forests. As a result, many of the large game species that had been hunted in the Early Paleo period either moved north or became locally extinct. Late Paleo peoples covered large territories as they moved around to exploit different resources.

The transition from the Paleo period to the Archaic archaeological culture of the Great Lakes region is marked by the development of new tool technologies correlated with increasing resource diversification.

During the Early Archaic period (ca. 8000 to 6000 BCE), the jack and red pine forests that characterized the Late Paleo environment were replaced by forests dominated by white pine with some associated deciduous elements. Early Archaic projectile points differ from Paleo forms, most notably by the presence of side and corner notching on their bases. A ground stone tool industry, including celts and axes, also emerged, indicating that woodworking was an important component of the technological development of Archaic peoples. Although there may have been some reduction in the degree of seasonal mobility, it is still likely that population density during the Early Archaic was low, and band territories were large.

More diversified tool technology development continued into the Middle Archaic period (ca. 6000 to 2500 BCE). The presence of grooved stone net-sinkers suggests an increase in the importance of fishing in subsistence activities. Bannerstones also appeared during this period and are considered weights for “atlatls” or spear-throwers. The increased reliance on local, often poor-quality chert resources for chipped stone tools suggests that in the Middle Archaic, groups inhabited smaller territories lacking high-quality raw materials. This territory size reduction appears to have resulted from gradual region-wide population growth, which forced a reorganization of subsistence patterns. A major development of the later part of the Middle Archaic period was the initiation of long-distance trade. Tools manufactured from natural copper sources near Lake Superior were widely traded in eastern Ontario (‘Old Copper complex’). A distinctive occupation or tradition, known as the Laurentian Archaic, appears in eastern Ontario, western Quebec, northern New York, and Vermont within the transitional zone between the deciduous forests to the south and coniferous forests to the north and is identifiable through the association of certain diagnostic tool types, including ground slate semi-lunar knives (or “ulus”), plummets for use in fishing, ground slate points and knives, and ground stone gouges, adzes and grooved axes. The tool assemblage has been used to suggest that there was less reliance on plant foods and a greater reliance on hunting and fishing in this region than for Archaic peoples in southern Ontario, where people made use of various nut-bearing trees. Stone tools designed specifically for preparing wild plant foods suggest that subsistence catchment was being widened and new resources being more intensively exploited.

The trend towards decreased territory size, increased population density, and a broadening subsistence base continued during the Late Archaic (ca. 2500 to 1100 BCE). Increased territoriality and more limited movement are also consistent with the development of distinct local styles of projectile points. The trade networks that began in the Middle Archaic expanded, including marine shell artifacts from as far away as the Mid-Atlantic coast, polished stone pipes, and slate gorgets. A more unusual Late Archaic artifact is the “birdstone,” small, bird-like effigies usually manufactured from green banded slate. In southern Ontario, the Late Archaic is subdivided into three traditions based on projectile point styles: Narrow, broad, and small points. The small point tradition, i.e., Crawford Knoll and Innes, is thought to represent the spread of bow and arrow technology. The appearance of the first true cemeteries marks the Terminal Archaic period (ca. 1100 to 950 BCE). Before this period, individuals were interred close to where they died. However, burial patterns changed, wherein individuals who died far from the cemetery would be returned for final burial at the group cemetery, often resulting in disarticulated skeletons and occasionally missing minor bone elements (i.e., finger bones). The emergence of local group cemeteries has been interpreted as a response to increased population densities and competition between local groups for access to resources; cemeteries would have provided symbolic claims over a local territory and its resources.

The Early Woodland period (ca. 950 to 400 BCE) is distinguished from the Late Archaic period primarily by the addition of ceramic technology. While the introduction of pottery provides a useful demarcation point for archaeologists, it may have made less difference in the lives of the Early Woodland peoples. Lifeways show a great deal of continuity with the preceding Late Archaic period. For instance, birdstones continue to be manufactured, although the Early Woodland varieties have “pop-eyes” that protrude from their heads' sides. Likewise, well-made projectile points produced during the Archaic period’s terminal part continue in use. The Meadowood complex, marked by thin, well-made, side-notched points, appears primarily in southern Ontario, although there are some sites with Meadowood artifacts in eastern Ontario. The trade networks established in the Middle and late Archaic periods continued to function. However, there does not appear to have been as much traffic in marine shells during the Early Woodland period. These trade items were included in increasingly sophisticated burial ceremonies, some of which involved the construction of burial mounds, particularly in the north shore region of Lake Ontario.

In terms of settlement and subsistence patterns, the Middle Woodland (ca. 400 BCE – 500 CE) provides a major point of departure from previous periods with a great degree of sedentism. Fish were becoming an even more important part of the diet, and rich, densely occupied sites appeared along the margins of major rivers and lakes. Unlike earlier seasonally utilized locations, these sites appear to have functioned as base camps, occupied intermittently throughout the year. There are also numerous small upland sites, many of which can be interpreted as special-purpose camps from which localized resource patches were exploited. Middle Woodland vessels are often decorated with tool-impressed designs covering the entire exterior surface and upper portion of the vessel interior. In eastern Ontario, the Point Peninsula ceramic style features a stamped zigzag pattern applied at various angles to the exterior of the vessel, known as “pseudo scallop shell.” Another common decorative style is the dentate stamp, a comb-like tool that creates square impressions.

The relatively brief period of the Transitional Woodland period (ca. 550 – 900 CE) is marked by the acquisition of cultivar plant species, such as maize and squash, from communities living south of the Great Lakes. With the transition to food production, sites were occupied for longer periods and by larger populations. The Princess Point complex and cord-marked pottery in southern Ontario represent the Transitional Woodland period. There are few Transitional Woodland sites in eastern Ontario. However, these changes are not as evident in the parts of the province where horticulture is not viable, such as the study area. The advent of horticulture is represented mostly through the acquisition of these resources through trade with horticulturalists to the south.

In the Late and Terminal Woodland (immediately prior to the early contact period), there are several instances of Late Woodland pottery types typically associated with Iroquoian groups on what would otherwise be considered Algonquian archaeological sites in the territory east of Georgian Bay across the area of Algonquin Park and the Halliburton Highlands over to, and including, the Ottawa River valley (cf. Ballantine 1996, 1997; Mitchell 1975, 1990, 1996; Saint-Germain 1999; von Gernet 1992, 1993). There has been some debate about what the presence of these purportedly Iroquoian ceramic artifacts in an Algonquin context might indicate. Interpretations include the incursion of Iroquoian peoples into Algonquin territory; ceramics as trade items between Iroquoian and Algonquins; the presence of Iroquoian women in Algonquin societies, either as wives or captives, who continued to manufacture ceramics according to their ethnic traditions; or Algonquin manufacture of ceramics that simulate Iroquoian ceramic types (Pendergast 1999). Each possible interpretation suggests a close interaction sphere between Algonquin and Iroquoian peoples, further

supported by evidence of Iroquoian and Algonquin trade relationships in the early contact period. It has also been suggested that Algonquin and Iroquoian peoples may have “shared in a common Late Woodland cultural stratum,” including common elements such as ceramics (von Gernet 1992). Fox and Garrad (2004) suggest that Huron and Algonquin shared not only a territory in the southern Georgian Bay area (traditional “Huronia”) but also shared a material culture and may have cohabited in settlements to a greater degree than as simply visitors. Ballantine (1997) has suggested that Algonquian sites, or sites shared by Iroquoians and Algonquians, exhibit a wider variety of lithic raw materials and a greater reliance on quartz, based on his work in the Haliburton area.

1.2.2 Post-Contact Indigenous Period

The study area is in the Muskoka District, which forms part of an area sometimes referred to modernly as “The Land Between” for its geographic location between the arable lands in southern Ontario and the Canadian Shield to the north. However, that moniker is also an apt description for an interaction sphere between Indigenous nations. The start of the Contact period was one of a complex interaction between the Huron-Wendat Iroquoian-speaking horticulturalists living in semi-permanent villages located around the southern end of Georgian Bay to the south and more mobile Anishinaabe peoples living along the rivers and lakes to the north (Heidenreich 1971, Map 24). As interactions with Europeans (primarily the French) intensified through the fur trade and later the exploration of the Great Lakes region, travel along the eastern shore of Georgian Bay and through the Severn and French rivers included a greater mix of people and an increase in the trade of goods between Indigenous nations and between Indigenous and European peoples.

The Michi Saagiig Nishnaabeg (Mississauga Anishinaabeg) traditional homeland stretched along the north shore of Lake Ontario and its tributary rivers from present-day Gananoque in the east to Long Point on Lake Erie in the west. In the winter, the communities dispersed into smaller groups. They travelled inland to the north, around present-day Bancroft, the Haliburton Highlands and into the Muskoka area. Mississauga’s oral history relates that their ancestors have occupied this part of southern Ontario since the last deglaciation (Migizi and Kapyrka 2015).

The Mississauga traditional territory was located between two powerful confederacies, the Three Fires Confederacy (consisting of the Odawa, Ojibwa, and Pottawatomi) located to the north and west, and the Haudenosaunee (Five Nations Iroquois) Confederacy on the south shore of Lake Ontario in present-day New York State. In this geopolitical context, the Mississauga positioned themselves as peacekeepers among the various Indigenous nations, acting as negotiators and emissaries (Migizi and Kapyrka 2015). In the 1640s, the Five Nations Iroquois began a territorial expansion campaign between Lake Ontario’s north shore and what is now central Ontario. In 1649, raids by the Seneca and Mohawk north of Lake Ontario, coinciding with the widespread occurrence of infectious disease and famine among the Huron-Wendat, Tionontate (Petun), and Atawandaron (Neutral) nations, resulted in the latter groups’ dispersal from the region, and the Seneca establishing regional dominance (Heidenreich 1978).

In 1667, surviving Huron-Wendat warriors allied with the Ojibwa and Mississaugas to counterattack the Iroquois who had settled along the north shore of Lake Ontario. By 1690, the Mississauga had begun moving back into the lower Great Lakes basin (Konrad 1981; Rogers 1978). Mississauga oral traditions, as told by Chief Robert Paudash and recorded in 1905, indicate that after the Mississauga defeat of the Mohawk, the Mohawk retreated to their homeland south of Lake Ontario, and a peace treaty was negotiated between

those groups around 1695 (Paudash 1905). Upon the Mississaugas' return, they re-established their role as peacekeepers in the region, extending that to include the incoming Euro-Canadian settlers (Curve Lake First Nation no date [n.d.]; Kapyrka 2018). The Huron-Wendat permanently left the region, moving to the east in Quebec and the southwest in the present-day United States.

French maps of the late 17th century indicate the presence of the Mississauga in the Muskoka area. When the British explored the same region in the middle and late 18th century, they noted the presence of "Chippewas," although they used the terms Chippewa and Mississauga interchangeably (Murray 1963: liii). The chief of the Chippewas was Yellowhead (Mesquakie), from which the name Muskoka is derived (Murray 1963, liii).

Despite the differentiation among these groups in Euro-Canadian sources, Indigenous groups had a considerably different view concerning their self-identification during the first few centuries of European contact. These peoples relied upon kinship ties that cut across European notions of nation identity (Bohaker 2006, 277-283). Many of the British-imposed names, such as Chippewa, Ottawa, Potawatomi, or Mississauga, artificially separated how self-identified Indigenous peoples classified themselves; these groups were culturally and socially more alike than contemporary European documentation might indicate (Bohaker 2006, 1-8).

The expansion of the fur trade led to increased interaction between European and Indigenous people and, ultimately, intermarriage between European men and Indigenous women. During the 18th century, the progeny of these marriages began to identify as Métis and no longer identified directly with their paternal or maternal cultures. The ethnogenesis of the Métis progressed with establishing distinct Métis communities along the major waterways in the Great Lakes of Ontario. Métis communities were primarily focused around the upper Great Lakes and along Georgian Bay; however, Métis people have historically lived throughout Ontario (Métis Nation of Ontario 2023; Stone and Chaput 1978, 607-608).

Since contact with European explorers and immigrants, and later, with the establishment of provincial and federal governments (the Crown), the lands within Ontario have been included in various treaties, land claims, and land cessions. Following the American Revolutionary War, the Crown focused on settling European immigrants into what became the province of Upper Canada in 1791. The Crown government entered into a series of treaties with Indigenous peoples to enable widespread settlement. The first treaty signed between the Crown and the Indigenous peoples of the area was the Robinson-Huron Treaty (Treaty number 61), signed on September 9, 1850. Morris (1943) describes the Robinson-Huron Treaty as part of:

> two agreements signed in September of 1850…and secured virtually the whole of the Upper Canadian northwest for government use" (Surtees 1986: 19). This agreement includes "the eastern and northern shores of Lake Huron from Penetanguishene to Sault Ste. Marie, and thence to Batchewana Bay on the northern shore of Lake Superior, together with the Islands in said lakes, opposite to the shores thereof and inland to the height of land which separates the territory covered by the Charter of the Honorable Hudsons Bay Company from Canada, as well as all unconceded lands within the limits of Canada West, to which they have any just claim of the other part
>
> (Morris 1943, 24-25)

The parcel surrendered "contained 35,700 square miles of territory" (Surtees 1986, 19). Twenty-one reserves were included in the treaty, the locations of which could be chosen by the chiefs. The treaty was likely inspired by the promotion of mining activity in the area (Surtees 1986, 20).

In addition to the Robinson-Huron Treaty, the study area also falls within the Williams Treaty lands. Figure 3 provides a map of southwestern Ontario illustrating early treaties and purchases (Government of Canada n.d.; Morris 1943) and shows the location of the study area within the Williams Treaty lands (labelled "AF").

The Williams Treaty, between the Crown and the Chippewas and Mississaugas, is part of "[t]hree separate and large parcels of land in southern and central Ontario…acquired by the Government of Canada in 1923" (Surtees 1986, 1). The particular parcel associated with the study area includes a "very large tract lying between Lake Huron and the Ottawa River bounded on the north by the Mattawa River-Lake Nipissing and French Line and on the south by earlier treaties concluded in 1818 and 1819" (Surtees 1986, 1) and contained approximately 17,600 square miles (Morris 1943, 61). It is also worth noting that this area also "included substantial portions of land that had been the object of previous land cession treaties" (Surtees 1986, 1).

Within the Muskoka District, the Wasauksing First Nation reserve was established on Parry Island, near Parry Sound, in 1850 as part of the Robinson-Huron Treaty. Initially occupied through the early 1800s, the community of Wasauksing originally constituted two villages, known as Niisaakiing (Upper Village) and Nishnaabe-oodenaang (Lower Village), of Ojibwa, Odawa, and Pottawatomi. A third village, Gamiing (Middle Village), was settled in 1880 by additional Ojibwe and Pottawatomi (Wasauksing First Nation Lands and Natural Resources n.d.).

The Wahta Mohawk Territory, west of Bala, was founded in 1881 when the Sulpician Order purchased a block of land in hopes of removing the Mohawk community at Kanesatake in Quebec because of a dispute over land ownership. Ultimately, only about one-fifth of the community consented to move (Smith n.d.).

In the 1830s, many Pottawatomi left the expanding United States to settle in parts of southern Ontario, notably at Walpole Island near Sarnia, Manitoulin Island, and Beausoleil and Christian islands in southern Georgian Bay (First Nations of Simcoe County n.d.). Around 1880, 19 Odawa and Pottawatomi families left Christian Island to settle at Moose Deer Point. The Moose Deer Point Reserve was established in 1917.

The nature of Indigenous settlement size, population distribution, and material culture shifted as European settlers encroached upon Indigenous territory. However, despite this shift, "written accounts of material life and livelihood, the correlation of historically recorded villages to their archaeological manifestations, and the similarities of those sites to more ancient sites have revealed an antiquity to documented cultural expressions that confirms a deep historical continuity to…systems of ideology and thought" (Ferris 2009, 114). As a result, Indigenous peoples have left behind archaeological resources throughout the region which show continuity with past peoples, even if they have not been explicitly recorded in Euro-Canadian documentation.

1.2.3 Euro-Canadian Period

The earliest documented European interaction in the Muskoka District occurred in the early 1600s, first by Etienne Brule, whom Samuel de Champlain sent to live with the Algonquin and Huron over the winter of 1610-1611. In 1615, the Recollet priest Joseph Le Caron and 12 other Frenchmen set out to Huronia along the Ottawa and French rivers route that took them through the north end of Muskoka and along the eastern shore of Georgian Bay. Champlain followed them in the same year when he overwintered with the Huron (Murray 1963). Over the next 65 years, French traders and missionaries followed, taking the Ottawa-French river route and the route that accessed Georgian Bay via the Severn River from Lake Ontario.

Almost a century after the last French missionaries, the British began to show interest in the area. Although knowledge of the Severn River route was widely known in the 1760s, it was not until 1780 that General Frederick Haldimand, Governor of Canada, issued orders for a survey party to follow and survey the route from Lake Ontario along the Toronto portage, Lake Simcoe, and the Severn River (Murray 1963: xlii). Although the survey was fraught with inaccuracies, it did provide the first detailed description of the Severn River. Further exploration occurred in 1788 when Gother Mann made a report on the islands of Georgina Bay, Matchedash Bay, and the Severn River (Murray 1963: xlii). In the spring of 1793, Lieutenant-Governor John Graves Simcoe and a party followed the Toronto route to Georgian Bay, encountering a fur trader named Cowan, who had lived there for 15 years (Murray 1963: xliii).

1.2.3.1 District Municipality of Muskoka

In 1851, Simcoe County annexed the District of Muskoka, and the *Parliamentary Representation Act* of 1853 divided Simcoe County into two ridings (Mika and Mika 1981). Land was made available for settlement under the *Public Lands Act* of 1860, but the settlement was slow until the clearing of Muskoka Road. During the 1850s and 1860s, the government, in attempting to open access to the districts of the north, began the construction of “Colonization Roads” (Ontario Heritage Trust 2018). Muskoka Road was one such colonization road, and construction began in 1858, starting in Washago and going to the interior of Muskoka. The road was completed to Bracebridge by 1861, and by 1863, the road had been completed to the area where Huntsville eventually grew (Murray 1963: lxx). In 1868, the townships in the Muskoka District included Cardwell, Macaulay, Watt, Brunel, Draper, McLean, Muskoka, and Stephenson (Mika and Mika 1981).

1.2.3.2 Town of Bracebridge

Bracebridge, branded as “The Heart of Muskoka,” is located geographically in the centre of Muskoka and is the headquarters for the district government. The community was incorporated as a village in 1875 and a town in 1889. The Bracebridge Public Library service began in 1908 when the original Carnegie building was constructed. The 2,800 square foot Muskoka stone structure was expanded to 8,400 square feet in 1984 with an addition that maintained the heritage character of the building while allowing for improved service and collection space. The Bracebridge Public Library marked 100 years of service to the community during its centennial in 2008.

With the advent of regional government in January 1971, the Town of Bracebridge and the surrounding townships were brought together as one municipality. It encompasses 62,119 hectares and has five wards: Bracebridge, Monck/Muskoka, Macaulay, Draper, and Oakley (Town of Bracebridge 2023b). The naming of Bracebridge has been traced to a postmaster who took the name from the book, “Bracebridge Hall” written by American author Washington Irving.

According to the 2011 Census, the Town’s population is 16,000 (Town of Bracebridge 2023b).

1.2.3.3 Historical Maps

An examination of historical maps was undertaken to understand the historical land use of the study area. When examining 19th century historical mapping, it is important to note that numerous county atlases from that era were primarily created to identify the subscribers’ factories, offices, residences, and landholdings who financially supported their production through subscription fees. Consequently, landowners who chose not to subscribe were often omitted from the maps, leading to their absence in the depicted information (Caston 1997, 100). As a result, the depiction and accuracy of structures on these maps are not always reliable (Gentilcore and Head 1984). Further, a review of historical mapping has inherent inaccuracy due to potential errors in georeferencing. Georeferencing is conducted by assigning spatial coordinates to fixed locations and using these points to spatially reference the remainder of the map. Due to changes in “fixed” locations over time (e.g., road intersections, road alignments, shorelines, etc.), errors/difficulties of scale and the relative idealism of the historical cartography, historical maps may not translate accurately into real space points. This may provide obvious inconsistencies during historical map review.

An examination of the Study Area Overlaid on 1879 *Guide Book & Atlas of Muskoka and Parry Sound Districts* (Page 1879) shows Muskoka Township used the “1,000-acre sectional” system (Figure 4). The Canada Company first introduced the township system in 1835, utilizing a 1,000-acre section system. The company acquired one million acres of unsurveyed land, known as the Huron Tract, from the government, originally purchased from the Six Nations. Each lot in this system was 20 by 50 chains, totalling 100 acres, with additional space for a one-chain wide road at every alternate concession line and every fifth lot line (Weaver 1962). This layout created sections of 1,000 acres each, divided into ten 100-acre lots. The survey lines were in the middle of the allowances for roads. By 1850, this system was adopted for Crown surveys, with the government adding a one-chain road allowance along rivers and lakes. This practice was followed in all subsequent townships, with few exceptions. The 1,000-acre sectional system was widely accepted and used to lay out townships from Georgian Bay to the Ottawa River.

Based on the 1879 map (Page 1879), Lot 6, owned by J. Dixon, includes one historical homestead located greater than 150 metres from the study area. However, a historical transportation route is depicted adjacent to the western limit of the study area.

1.3 Archaeological Context

1.3.1 Natural Environment

The study area is contained within the Number 11 strip physiographic region, as identified by Chapman and Putnam (1984). The Number 11 strip physiographic region, located southeast of Severn Township and north of Ramara Township, is a flat strip of land filled with sediment during the glacial Lake Algonquin phase. As defined by Chapman and Putnam (1984), it is between two bedrock-dominated upland areas, part of the Georgian Bay fringe physiographic region. Three sediment deposits are found here: outwash deposits, glaciolacustrine plain deposits, and subaqueous fan deposits (Chapman and Putnam 1984). These deposits provide sand and gravel resources, although their distribution and quality vary. They mainly consist of stratified sand with varying grain sizes and gravel material in the lower central core of subaqueous fan deposits. Silt and clay are also present in varying amounts.

The Muskoka District forms the southwestern edge of the Canadian Shield, and large-scale soil mapping is unavailable for the Muskoka District. Nevertheless, the general distribution of soils can be interpreted from small-scale soil maps and large-scale quaternary geology maps. Generalized mapping of soil associations in southern Ontario (Hoffman et al. 1964) reveals three dominant soil groups in the Muskoka area: Wendigo, Monteagle, and Magnetawan, with the study area situated in a band of Wendigo loamy sand over rock (Hoffman et al. 1964). In addition to these soils, extensive deposits of organic soils have been mapped in the Muskoka District.

Elevated topography (e.g., eskers, drumlins, large knolls, and plateaux) is considered a feature that indicates archaeological potential. Per the 1981 *Southern Ontario Engineering Geology Terrain Study* (Mollard 1981), the study area and its vicinity do not contain any archaeological features related to elevated topography (Figure 5). The elevation in the study area varies from approximately 255 to 282 metres above sea level. Generally, the topography within the study area and surrounding area descends southwest.

Potable water is an essential resource for any extended human occupation or settlement. Since water sources in southwestern Ontario have remained relatively stable, proximity to potable water is a useful index for evaluating archaeological potential. Distance to water is one of the most used variables for the predictive modelling of archaeological site locations in Ontario. The study area is in the Muskoka River watershed and is crossed by a tributary of the Muskoka River; however, the closest potable and navigable water source is more than 150 metres from the study area.

1.3.2 Registered Archaeological Sites and Previous Archaeological Assessments

In Canada, archaeological sites are registered within the Borden system, a national grid system designed by Charles Borden in 1952 (Borden 1952). The grid covers the entire surface area of Canada and is divided into major units containing an area that is two degrees in latitude by four degrees in longitude. Major units are designated by upper case letters. Each major unit is subdivided into 288 basic unit areas, each containing an area of 10 minutes in latitude by 10 minutes in longitude. The width of basic units reduces as one moves north due to the curvature of the earth. In southern Ontario, each basic unit measures approximately 13.5 kilometres east-west by 18.5 kilometres north-south. In northern Ontario, adjacent to Hudson Bay, each basic unit measures approximately 10.2 kilometres east-west by 18.5 kilometres north-south. Basic units are



designated by lowercase letters. Individual sites are assigned a unique, sequential number as they are registered. These sequential numbers are issued by the MCM, which maintains the *Ontario Archaeological Sites Database*. The study area under review is within Borden Block BhGt.

Information concerning specific site locations is protected by provincial policy and is not fully subject to the *Freedom of Information and Protection of Privacy Act* (Government of Ontario 1990c). The release of such information in the past has led to looting or various forms of illegally conducted site destruction. Confidentiality extends to media capable of conveying location, including maps, drawings, or textual descriptions of a site location. The MCM will provide information concerning site location to the party or an agent of the party holding title to a property or a licensed archaeologist with relevant cultural resource management interests.

An examination of the *Ontario Archaeological Sites Database* has shown that no archaeological sites are registered within a one-kilometre radius of the study area (Government of Ontario 2023b.

A query of the *Ontario Public Register of Archaeological Reports* did not identify any previous archaeological surveys within 50 metres of the study area (Government of Ontario 2023c).

1.3.1 Commemorative Plaques and Cultural Heritage Resources

A query of the Ontario Heritage Trust *Plaque Database* and Government of Ontario *Ontario Heritage Act Register* (Ontario Heritage Trust 2023a, 2023b; Government of Ontario 2023) did not identify any commemorative plaques or cultural heritage resources within 150 metres of the study area. The Town of Bracebridge does not have an online registry of cultural heritage resources (Town of Bracebridge 2023a).

1.3.2 Archaeological Management Plan

The Muskoka *Official Plan*, consolidated in March 2023 (The District Municipality of Muskoka 2023), includes Schedule G – Archaeological Potential, outlining areas with archaeological potential. Based on the Muskoka *Official Plan* (The District Municipality of Muskoka 2023), the study area is identified as having moderate to high archaeological potential. However, it should be noted that the mapping is restricted to identifying such areas based solely on the presence of water source features.

1.4 Existing Conditions

The study area, located at 300 Pine Street, falls within Lot 6, Concession 1 of the Geographic Township of Macaulay, former Muskoka County, now the Town of Bracebridge, District Municipality of Muskoka, Ontario. Situated on the eastern edge of Bracebridge, it lies roughly 14.9 kilometres northeast of Gravenhurst. Spanning approximately 18.21 hectares, the area is mainly covered by dense mixed forest, indicative of its natural vegetation. Notably, an aggregate pit occupies the northwest section of the study area.

2 Field Methods

A desktop Stage 1 archaeological assessment was undertaken to evaluate the archaeological potential of the study area. The Stage 1 archaeological assessment was completed under Project Information Form (PIF) number P390-0404-2023 issued to Ragavan Nithiyanantham, of Stantec, by the MCM. An optional property inspection was not conducted.

3 Analysis and Conclusions

Archaeological potential is established by determining the likelihood that archaeological resources may be present on a subject property. Stantec applied archaeological potential criteria commonly used by the MCM (Government of Ontario 2011) to determine areas of archaeological potential within the region under study. Features and characteristics that indicate the potential for archaeological resources are defined within Section 1.3.1 of the MCM's *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011, 17-18) and include:

- Previously identified archaeological sites.
- Water sources:
    - Primary water sources (lakes, rivers, streams, creeks).
    - Secondary water sources (intermittent streams and creeks; springs; marshes; swamps).
    - Features indicating past water sources (e.g., glacial lake shorelines indicated by the presence of raised gravel, sand, or beach ridges; relic river or stream channels indicated by clear dip or swale in the topography; shorelines of drained lakes or marshes; and cobble beaches).
    - Accessible or inaccessible shoreline (e.g., high bluffs, swamps, or marsh fields by the edge of a lake; sandbars stretching into marsh).
- Elevated topography (eskers, drumlins, large knolls, plateau).
- Pockets of well-drained sandy soil, especially near areas of heavy soil or rocky ground; Distinctive land formations that might have been special or spiritual places, such as waterfalls, rock outcrops, caverns, mounds, and promontories and their bases (there may be physical indicators of their use, such as burials, structures, offerings, rock paintings or carvings).
- Resource areas including:
    - Food or medicinal plants.
    - Scarce raw minerals (e.g., quartz, copper, ochre, or outcrops of chert).
    - Early Euro-Canadian industry (fur trade, mining, logging).
- Areas of Euro-Canadian settlement. These include places of early military or pioneer settlements (e.g., pioneer homesteads, isolated cabins, farmstead complexes), early wharf or dock complexes, pioneer churches and early cemeteries. There may be commemorative markers of their history, such as local, provincial, or federal monuments or heritage parks.
- Early historical transportation routes (e.g., trails, passes, roads, railways, portage routes).
- Property listed on a municipal register or designated under the *Ontario Heritage Act* (Government of Ontario 1990b) or that is a federal, provincial, or municipal historic landmark or site.
- Property that local histories or informants have identified with possible archaeological sites, historical events, activities, or occupations.

Many of the above features of archaeological potential have a buffer assigned to them, extending the zone of archaeological potential beyond the physical feature. Section 1.4 of the MCM's *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011, 20-21) employs the following buffers:

- 300-metre buffer for previously identified archaeological sites, water sources; areas of early Euro-Canadian settlement, or locations identified through local knowledge or informants
- 100-metre buffer for early historical transportation route

If no buffer is present, the potential is restricted to the physical limits or the feature: elevated topography, pockets of well-drained sandy soil, distinctive land formations, and resource areas.

Furthermore, Section 2.1.5 of the MCM's *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011) provides modified buffers that may be used for northern Ontario and Canadian Shield terrain, which apply to the current study area:

- Where the identified feature of archaeological potential is a modern water source, test pitting (Stage 2 archaeological assessment) is required between 0 and 50 metres from the feature. Space test pits at maximum intervals of five metres. Survey is not required beyond 50 metres.
- For features of archaeological potential other than modern water sources (e.g., historical water sources such as glacial shorelines), test pitting (Stage 2 archaeological assessment) is required as follows:
    - Space test pits at maximum intervals of five metres between 0 and 50 metres from the feature of archaeological potential.
    - Space test pits at maximum intervals of 10 metres between 50 and 150 metres from the feature of archaeological potential.
    - Survey is not required beyond 150 metres.

The study area is in the Muskoka River watershed and is crossed by tributaries of the Muskoka River; however, the closest navigable water source is more than 150 metres away.

An examination of the MCM's *Ontario Archaeological Sites Database* did not identify any registered archaeological site in or within 150 metres of the study area (Government of Ontario 2023b). Additionally, a review of the Ontario Heritage Trust *Plaque Database* and Government of Ontario *Ontario Heritage Act Register* (Ontario Heritage Trust 2023a, 2023b; Government of Ontario 2023a) did not identify any commemorative plaques or cultural heritage resources within 150 metres of the study area. The Town of Bracebridge does not have an online registry of cultural heritage resources (Town of Bracebridge 2023).

An examination of historical mapping demonstrates that a 19th century transportation route is adjacent to the study area's western limit.

However, a negative indicator of archaeological potential is extensive and deep land alterations that have severely damaged the integrity of any archaeological resources. This may include quarrying, major landscaping involving grading below topsoil, building footprints, and sewage and infrastructure development. The review of topographic maps and aerial imagery shows notable disturbances in the terrain in the northwest part of the study area linked to quarrying activities (Figure 6). Defining the extent of these

disruptions is challenging based on topographic maps and aerial images alone and would require an on-site property inspection for accurate determination. Furthermore, parts of the study area, located more than 50 metres from a modern water source and 150 metres from features of archaeological potential other than a modern water source, per Section 2.1.5, are considered to have no to low archaeological potential (Figure 7).

When the above-listed criteria are applied, parts of the study area are evaluated to have archaeological potential (Figure 7).

4 Recommendations

Based on the findings presented in this report, Stantec recommends:

1. Lands evaluated as having no or low archaeological potential should be visually inspected to confirm existing ground conditions (Figure 8).
2. Stage 2 archaeological assessment of lands evaluated to have archaeological potential. The Stage 2 archaeological assessment will involve a test pit survey per Section 2.1.5 of the MCM's *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011) (Figure 8):
    - Where the identified feature of archaeological potential is a modern water source, test pitting (Stage 2 archaeological assessment) is required between 0 and 50 metres from the feature. Space test pits at maximum intervals of five metres. Survey is not required beyond 50 metres.
    - For features of archaeological potential other than modern water sources (e.g., historical water sources such as glacial shorelines), test pitting (Stage 2 archaeological assessment) is required as follows:
        - Space test pits at maximum intervals of five metres between 0 and 50 metres from the feature of archaeological potential.
        - Space test pits at maximum intervals of 10 metres between 50 and 150 metres from the feature of archaeological potential.

The MCM is asked to review the results presented and accept this report into the *Ontario Public Register of Archaeological Reports*.

5 Advice on Compliance with Legislation

In accordance with Section 7.5.9 of the MCM's Standards and Guidelines for Consultant Archaeologists (Government of Ontario 2011), the following standard statements are a required component of archaeological reporting and are provided from the MCM's Standards and Guidelines for Consultant Archaeologists (Government of Ontario 2011).

This report is submitted to the Minister of Citizenship and Multiculturalism as a condition of licensing in accordance with Part VI of the *Ontario Heritage Act*, R.S.O. 1990, c O.18 (Government of Ontario 1990b). The report is reviewed to ensure that it complies with the standards and guidelines that are issued by the Minister, and that the archaeological fieldwork and report recommendations ensure the conservation, protection and preservation of the cultural heritage of Ontario. When all matters relating to archaeological sites within the project area of a development proposal have been addressed to the satisfaction of the Ministry of Citizenship and Multiculturalism, a letter will be issued by the ministry stating that there are no further concerns with regard to alterations to archaeological sites by the proposed development.

It is an offence under Sections 48 and 69 of the *Ontario Heritage Act* (Government of Ontario 1990b) for any party other than a licensed archaeologist to make any alteration to a known archaeological site or to remove any artifact or other physical evidence of past human use or activity from the site, until such time as a licensed archaeologist has completed fieldwork on the site, submitted a report to the Minister stating that the site has no further cultural heritage value or interest, and the report has been filed in the Ontario Public Register of Archaeological Reports referred to in Section 65.1 of the *Ontario Heritage Act* (Government of Ontario 1990b).

Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48(1) of the *Ontario Heritage Act* (Government of Ontario 1990b). The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out archaeological fieldwork, in compliance with Section 48(1) of the *Ontario Heritage Act* (Government of Ontario 1990b).

The *Funeral, Burial and Cremation Services Act,* 2002, S.O. 2002, c.33 (Government of Ontario 2002), requires that any person discovering or having knowledge of a burial site shall immediately notify the police or coroner. It is recommended that the Registrar of Cemeteries at the Ministry of Public and Business Service Delivery is also immediately notified.

Archaeological sites recommended for further archaeological fieldwork or protection remain subject to Section 48(1) of the *Ontario Heritage Act* (Government of Ontario 1990b) and may not be altered, or have artifacts removed from them, except by a person holding an archaeological licence.



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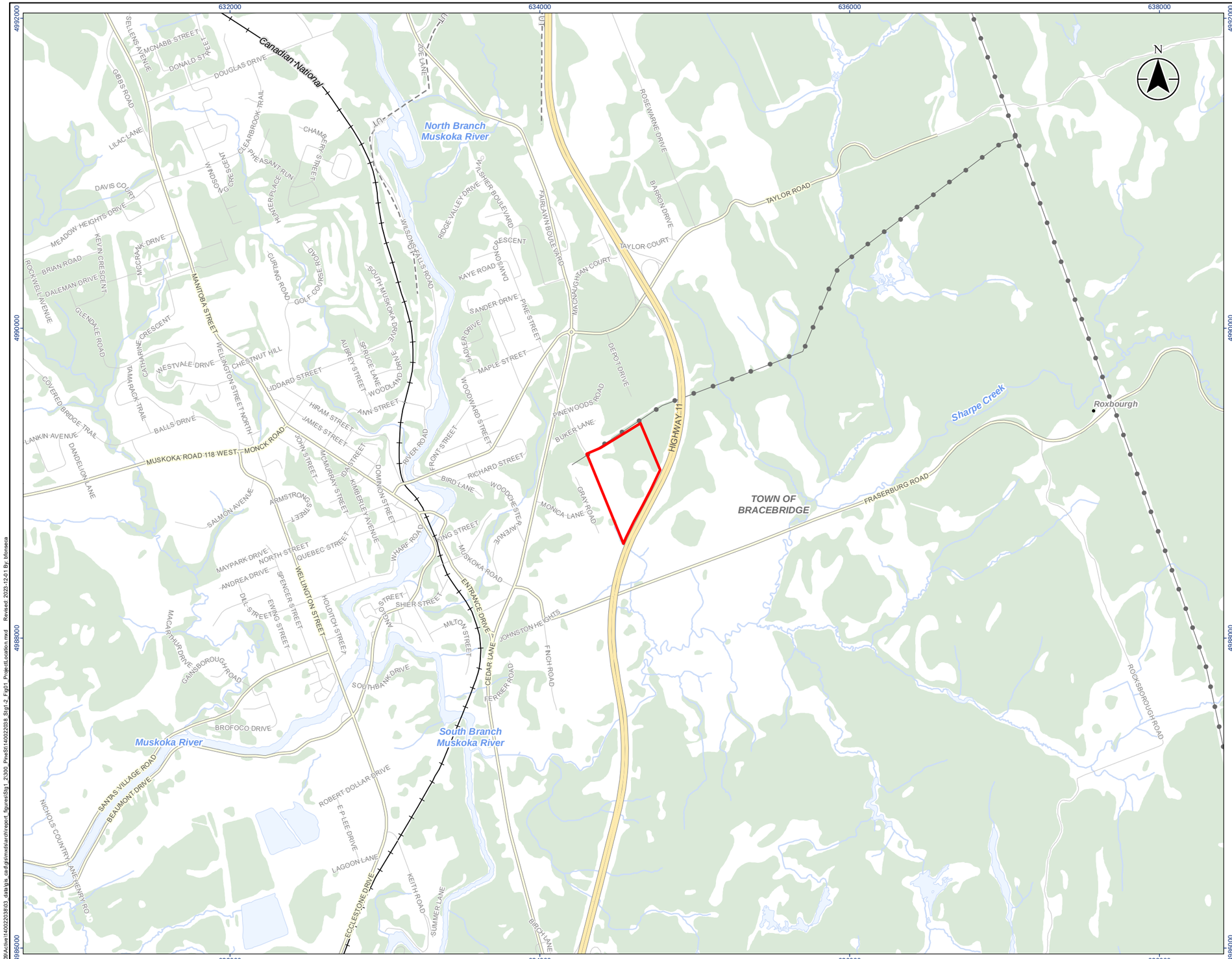
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7 Maps

Maps of the Stage 1 archaeological assessment of the study area are provided on the following pages.



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Legend

- Study Area
- Highway
- Major Road
- Minor Road
- Railway
- Hydro Line
- Unknown Transmission Line
- Watercourse
- Municipal Boundary, Lower
- Waterbody
- Wooded Area

0 500 1,000 m

1:25,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2023.

Project Location
Muskoka, ON

140022038 REV1
Prepared by BF on 2023-12-01
Technical Review by DH on 2023-11-08

Client/Project
MUSKOKA ALGONQUIN HEALTHCARE
STAGE 1 ARCHAEOLOGICAL ASSESSMENT: BRACEBRIDGE HOSPITAL - 300 PINE STEET

Figure No.
1

Title
Location of the Project

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Legend
Study Area

0 50 100
m
1:4,000 (At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2023.
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Project Location
Muskoka, ON

140022038 REV1
Prepared by BF on 2023-12-01
Technical Review by DH on 2023-10-25

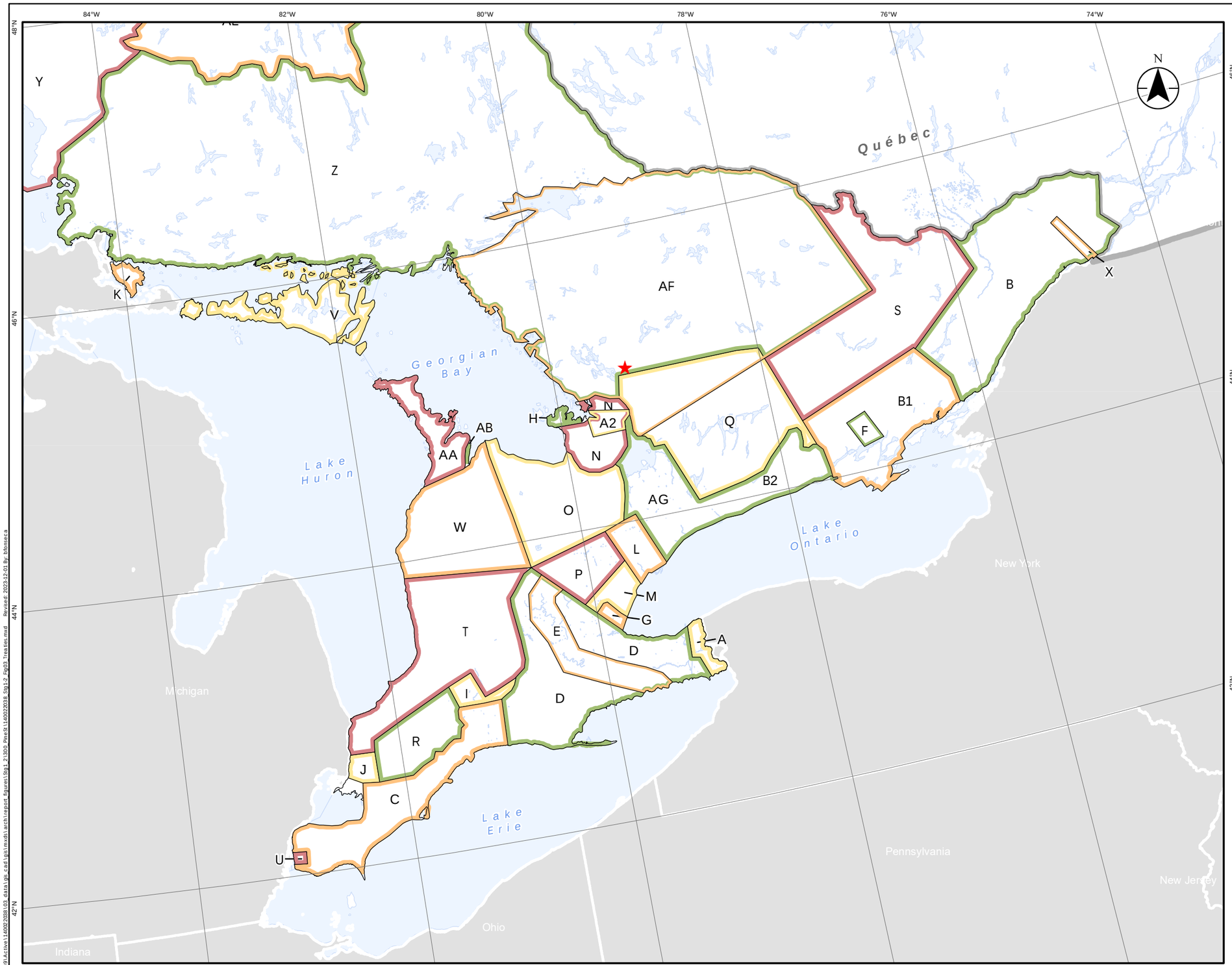
Client/Project
MUSKOKA ALGONQUIN HEALTHCARE
STAGE 1 ARCHAEOLOGICAL ASSESSMENT: BRACEBRIDGE HOSPITAL - 300 PINE STREET

Figure No.
2

Title
Location of the Study Area

V:\1609\Active\140022038\03_data\gis_cad\gis\mxds\arch\report_figures\Stg1_2000_PhaseSt\140222038_Stg1-2_Fig02_StudyArea.mxd Revised: 2023-12-01 By: bfonseca

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Stantec

Legend

- Study Area
- Waterbody

A	Treaty No. 381, May 9th, 1781 (Mississauga and Chippewa)
AA	Treaty No. 72, October 30th, 1854 (Chippewa)
AB	Treaty No. 82, February 9th, 1857 (Chippewa)
AE	Treaty No. 9, James Bay 1905, 1906 (Ojibway and Cree)
AF	Williams Treaty, October 31st and November 15th, 1923 (Chippewa and Mississauga)
AG	Williams Treaty, October 31st, 1923 (Chippewa)
A2	John Collins' Purchase, 1785 (Chippewa)
B	Crawford's Purchase, October 9th, 1783 (Algonquin and Iroquois)
B1	Crawford's Purchase, October 9th, 1783 (Mississauga)
B2	Crawford's Purchase, 1783, 1787, 1788 (Mississauga)
C	Treaty No. 2, May 19th, 1790 (Odawa, Chippewa, Pottawatomi, and Huron)
D	Treaty No. 3, December 2nd, 1792 (Mississauga)
E	Haldimand Tract: from the Crown to the Mohawk, 1793
F	Tyendinaga: from the Crown to the Mohawk, 1793
G	Treaty No. 3 3/4: from the Crown to Joseph Brant, October 24th, 1795
H	Treaty No. 5, May 22nd, 1798 (Chippewa)
I	Treaty No. 6, September 7th, 1796 (Chippewa)
J	Treaty No. 7, September 7th, 1796 (Chippewa)
K	Treaty No. 11, June 30th, 1798 (Chippewa)
L	Treaty No. 13, August 1st, 1805 (Mississauga)
M	Treaty No. 13A, August 2nd, 1805 (Mississauga)
N	Treaty No. 16, November 18th, 1815 (Chippewa)
O	Treaty No. 18, October 17th, 1818 (Chippewa)
P	Treaty No. 19, October 28th 1818 (Chippewa)
Q	Treaty No. 20, November 5th, 1818 (Chippewa)
R	Treaty No. 21, March 9th, 1819 (Chippewa)
S	Treaty No. 27, May 31st, 1819 (Mississauga)
T	Treaty No. 27½, April 25th, 1825 (Ojibwa and Chippewa)
U	Treaty No. 35, August 13th, 1833 (Wyandot or Huron)
V	Treaty No. 45, August 9th, 1836 (Chippewa and Odawa, "For All Indians To Reside Thereon")
W	Treaty No. 45½, August 9th, 1836 (Saugeen)
X	Treaty No. 57, June 1st, 1847 (Iroquois of St. Regis)
Y	Treaty No. 60, Robinson, Superior, September 7th, 1850 (Ojibwa)
Z	Treaty No. 61, Robinson, Huron, September 9th, 1850 (Ojibwa)

0 50 100 km

1:3,000,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 Statistics Canada Lambert
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2018.
3. Treaty boundaries adapted from Morris 1943 (1964 reprint). For cartographic representation only.

Project Location
Muskoka, ON

140022038 REV1
Prepared by BF on 2023-12-01
Technical Review by DH on 2023-11-08

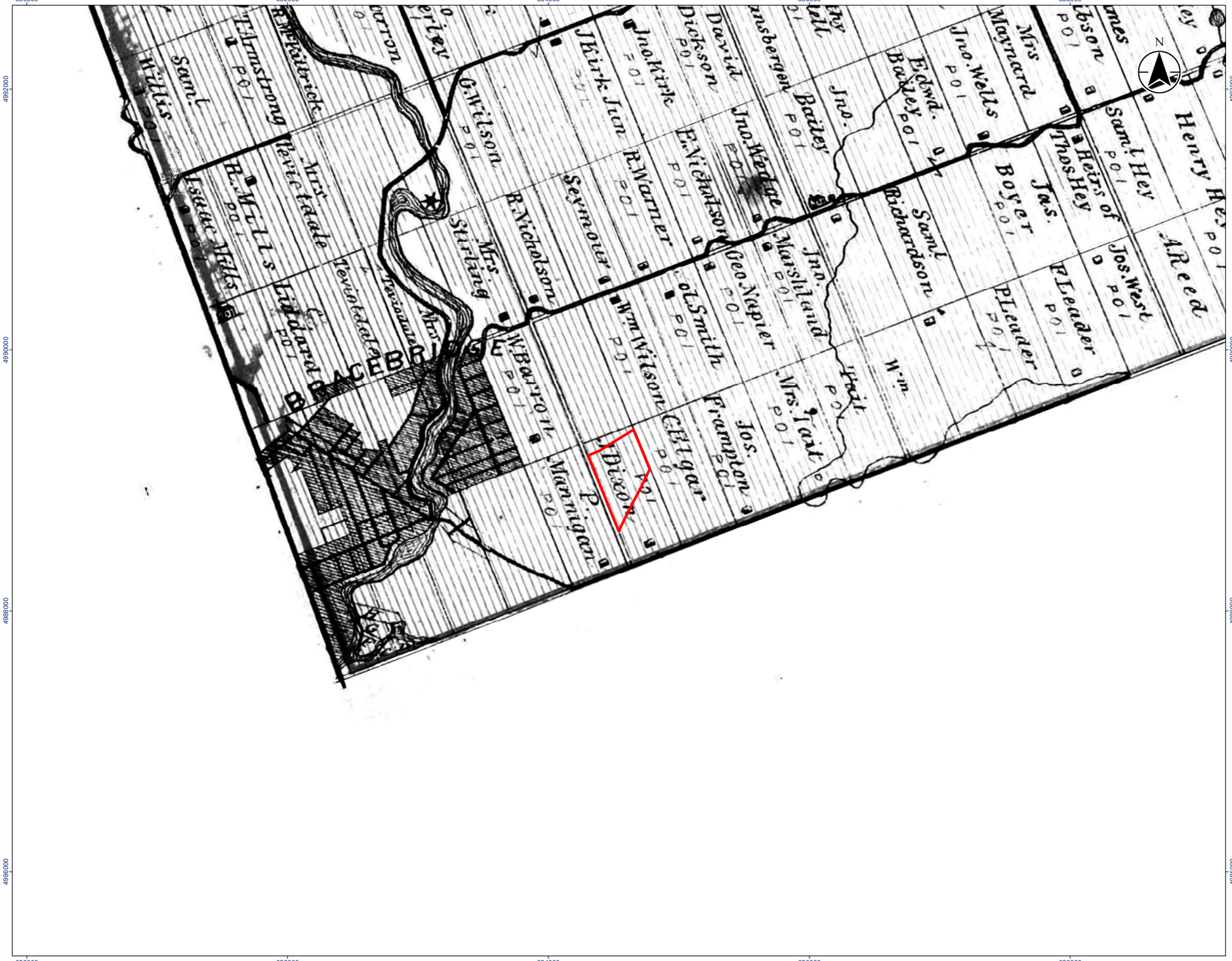
Client/Project
MUSKOKA ALGONQUIN HEALTHCARE
STAGE 1 ARCHAEOLOGICAL ASSESSMENT: BRACEBRIDGE HOSPITAL - 300 PINE STREET

Figure No.
3

Title
Treaties and Purchases (Adapted from Morris 1943)

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V:\1099\Active\140022038\03_data\gis_cad\gis\mxds\arch\report_figures\Stg1-2\1800_PineSt\140022038_Stg1-2_Fig03_Treaties.mxd Revised: 2023-12-01 By: bfonseca



Legend

Study Area (Approximate)

Notes

1. Historic image not to scale.
2. Reference: Page, H.R. 1879. Guide Book & Atlas of Muskoka and Parry Sound Districts. Toronto.



Project Location
Muskoka, ON

140022038 REV1
Prepared by BF on 2023-12-01
Technical Review by DH on 2023-10-25

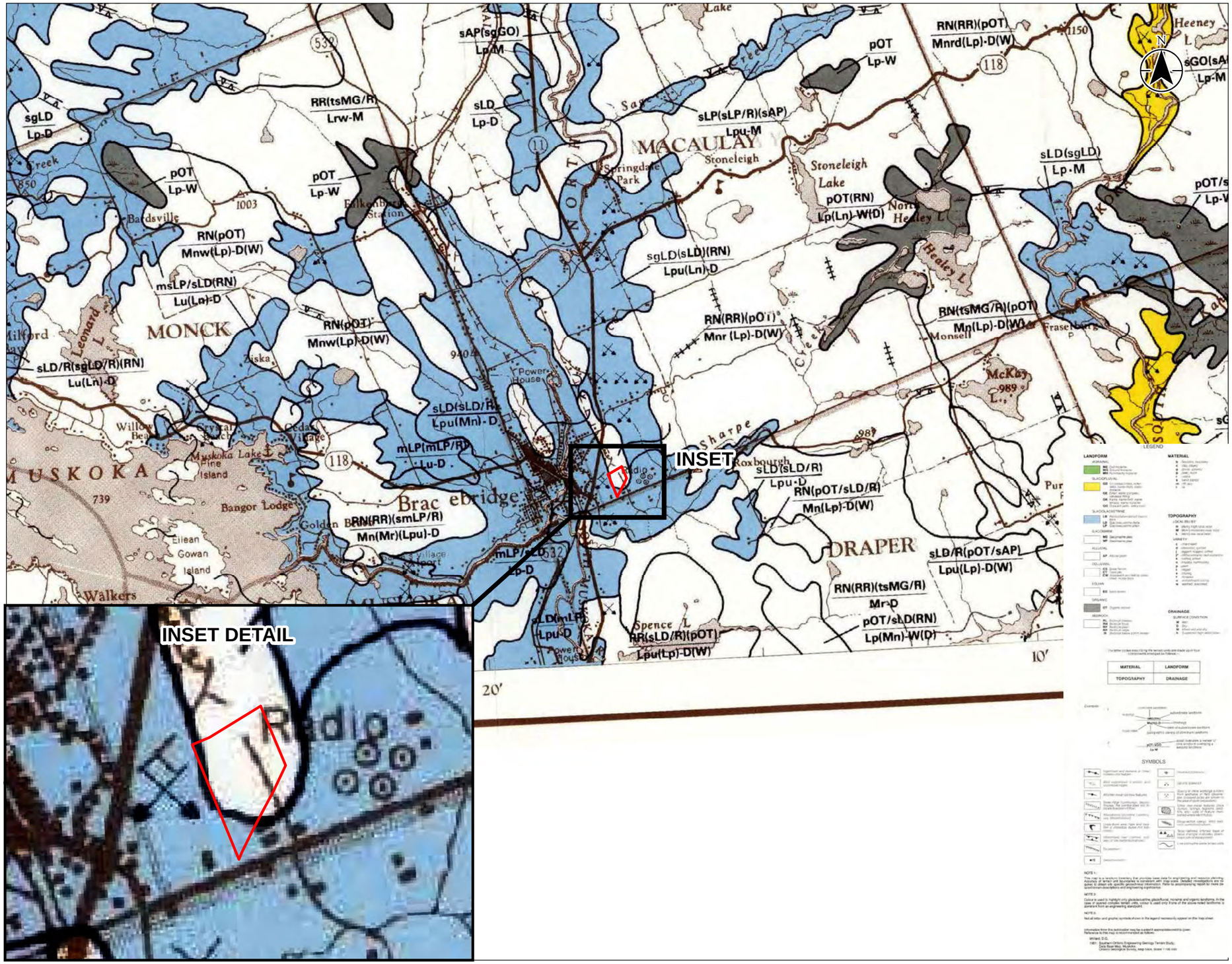
Client/Project
MUSKOKA ALGONQUIN HEALTHCARE
STAGE 1 ARCHAEOLOGICAL ASSESSMENT: BRACEBRIDGE HOSPITAL - 300 PINE STREET

Figure No.
4

Title
Study Area Overlaid on 1879 Guide Book & Atlas of Muskoka and Parry Sound Districts

V:\1608\Active\140022038\03_data\gis_cad\gismxds\archivreport_figuresStg1_2000_PineSt\140022038_Stg1-2_Fig04_1879historic.mxd Revised: 2023-12-01 By: Monseca

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Legend

Study Area (Approximate)

Notes

1. Historic image not to scale.
2. Reference: Mollard, D.G. 1981: Southern Ontario Engineering Geology Terrain Study, Data Base Map, Muskoka. Ontario Geological Survey, Map 5504, Scale 1:100 000



Project Location
Muskoka, ON

140022038 REV1
Prepared by BF on 2023-12-01
Technical Review by DH on 2023-11-24

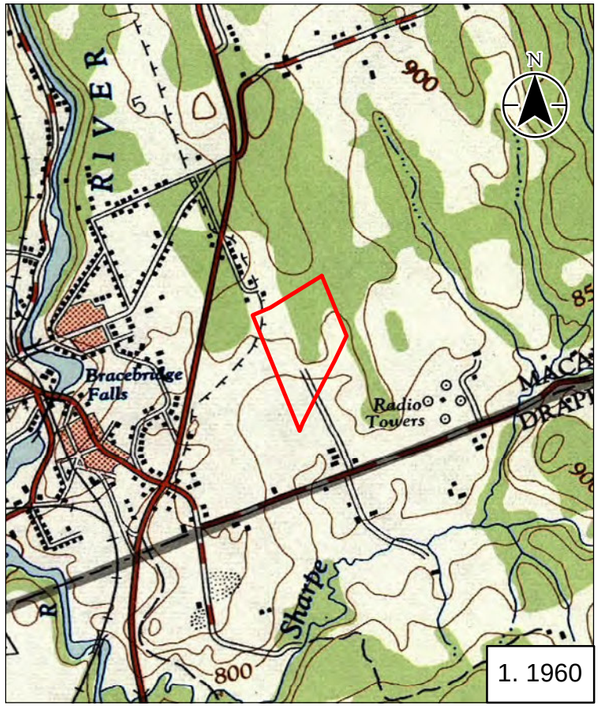
Client/Project
MUSKOKA ALGONQUIN HEALTHCARE
STAGE 1 ARCHAEOLOGICAL ASSESSMENT: BRACEBRIDGE HOSPITAL - 300 PINE STREET

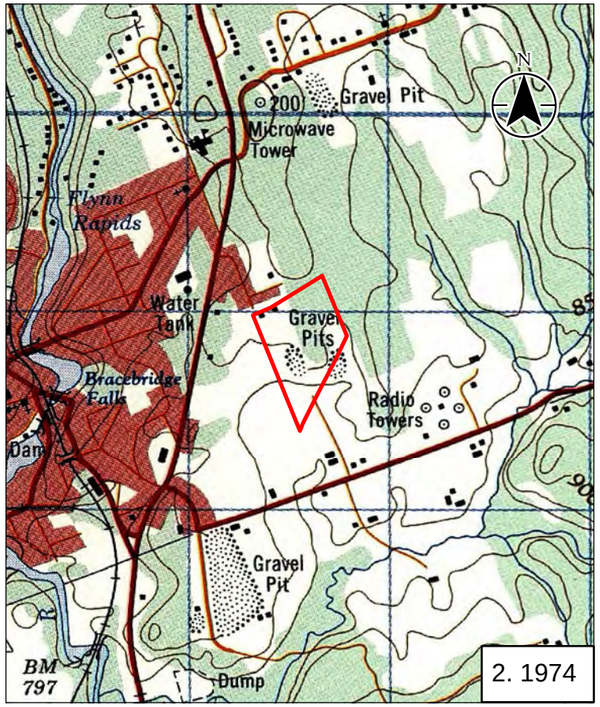
Figure No.
5

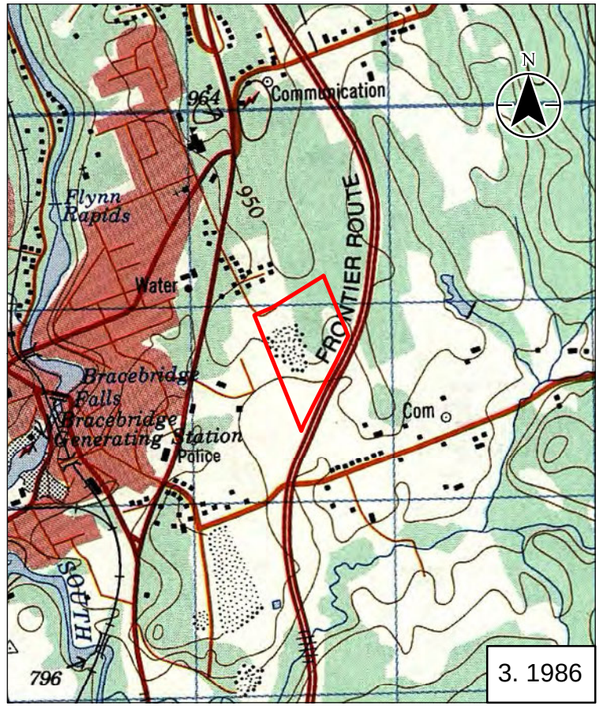
Title
Study Area Overlaid on Muskoka NTS 31E/SW Southern Ontario Engineering Geology Terrain Study

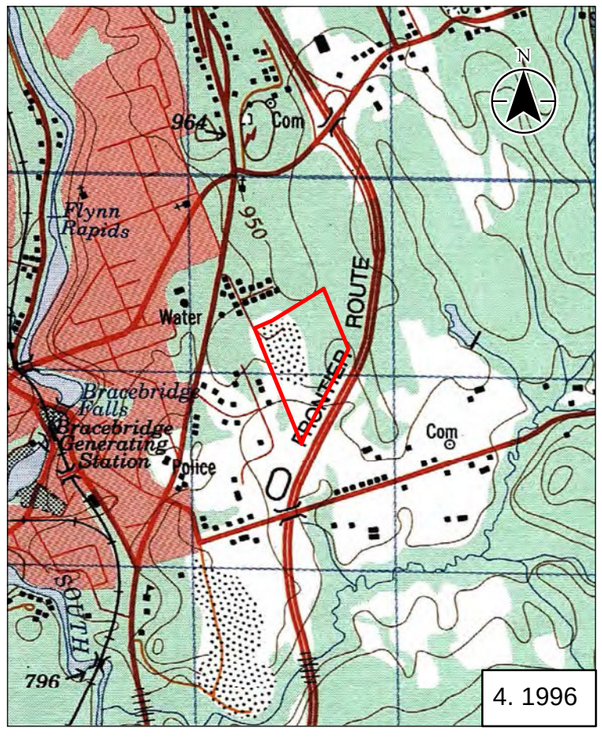
V:\1600\Active\140022038\03 -data\gis_cad\gis\mxds\archive\report_figures\Sig1_2300_PrelSt1\40022038_Sig1-2_Fig05_GeologicalTerrain.mxd Revised 2023-12-01 By: bfonseca

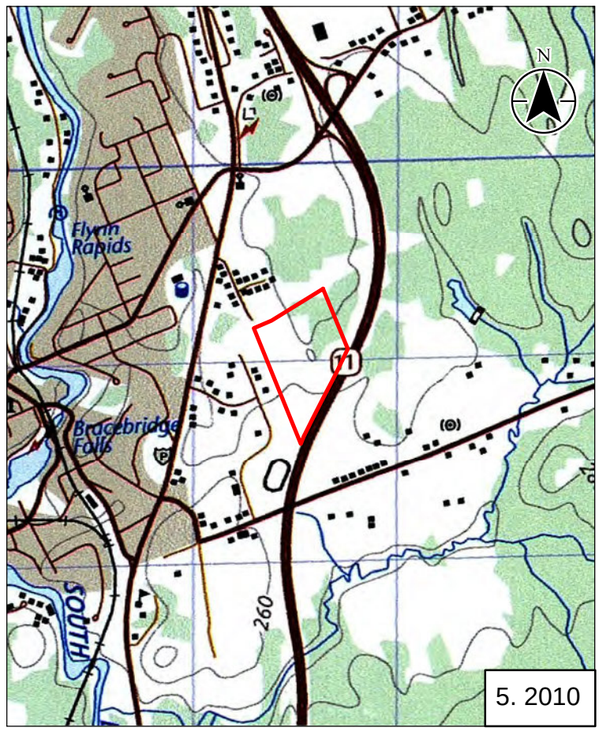
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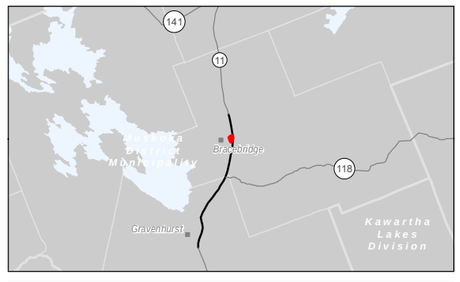
Stantec

Legend

Study Area (Approximate)

Notes

1. Topographic maps not to scale.
2. 1960. Natural Resources Canada (NRCan) / Ministère des Ressources naturelles Canada (RNCan). Bracebridge (East), Ontario. 1:50,000. Map Sheet 031E03, ed. 1, 1960.
3. 1974. Natural Resources Canada (NRCan) / Ministère des Ressources naturelles Canada (RNCan). Bracebridge, Ontario. 1:50,000. Map Sheet 031E03, ed. 2, 1974.
4. 1986. Natural Resources Canada (NRCan) / Ministère des Ressources naturelles Canada (RNCan). Bracebridge, Ontario. 1:50,000. Map Sheet 031E03, ed. 3, 1986.
5. 1996. Natural Resources Canada (NRCan) / Ministère des Ressources naturelles Canada (RNCan). Bracebridge, Ontario. 1:50,000. Map Sheet 031E03, ed. 4, 1996.
6. 2010. Natural Resources Canada (NRCan) / Ministère des Ressources naturelles Canada (RNCan). Bracebridge, Ontario. 1:50,000. Map Sheet 031E03, ed. 5, 2010.



Project Location
Muskoka, ON

140022038 REV1
Prepared by BF on 2023-12-01
Technical Review by DH on 2023-11-09

Client/Project
MUSKOKA ALGONQUIN HEALTHCARE
STAGE 1 ARCHAEOLOGICAL ASSESSMENT: BRACEBRIDGE HOSPITAL - 300 PINE STREET

Figure No.
6

Title
Study Area Overlaid on 20th Century Topographic Maps

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Legend

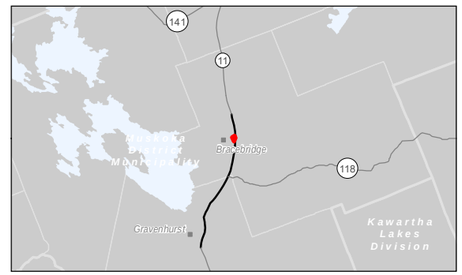
- Study Area
- Historical Farmstead
- Historical Transportation Route
- Archaeological Potential, Stage 2 Archaeological Assessment Recommended
- No or Low Archaeological Potential, Beyond 50 m from Modern Water Sources and 150 m from Features of Archaeological Potential
- No to Low Archaeological Potential, Disturbed

0 50 100 m

1:4,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2023.
3. Orthoimagery © First Base Solutions, 2023. Imagery Date, unknown.



Project Location
Muskoka, ON

140022038 REV1
Prepared by BF on 2023-12-01
Technical Review by DH on 2023-11-14

Client/Project
MUSKOKA ALGONQUIN HEALTHCARE
STAGE 1 ARCHAEOLOGICAL ASSESSMENT: BRACEBRIDGE HOSPITAL - 300 PINE STREET

Figure No.
7

Title
Stage 1 Archaeological Assessment Results

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634000 634400 634800

4989200

4988800



Stantec

Legend

Study Area

Assessment Method

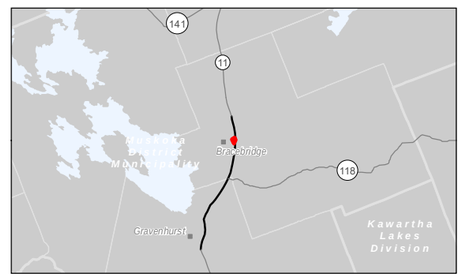
- No to Low Archaeological Potential, Beyond 50 m from Modern Water Sources and 150 m from Features of Archaeological Potential, Visual Inspection Recommended
- Test Pit Survey (5 m), 0 to 50 m from Features of Archaeological Potential
- Test Pit Survey (10 m), 50 to 150 m from Features of Archaeological Potential
- Low to No Archaeological Potential, Disturbed, Visual Inspection Recommended

0 50 100 m

1:4,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2023.
3. Orthoimagery © First Base Solutions, 2023. Imagery Date, unknown.



Project Location
Muskoka, ON

140022038 REV1
Prepared by BF on 2023-12-01
Technical Review by DH on 2023-11-14

Client/Project
MUSKOKA ALGONQUIN HEALTHCARE
STAGE 1 ARCHAEOLOGICAL ASSESSMENT: BRACEBRIDGE HOSPITAL - 300 PINE STREET

Figure No.
8

Title
Stage 1 Archaeological Assessment Results and Recommendations

V:\1069\Active\140022038\03_data\gis_cad\gis\mxds\arch\report_figures\Stg1_2300_PineSt\140022038_Stg1-2_Fig08_Recommendations.mxd Revised: 2023-12-01 By: bbrisebois

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Phase I Environmental Site Assessment

300 Pine Street
300 Pine Street, Bracebridge, ON



Prepared for:
Muskoka Algonquin Healthcare

Prepared by:
Stantec
100-300 Hagey Boulevard
Waterloo, ON N2L 0A4

Job No.: 140022038

November 20, 2023

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Executive Summary

Executive Summary

Site Description and Current Operations

Stantec Consulting Ltd. (Stantec) conducted a Phase I Environmental Site Assessment (Phase I ESA) of the property located at 300 Pine Street in Bracebridge, Ontario, hereinafter referred to as the "Site". The Phase I ESA was conducted for Muskoka Algonquin Healthcare (MAHC) in support of redevelopment purposes. The purpose of the Phase I ESA was to assess if evidence of potential or actual environmental contamination exists in connection with the Site, as a result of current or past activities on the Site or neighbouring properties.

The Site is located within an industrial and residential neighbourhood and is currently occupied by a vacant sand pit and undeveloped land.

Records Review

Based on aerial photographs, the Site was vacant and undeveloped with treed areas and agricultural areas until at least 1977. Based on the available aerial photograph from 1977, the Site appeared to be undeveloped with disturbed soils in parts of the western and southern portions of the Site. Based on the available aerial photographs between 1987 to 2022, the Site appears to have been undeveloped with disturbed soils (a sand pit) on the northwest portion of the Site. Based on a review of the Environmental Risk Information Services (ERIS) report the following records were identified for the Site:

- An Environmental Compliance Approval from 2001, 2009, and 2010 for the establishment of stormwater management works, including on-site storm sewers.
- A Certificate of Approval for emissions to the air from an emergency standby diesel generator in 2001. The ECA identifies the location of the generator at the "Pine Street Booster Station, Northwest Side of Intersection of Pine and Maple Streets, Bracebridge, Ontario". Despite being mapped by ERIS as on-site, this location is more than 700 m northwest of the Site and is not considered to represent a potential concern to the Site.

Commercial operations north and west, including historical automotive repair operations at 40 Depot Drive (at least 90 m northeast) and a former retail fuel storage tank at 8 Gray Road (approximately 70 m west) are not considered to represent a potential environmental concern to the Site due to the inferred downgradient locations. Undeveloped, forested land and/or residential properties are also present to the north, east (across Highway 11), and south of the Site.

Site Visit/Interviews

The site visit was conducted by Marissa Lusito, M.Env.Sc., B.Sc.H., of Stantec, on October 18, 2023. The Site and readily visible and publicly accessible portions of adjoining and neighbouring properties were observed for the presence of potential sources of environmental contamination. A Site Representative was not available to complete an interview to obtain or confirm information on the historic operations and activities on the Site.

At the time of the site visit, the Site was vacant and undeveloped, with evidence of a historical sand pit on the northwest portion of the Site.

Conclusions

The Phase I ESA has revealed no evidence of environmental contamination associated with current or historical activities at the Site. No recommendations for further environmental site assessment work are made at this time.

The statements made in this Executive Summary are subject to the same limitations included in the Closure (Section 7.0) and are to be read in conjunction with the remainder of this report.

Phase I Environmental Site Assessment

1.0 General Information

Client Information:
Muskoka Algonquin Healthcare
Andrew Gall
100 Frank Miller Drive
Huntsville, ON P1H 1H7

Project Information:
Bracebridge Hospital
140022038

Site Information:
300 Pine Street
300 Pine Street
Bracebridge, ON P1L 1Z5

Consultant Information:
Stantec
100-300 Hagey Boulevard
Waterloo, ON N2L 0A4

Phone: (519) 579-4410 **Fax:** (519) 579-6733
E-mail Address:
Site Visit Date:
Report Date: November 12, 2024
Site Assessor: Marissa Lusito, M.Env.Sc., B.Sc.H.
Report Preparer: Marissa Lusito, M.Env.Sc., B.Sc.H.
Senior Reviewer: Randy Sinukoff, M.A.Sc., P.Eng., EP

Site Assessor:

Marissa Lusito, M.Env.Sc., B.Sc.H.
Environmental Assessor

Report Preparer:

Marissa Lusito, M.Env.Sc., B.Sc.H.
Environmental Assessor

Senior Reviewer:

Randy Sinukoff, M.A.Sc., P.Eng., EP
Senior Reviewer

The environmental site assessment and preparation of this report were completed in general accordance with the objectives, requirements or standards of the Canadian Standards Association (CSA) Z768-01 *Phase I Environmental Site Assessment* Standard (R2022).

2.0 Introduction

2.1 Objectives

Stantec Consulting Ltd. (Stantec) conducted a Phase I Environmental Site Assessment (Phase I ESA) of the property located at 300 Pine Street in Bracebridge, Ontario, hereinafter referred to as the "Site". The Phase I ESA was conducted for Muskoka Algonquin Healthcare (MAHC) in support of redevelopment purposes. The purpose of the Phase I ESA was to assess if evidence of potential or actual environmental contamination exists in connection with the Site, as a result of current or past activities on the Site or neighbouring properties.

A site plan is included in **Appendix A** and selected photographs of the Site are included in **Appendix B**.

2.2 Scope of Work

The Phase I ESA carried out by Stantec on this Site was conducted in general accordance with Stantec's Proposal #140022038, dated September 30, 2022, and the Canadian Standards Association's (CSA) *Phase I Environmental Site Assessment* Standard Z768-01 (R2022). The Phase I ESA consisted of the following:

- Records review including, but not limited to, publicly available city directories, aerial photographs, fire insurance plans, geological and topographic maps, provincial government regulatory search;
- Purchase of a database report from Environment Risk Information Services (ERIS) that consisted of a search of available databases within a 250 m radius of the centre of the Site;
- A request to the Ontario Ministry of the Environment, Conservation and Parks (MECP) for documents related to various environmental concerns associated with the Site;
- A request to Technical Standards and Safety Authority for documents related to potential fuel storage equipment associated with the Site;
- A request for city directories for the Site and surrounding properties;
- Review of available environmental databases and records;
- Review of previous environmental reports and existing title searches;
- Interviews with persons having knowledge of the Site;
- A site visit;
- Evaluation of information and preparation of the report provided herein.

A Phase I ESA does not include sampling or testing of air, soil, groundwater, surface water or building materials. For this Phase I ESA, no enhancements to the CSA standard were made.

This assessment did not include a review or audit of operational environmental compliance issues, or of any environmental management systems, which may exist for the Site.

The assessment of the Site for the potential presence of hazardous building materials was based on the age of the building and components, and a non-intrusive visual review of the Site. No sampling of materials was conducted. A Phase I ESA does not constitute a Hazardous Materials Survey or Designated Substances Survey.

The assessment of the Site for microbial contamination and moisture damage was made during the walk through of the building. This assessment was visual only and not every area was assessed. No sampling or intrusive investigation was conducted.

The site visit was conducted by Marissa Lusito, M.Env.Sc., B.Sc.H., of Stantec, on October 18, 2023. The Site and readily visible and publicly accessible portions of adjoining and neighbouring properties were observed for the presence of potential sources of environmental contamination. A Site Representative was not available to complete an interview to obtain or confirm information on the historic operations and activities on the Site.

The professional qualifications of the project team are provided in **Appendix C**.

2.3 Regulatory Framework

CSA Standard Z768-01 (R2022) establishes principles and practices that are applicable to a Phase I ESA. The purpose of a Phase I ESA is to identify actual and potential site contamination. Such identification involves the evaluation and reporting of existing information collected through records review, site visits, and interviews. Phase I ESAs may assist in reducing uncertainty about potential environmental liabilities and may be a basis for further investigation of a property. Phase I ESAs may be used to make informed decisions about property

transactions, to identify certain baseline environmental conditions, to assist in meeting regulatory requirements, and as an initial step in site remediation. This Phase I ESA, however, was not completed for the purposes of meeting the Records of Site Condition requirements described in Ontario Regulation 153/04, as amended.

Because a Phase I ESA does not include such tasks as sample gathering, laboratory testing, or intrusive investigations, a Phase I ESA report can, in most cases, only describe the potential of contamination being present or absent at a property. If there are previous soil or groundwater sample results available, the data can be compared to applicable Federal and/or Provincial numerical standards for soil and groundwater quality for specific land and groundwater uses. A Phase I ESA performed in accordance with the requirements of CSA Standard Z768-01 (R2022) is intended to reduce, but not necessarily eliminate, uncertainty regarding the potential for contamination of a property.

In addition, a Phase I ESA in accordance with the requirements of CSA Standard Z768-01 (R2022) involves a review of any site buildings for the potential presence of hazardous materials related to building components and materials. Specific Federal and/or Provincial regulations, guidelines or codes of practice exist for the individual hazardous materials. Where required, this documentation was used to determine appropriate conclusions and formulate appropriate recommendations.

3.0 Records Review

3.1 Information Sources

The applicable search distance for the records review included the Site, properties immediately adjoining the Site and other neighbouring properties where activities considered to be potential sources of environmental contamination were apparent. Information sources obtained and reviewed as part of the records review are listed below.

SOURCE	INFORMATION/CONTACT
Aerial Photographs	ERIS: 1951, 1993, 2022 The District of Muskoka's Air Photo Catalog: 1969, 1977, 1987, 2008, 2013, and 2018
Fire Insurance Plans	A request was submitted to Opta for fire insurance plans and underwriters' reports for the Site and properties within 250 m of the centre of the Site. No records were available for the Site.
City Directories	A request was made for city directories pertaining to the Site and 10 neighbouring properties, from the following directories: Digital Business Directory - 2012 to 2021
Previous Environmental Reports	"Phase One Environmental Site Assessment - 300 Pine Street, Bracebridge, Ontario" by Golder Associates Ltd., dated November 2015, for Fowler Construction Company Ltd.
Company Records	No company records were made available to Stantec.
Geological and Geotechnical Reports	No previous geological or geotechnical reports were provided to Stantec.
Regulatory Infractions	A request submitted to the MECP's Freedom of Information and Protection of Privacy Office included a search for occurrence reports and general information from the District Office, investigation documents from the Investigations and Enforcement Branch, and orders from the Sector Compliance Branch pertaining to the municipal address of the Site and current/former tenants and owners of the Site.
Reportable Spill Occurrences	ERIS - Ontario Spills
Contaminated Sites	"Inventory of Coal Gasification Plant Waste Sites in Ontario" (April 1987) "Inventory of Industrial Sites Producing or Using Coal Tar and Related Tars in Ontario" (November 1988) ERIS - MECP Brownfield Environmental Site Registry
Hazardous Waste Generator Registration	ERIS - Ontario Regulation 347 Waste Generators Summary
PCB Storage Sites	ERIS - National PCB Inventory database, Ontario Inventory of PCB Storage Sites

3.0 Records Review (continued)

3.1 Information Sources (continued)

SOURCE	INFORMATION/CONTACT
Landfill Records	"Waste Disposal Site Inventory" (June 1991) ERIS - Waste Disposal Sites - MOE CA Inventory, Ontario Regulation 347 Waste Receivers Summary
Underground & Aboveground Storage Tanks	ERIS and Technical Standards and Safety Authority (TSSA) Fuel Storage Tank Databases
Water Well Records	ERIS - Water Well Information System (WWIS)
Other Available Information	"Surficial Geology of Southern Ontario"; Ontario Geological Survey, GIS-based geological map, Data 128-REV, Scale 1:50,000, 2010. "Bedrock Geology of Ontario"; Ontario Geological Survey, GIS-based geological map, Data 126-REV 1, Scale 1:250,000, 2011. ERIS - full database list (erisinfo.com) Topographic mapping available from the Ontario Ministry of Natural Resources and Forestry (MNRF) online mapping accessed October 16, 2023. Geowarehouse, online land registry information, accessed September 27, 2023.
Technical Standards and Safety Authority (TSSA)	A request was made for the Release of Public Information - Fuels Safety Records, on October 18, 2023.

3.2 Previous Reports

Stantec was provided with a previous environmental report entitled, "Phase One Environmental Site Assessment - 300 Pine Street, Bracebridge, Ontario". This report was prepared for Fowler Construction Company Ltd., dated November 2015 by Golder Associates Ltd.

The Phase One ESA was completed in accordance with Ontario Regulation 153/04. It was reported that the southern portion of the Site was historically used for agricultural purposes from at least prior to 1927. The western portion of the Site was redeveloped for commercial aggregate extraction purposes starting in approximately 1980.

At the time of the site visit, on October 27, 2015, the site was undeveloped with evidence of former aggregate extraction activities. No buildings or structures were noted at the Site.

The surrounding properties were reported to have the following land uses:

- North: A Hydro One corridor followed by residential, undeveloped and commercial land. It was reported that Walmart (located at 40 Depot Drive, 90 m northeast) formerly had automotive repair operations at the property.
- East: Highway 11 followed by undeveloped and agricultural properties.
- South: Highway 11 followed by residential and agricultural properties.

3.0 Records Review (continued)

3.2 Previous Reports (continued)

- West: Light industrial and commercial properties, including Hydro One Bracebridge Transmission Station (1 Gray Road, 100 m west), Manion Marine (12 Gray Road, 70 m west), Master Tech Automotive (15 Gray Road, 150 m west), First Canada ULC (23 Gray Road, 150 m west).

Eight potentially contaminating activities (PCAs) were identified within the Phase One Study area, with none of the PCAs resulting in an area of potential environmental concern (APEC) at the Site.

It was reported that a Phase Two ESA was not required based on the conclusion of the report.

3.3 Regulatory Information

Available environmental databases and records were searched to determine if the Site, adjacent or neighbouring properties were listed. The databases and search results are presented below.

MECP Freedom of Information and Privacy Protection Office
A response to a request to the MECP related to various environmental concerns indicated that no records were available for the Site. A copy of the response is included in **Appendix D**.

Technical Standards and Safety Authority (TSSA)
A request was made to TSSA for the release of public records pertaining to fuels safety at the Site. A response to the request was received on November 15, 2023, indicating that no records were available for the Site. A copy of this response is included in **Appendix D**.

Inventory of Coal Gasification Plant Waste Sites in Ontario (dated April 1987)
No properties within 1 km of the Site were listed as former coal gasification sites.

Inventory of Industrial Sites Producing or Using Coal Tars in Ontario (dated November 1988)
No properties within 1 km of the Site were listed as a former coal tar industrial site.

MECP Waste Disposal Site Inventory (dated June 1991)
Based on the coordinates provided in the inventory, no waste disposal sites were identified within 1 km of the Site. The Rosewarne Landfill is located 1.5 km north of the Site.

HWIN Registered Generator List
The ERIS report indicated that neighbouring and/or adjacent properties within 250 m of the Site were listed as hazardous waste generators, these records are discussed in **Section 5.8**. No hazardous waste generator records were listed for the Site.

Ontario Inventory of PCB Storage Sites and National PCB Inventory
The ERIS report indicated that no PCB storage sites were identified for the municipal address of the Site and/or adjacent/neighbouring properties within 250 m of the Site.

MECP Brownfields Environmental Site Registry
The ERIS report indicated that no Records of Site Condition under O.Reg. 153/04 (Part of XV.1 of the Environmental Protection Act) were identified for the municipal address of the Site and/or adjacent/neighbouring properties within 250 m of the Site.

ERIS
An ERIS report was purchased and consisted of a search of available databases within a 250 m radius of the perimeter of the Site. A complete copy of the report is included in **Appendix D**. Relevant listings for the Site are below:

- An Environmental Compliance Approval from 2001, 2009, and 2010 for the establishment of stormwater management works, including on-site storm sewers.
- A Certificate of Approval for emissions to the air from an emergency standby diesel generator in 2001. The ECA identifies the location of the generator at the "Pine Street Booster Station, Northwest Side of Intersection of Pine and Maple Streets, Bracebridge, Ontario". Despite being mapped by ERIS as on-site,

3.0 Records Review (continued)

3.3 Regulatory Information (continued)

this location is more than 700 m northwest of the Site and is not considered to represent a potential concern to the Site.

Relevant listings for adjacent/neighbouring properties within 250 m of the Site presented in the ERIS report are discussed in **Section 5.8**.

Water Well Information System (WWIS) database, searched by ERIS
The ERIS report identified records of 18 wells within a 250 m radius of the centre of the Site, including five located at the Site. The wells at the Site were reportedly installed between 1988 and 1999 and were utilized for domestic water supply. The subsurface conditions generally consisted of sand underlain by clay to a maximum depth of 97.5 m below ground surface (BGS). Bedrock (grey granite) was reportedly encountered in one well at 10.7 m BGS and another well at 81.4 m BGS.

3.4 Physical Setting

3.4.1 Surficial Geology

Based on an available surficial geology map, the native surficial soils at the Site consist of gravel and sand, includes proglacial river and deltaic deposits.

Based on the well records detailed in the ERIS report, the subsurface conditions in the vicinity of the Site generally consisted sand, consistent with the surficial geology mapping, underlain by clay to a maximum investigation depth of 97.5 m BGS.

3.4.2 Surface Water Drainage

The exterior surfaces of the Site mainly consist of an open sand pit on the northwest portion of the Site and vegetated and treed areas on the remainder of the Site. Stormwater on the Site is anticipated to drain by infiltration and/or overland flow.

3.4.3 Topography and Regional Drainage

The Site was observed to have an uneven ground surface at the time of the site visit with an open pit on the northwest portion of the Site.

Based on an available topographic map and the observed site topography, regional surface drainage (and anticipated shallow groundwater flow direction) appears to be to the west and southwest towards the north branch of the Muskoka River located approximately 900 m west of the Site. A tributary of Sharpe Creek is also located approximately 600 m west of the Site.

It should be noted that the direction of the shallow groundwater flow in limited areas can also be influenced by the presence of underground utility corridors and is not necessarily a reflection of regional or local groundwater flow or a replica of the Site or area topography.

3.4.4 Bedrock Geology

Based on an available bedrock geology map, bedrock in the area of the Site consists of migmatitic rocks and gneisses of undetermined protolith, commonly layered biotite gneisses and migmatites, locally includes quartofeldspathic gneisses, orthogneisses, and paragneisses. According to water well records for the Site, depth to bedrock (grey granite) was identified in one well at 10.7 m BGS and in another well at 81.4 m BGS.

4.0 Site Description

4.1 Property Information

The Site is located southeast of Pine Street and northwest of Highway 11, in Bracebridge, Ontario. The Site is located within an industrial and residential neighbourhood as depicted on **Figure No. 2**.

Current Site Owner:	The Corporation of the Town of Bracebridge
Legal Description:	Part Lot 6, Concession 1, Macaulay, Part 1, 35R-3456, except Part 1 to 5, 35R-8356, and Part 1 to 4, 35R-7976; Bracebridge; The District Municipality of Muskoka.
Property Area:	17.8 hectares
Utility Providers:	
Water:	The Site is vacant and is inferred to be not serviced
Storm and Sanitary Sewers:	The Site is vacant and is inferred to be not serviced
Electricity:	The Site is vacant and is inferred to be not serviced
Natural Gas:	The Site is vacant and is inferred to be not serviced

4.2 On-Site Buildings and Structures

No buildings were identified at the site during the site visit.

4.3 Historical Land Use

Historical land use for the Site was determined through historical records listed in Section 3.0. A summary of the historical information is presented below.

Period/Date:	Land Use:
Prior to 1977	Based on aerial photographs, the Site was vacant and undeveloped with treed areas and agricultural areas until the early 1970s, when small disturbed areas are noted on a 1971 aerial photograph included in the Golder Phase One ESA report.
1977 to 1987	Based on the available aerial photograph from 1977, the Site appeared to be undeveloped with disturbed soils in some areas of the western and southern portions of the Site.
1987 to the present	Based on the available aerial photographs between 1987 to 2022, the Site appears to have been undeveloped with disturbed soils (a sand pit) on the northwest portion of the Site.

5.0 Site Visit Findings

5.1 Current Site Operations

The Site is currently undeveloped and vacant. A historical sand pit, which is now vacant, is present on the northwest portion of the Site. A concrete pad was noted on the northwest portion of the Site; this is inferred to be part of the foundation for historical weigh scales used at the former pit.

5.2 Waste Generation and Storage

5.2.1 Solid and Liquid Wastes

No wastewater discharges were identified to be produced on the Site at the time of the site visit. No waste generation (including hazardous) or storage was identified to be conducted on the Site.

5.2.2 Drains, Sumps, Septic Systems and Oil Water Separators

No floor drains, sumps, septic systems, interceptors, or separators were identified on the Site.

5.2.3 Air Discharges and Odours

No sources of air emissions that are suspected to result in residual contamination to the property were identified on the Site. Further, no strong, pungent, or unusual odours were identified during the site visit.

5.3 Fuel and Chemical Storage

5.3.1 Underground Storage Tanks (USTs)

No chemical or fuel storage USTs were identified on the Site. Further, no vent or fill pipes indicating the potential presence of an abandoned or decommissioned UST were observed.

5.3.2 Aboveground Storage Tanks (ASTs)

No chemical or fuel storage ASTs were identified on the Site.

5.3.3 Other Storage Containers

No chemical storage was observed on Site.

5.4 Building Systems/Equipment

5.4.1 Heating and Cooling Systems

No heating or cooling systems are on the Site, as the Site is undeveloped.

5.4.2 Hydraulic Equipment

No hydraulic equipment is on the Site, as the Site is undeveloped.

5.5 Exterior Site Observations

5.5.1 Surface Features

No stained surficial materials or stressed vegetation was observed on the Site. A historical sand pit was identified on the northwest portion of the Site. No watercourses, lagoons or ditches were identified on the Site and no standing water was observed.

5.0 Site Visit Findings (continued)

5.5 Exterior Site Observations (continued)

5.5.2 Fill Materials

No evidence of imported fill materials was observed. The Site generally appears to be at grade with the adjacent roadways and adjoining properties. Therefore, it is unlikely that significant quantities of fill materials were brought onto the Site.

5.5.3 Wells

No abandoned or existing wells (water, oil, gas or disposal) were identified on the Site at the time of the site visit.

5.6 Hazardous Building Materials

5.6.1 Asbestos-Containing Materials (ACMs)

The common use of friable (crumbles easily by hand pressure) asbestos-containing materials (ACMs) in construction generally ceased voluntarily in the mid to late 1970s. Non-friable asbestos-containing products continued to be manufactured, imported and used in Canada until asbestos products were formally banned in December 2018. Asbestos was used in thousands of building products and the common uses of friable ACMs included boiler and pipe insulation, and spray-on fireproofing. Asbestos was also used in many manufactured products such as floor tiles, ceiling tiles, transite cement products and various other construction materials. Vermiculite used as insulation may be contaminated with asbestos fibres.

As the Site is undeveloped, no suspected ACMs were identified on the Site during the site visit.

5.6.2 Polychlorinated Biphenyls (PCBs)

From the 1930s to the 1970s, PCBs were widely used as coolants and lubricants for electrical equipment, including transformers and capacitors, and in a number of industrial materials, including sealing and caulking compounds, inks and paint additives. The use of PCBs was prohibited in heat transfer and electrical equipment installed after September 1, 1977, and in transformers and capacitors installed after July 1, 1980. Regulations now require that PCB containing equipment be taken out of service prior to regulated deadlines.

As the Site is undeveloped, PCBs are not considered to represent a potential environmental concern to the Site.

5.6.3 Lead-Based Materials

In 1976, the lead content in interior paint was limited to 0.5% by weight under the federal Hazardous Products Act. Lead based water supply pipes were used greater than 50 years ago. Between 1930 and 1986, most buildings used copper pipe with lead-solder joints. Other lead-based products include wall shielding (x-ray rooms).

As the Site is undeveloped, no lead-based materials were identified on the Site.

5.6.4 Urea Formaldehyde Foam Insulation (UFFI)

Urea Formaldehyde Foam Insulation (UFFI) was used as an insulation product for existing houses between the mid-1970s and its ban in Canada in 1980. It was not commonly used for commercial or industrial buildings.

As the Site is undeveloped, no UFFI was identified on the Site.

5.6.5 Ozone-Depleting Substances (ODSs)

Refrigeration and air conditioning equipment in place before 1998 may contain refrigerants containing Ozone-Depleting Substances (ODSs). Non-ODS refrigerants have been developed and are available to replace these materials in newer equipment.

5.0 Site Visit Findings (continued)

5.6 Hazardous Building Materials (continued)

5.6.5 Ozone-Depleting Substances (ODSs) (continued)

As the Site is undeveloped, no equipment containing ODSs was identified on the Site.

5.7 Special Attention Items

5.7.1 Radon Gas

Radon is a radioactive gas associated with uranium rich black shale and/or granite bedrock. Radon emits alpha particles and produces several solid radioactive products called radon daughters. Harmful levels of radon and radon daughters can accumulate in confined air spaces, such as basements and crawl spaces.

There are insufficient existing data available to make an accurate assessment of the potential for radon gas issues at this Site. Such conditions would have to be determined by the completion of a study which is beyond the scope of work of this project.

5.7.2 Microbial Contamination (Mould) and Indoor Air Quality

The growth of mould in indoor environments is typically due to a moisture problem related to building envelope or mechanical systems deficiencies or design, and can produce adverse health effects. There is no practical way to eliminate all mould and mould spores in the indoor environment. The way to control mould is to control moisture.

No visual evidence of suspected indoor mould growth was observed on the Site, at the time of the site visit, as no buildings or structures exist.

5.7.3 Electromagnetic Frequencies (EMFs)

Electrical currents induce electromagnetic fields. No scientific data supports definitive answers to questions about the existence or non-existence of health risks related to electromagnetic fields.

The Site is located adjacent to high voltage transmission lines, which are located immediately north of the Site. An electrical substation is located 120 m west of the Site.

5.7.4 Noise and Vibration

The effects of noise and vibration on human health vary according to the susceptibility of the individual exposed, the nature of the noise/vibration and whether exposure occurs in the working environment or in the home.

No major or persistent sources of noise and vibration were identified on the Site at the time of the site visit, other than noise from adjacent roads and highways.

5.8 Neighbouring Property Information

The current activities on neighbouring properties observed at the time of the site visit and a summary of historical information gathered through the records review are presented in the following sections.

<u>North</u>
At the time of the site visit, the properties north of the Site were developed with residential and commercial properties. A summary of the listings in the ERIS report for properties located north of the Site are presented below.

40 Depot Drive (more than 90 m northeast):

- Walmart was listed as a generator of hazardous wastes from 2007 to 2022 for various wastes.
- Walmart was listed as a limited pesticide vendor.

5.0 Site Visit Findings (continued)

5.8 Neighbouring Property Information (continued)

- It was reported in a previous report (Golder, 2015), that Walmart historically performed automotive repair operations.

Given the distance from the Site and inferred groundwater direction (to the west), the historical automotive repair operations at 40 Depot Drive (more than 90 m northeast of the Site) are not expected to represent a potential environmental concern to the Site.

East:

At the time of the site visit, the properties east of the Site were comprised of undeveloped properties and Highway 11.

Given the undeveloped nature of the land east of the Site, no potential environmental concerns were identified east of the Site.

West

At the time of the site visit, the properties west of the Site consisted of light industrial and commercial properties. A summary of the listings in the ERIS report for properties located west of the Site are presented below.



Given the distance from the Site and the inferred groundwater flow direction (to the west), the remaining commercial and industrial operations west of the Site do not represent potential environmental concerns to the Site.

South

At the time of the site visit, the properties south of the Site were comprised of undeveloped and residential properties and Highway 11.

Given the undeveloped nature of the land south of the Site, no potential environmental concerns were identified south of the Site.

5.0 Site Visit Findings (continued)

5.8 Neighbouring Property Information (continued)

The remaining listings in the ERIS report were not expected to represent potential environmental concerns to the Site based on the distance from the Site and/or the nature of the records.

5.9 Client-Specific Items

No specific client requests were made with respect to this Phase I ESA.

6.0 Conclusions

The Phase I ESA has revealed no evidence of environmental contamination associated with current or historical activities at the Site. No recommendations for additional environmental site assessment work are made at this time.

7.0 Closure

This report documents work that was performed in accordance with generally accepted professional standards at the time and location in which the services were provided. No other representations, warranties or guarantees are made concerning the accuracy or completeness of the data or conclusions contained within this report, including no assurance that this work has uncovered all potential liabilities associated with the identified property.

This report provides an evaluation of selected environmental conditions associated with the identified portion of the property that was assessed at the time the work was conducted and is based on information obtained by and/or provided to Stantec at that time. There are no assurances regarding the accuracy and completeness of this information. All information received from the client or third parties in the preparation of this report has been assumed by Stantec to be correct. Stantec assumes no responsibility for any deficiency or inaccuracy in information received from others.

The opinions in this report can only be relied upon as they relate to the condition of the portion of the identified property that was assessed at the time the work was conducted. Activities at the property subsequent to Stantec's assessment may have significantly altered the property's condition. Stantec cannot comment on other areas of the property that were not assessed.

Conclusions made within this report consist of Stantec's professional opinion as of the time of the writing of this report and are based solely on the scope of work described in the report, the limited data available and the results of the work. They are not a certification of the property's environmental condition. This report should not be construed as legal advice.

This report has been prepared for the exclusive use of the client identified herein and any use by any third party is prohibited. Stantec assumes no responsibility for losses, damages, liabilities or claims, howsoever arising, from third party use of this report.

This report is limited by the following:

- *A Site Representative was not available to complete an interview regarding operations at the Site at the time of issuing this report.*

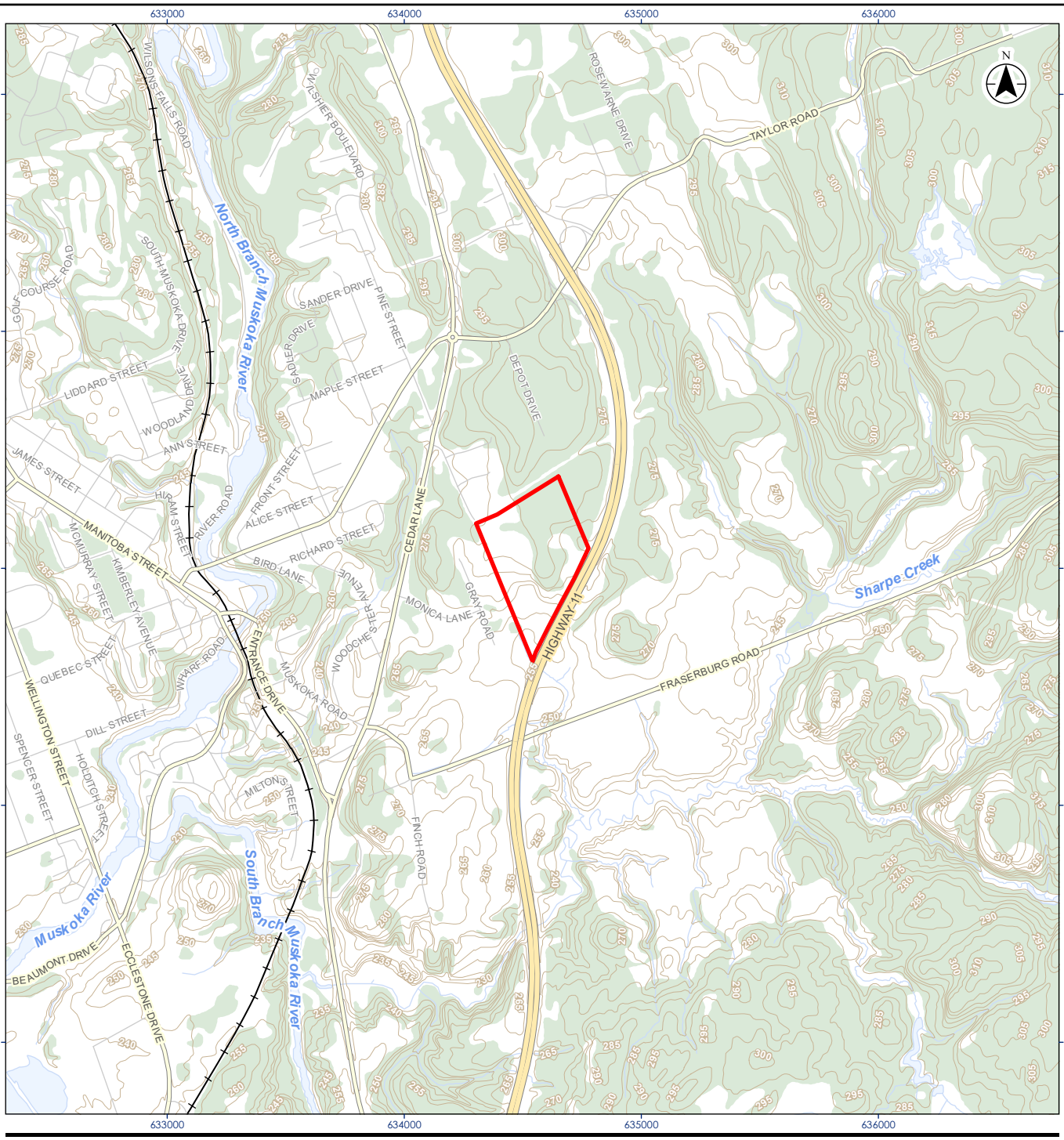
The locations of any utilities, buildings and structures, and property boundaries illustrated in or described within this report, if any, including pole lines, conduits, water mains, sewers and other surface or sub-surface utilities and structures are not guaranteed. Before starting work, the exact location of all such utilities and structures should be confirmed and Stantec assumes no liability for damage to them.

The conclusions are based on the site conditions encountered by Stantec at the time the work was performed at the specific testing and/or sampling locations, and conditions may vary among sampling locations. Factors such as areas of potential concern identified in previous studies, site conditions (e.g., utilities) and cost may have constrained the sampling locations used in this assessment. In addition, analysis has been carried out for only a limited number of chemical parameters, and it should not be inferred that other chemical species are not present. Due to the nature of the investigation and the limited data available, Stantec does not warrant against undiscovered environmental liabilities nor that the sampling results are indicative of the condition of the entire site. As the purpose of this report is to identify site conditions which may pose an environmental risk; the identification of non-environmental risks to structures or people on the site is beyond the scope of this assessment.

Should additional information become available which differs significantly from our understanding of conditions presented in this report, Stantec specifically disclaims any responsibility to update the conclusions in this report.
This report was prepared by Marissa Lusito, M.Env.Sc., B.Sc.H., and reviewed by Randy Sinukoff, M.A.Sc., P.Eng.

Appendix A

Site Plans





Notes
1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Northern Development, Mines, Natural Resources and Forestry © Queen's Printer for Ontario, 2023.
3. This figure is to be viewed in the context of the accompanying report and is subject to the limitations specified in that report.
4. m AMSL - metres above mean sea level.

Legend
- Site Boundary (Approximate)
- Topographic Contour (m AMSL)
- Expressway / Highway
- Major Road
- Minor Road
- Railway - Operational
- Watercourse
- Waterbody
- Wooded Area

0 500 1,000 metres

1:25,000 (at original document size of 8.5x11)

Stantec

Project Location
Bracebridge, Ontario

140022038
Prepared by GB on 2023-09-28

Client/Project
PHASE I ENVIRONMENTAL SITE ASSESSMENT
300 PINE STREET, BRACEBRIDGE, ON

Figure No.
1

Title
Site Location

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Stantec

Legend

Site Boundary (Approximate)

0 50 100 m

1:4,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2023.
3. Orthoimagery © First Base Solutions, 2023. Imagery Date, unknown.



Project Location
Braceridge, ON

140022038 REV1
Prepared by GB on 2023-11-17
Technical Review by DH on 2023-08-09

Client/Project
PHASE I ENVIRONMENTAL SITE ASSESSMENT
300 PINE STREET, BRACEBRIDGE, ONTARIO

Figure No.
2

Title
Surrounding Land Use

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Appendix B

Photographs



View of the entrance to the Site at the northwest boundary, facing south



View of foundations for the historical weigh scales on the northwest portion of the Site, facing northeast



View of the historical sand pit on the northwest portion of the Site, facing east



View of the sand pit on the northwest portion of the Site, facing southeast



View of the western portion of the Site, facing south



View of the west-central portion of the Site, facing north



View of the southern portion of the Site, facing south



View of the southern portion of the Site, facing east

Appendix C

Assessor Qualifications

Randy Sinukoff M.A.Sc., P.Eng., EP, EP(CEA), EP(EMSLA), QP$_{ESA}$

Senior Associate, National Technical Leader Facility Compliance and Auditing

37 years of experience · Markham, Ontario

Randy is a professional chemical engineer specializing in site assessment and remediation, hazard analysis and due diligence reviews, regulatory compliance, management systems, auditing and verifications, and sustainability. He has three Environmental Professional designations, most relevant in Site Assessment and Reclamation. Randy has performed the project management and senior technical evaluation functions for over 5000 projects, large and small, including those in all levels of government, real estate development, due diligence and risk management, chemical manufacturing and distribution, power generation and transmission, pipelines, transportation, construction, insurance, mining, and telecommunications. He has been the Qualified Person obtaining more than 23 Records of Site Condition for a wide cross-section of property uses in Ontario. Randy was heavily involved in the development of the Phase I ESA (Z768) and Phase II ESA (Z769) standards for the Canadian Standards Association (CSA) and is part of the Canadian Mirror Committee advising the International Organization for Standardization (ISO) and CSA on technical matters for environmental site assessment, environmental management and auditing.

EDUCATION

Master of Applied Science, Chemical Engineering, University of Toronto, Toronto, Ontario, Canada, 1984

Bachelor of Applied Science, Chemical Engineering, University of Toronto, Toronto, Ontario, Canada, 1982

REGISTRATIONS

Environmental Professional (Site Assessment and Reclamation); Environmental Management Systems Lead Auditor; Compliance Environmental Auditor #21379, Canadian Environmental Certification Approvals Board

Professional Engineer #42688705, Professional Engineers Ontario

PROJECT EXPERIENCE

Phase I and II ESAs, Risk Assessments and Records of Site Condition, North Maple Regional Park | City of Vaughan | Vaughan, Ontario, Canada | 2016-present | Project Leader/Qualified Person

Completion of ESAs, risk assessments and obtaining three Records of Site Condition under Ontario Regulation 153/04 for this 62 ha area former City of Toronto leaf composting facility for use of the property as public parkland. The initial RSC was obtained in 2018, and ESAs and risk assessments are ongoing to obtain two additional RSCs adjacent to a landfill site to expand the existing park. Randy is the project manager and Qualified Person overseeing completion of the Phase One and Two ESAs, and the Records of Site Condition, and is working closely with the QPRA on the risk assessments.

Phase I and II ESAs, and Records of Site Condition, Lawrence Heights Revitalization | Toronto Community Housing and City of Toronto | Toronto, Ontario, Canada | 2016-2019 | Project Leader/Qualified Person

Project Lead and Qualified Person for Stantec team to complete seven Phase I ESAs and RSCs, plus one Phase Two ESA to facilitate the redevelopment of lands associated with the redevelopment of Lawrence Heights. Randy worked with Toronto Community Housing and City of Toronto to organize RSCs which allowed realignment of roadways, transfer of lands between owners, and construction of new residential community housing and condominiums.

Environmental, Geotechnical and Engineering Pre-Purchase Due Diligence Assessment | Confidential Client | Hamilton, Ontario, Canada | 2020 | Project Manager, Primary Client Contact, Environmental Lead

Led the Stantec technical team (environmental, geotechnical, utilities, rail, structural, building conditions) to provide baseline due diligence assessment and recommendations for proposed purchase and redevelopment of >300 ha industrial property.

Environmental Compliance Reviews | Toronto Transit Commission | Toronto, Ontario, Canada | 2018-2020 | Lead Assessor/Advisor

Performed monthly compliance and contamination inspections and evaluation of construction contractor compliance to environmental regulations and project environmental management procedures at the McNicoll Bus Garage construction site for the Toronto Transit Commission. Work included advice on excess soils.

Marissa Lusito

Intermediate Environmental Assessor
4 years of experience · Whitby, Ontario

Marissa has four years of consulting experience related to the completion of environmental site assessment projects, including conducting and coordinating Phase I and Phase II Environmental Site Assessments and associated remediation programs. Recently, she has gained experience completing Assessments of Past Uses as per Excess Soil Regulation 406/19 requirements. Marissa has participated in soil, groundwater, and surface water sampling programs and has contributed to contaminated soil and groundwater remediation programs. She holds a Master of Environmental Science (M.Env.Sc.) from the University of Toronto and an Honours Bachelor of Science (B.Sc.H. - Biology) from Queen's University.

EDUCATION

Honours Bachelor of Science, Queen's University, Kingston, Ontario, Canada, 2016

Master of Environmental Science, University of Toronto, Toronto, Ontario, Canada, 2017

CERTIFICATIONS & TRAINING

Certificate, POST 2021 LEVEL 1 - BBS - Orientation and Test, Whitby, Ontario, Canada, 2021

PROJECT EXPERIENCE

ASBESTOS, LEAD BASED PAINT, AND HAZARDOUS MATERIAL (MERCURY, PCB) ASSESSMENTS

Culvert and Bridge Hazardous Materials Assessments* | Ontario Ministry of Transportation | Niagara Falls, Ontario | 2020 | Project Coordinator

Overseeing fieldwork, including organizing subcontractors, field technicians, and the necessary equipment. Compiling and reviewing laboratory results. Writing of the hazardous materials assessment report.

ENVIRONMENTAL SITE REMEDIATION

Phase II ESA and Remediation of Cyanide in Soil* | Oakville, Ontario | 2020-2021 | Project Coordinator, Environmental Scientist

Coordination of field staff and subcontractors to complete fieldwork for the Phase II ESA and soil remediation. Ordered and organized the necessary equipment and supplies. Arranged for the required analysis of samples with the laboratory. Contributed to the writing of the Phase II ESA and remediation reports.

Monthly Groundwater Monitoring* | Oshawa, Ontario | 2017-2020 | Project Coordinator

Perform monthly groundwater monitoring at a site with on-going in-situ remediation efforts. Draft quarterly reports based on the groundwater analytical results.

Groundwater Remediation* | Toronto, Ontario | 2017 | Environmental Scientist

Monitor the collection and removal of groundwater contaminated with volatile organic compounds from a historical dry cleaning facility.

ENVIRONMENTAL SITE ASSESSMENTS PHASE I, II, III

Phase I ESA Portfolio for Metrolinx* | Toronto, Ontario | 2021 | Project Coordinator

Completion of a review of current and historical environmental records. Coordination of site inspections with site assessors and the client. Composition of ten Phase I ESA reports in accordance with Ontario Regulation 153/04.

Assessment of Past Uses for Watermain Realignment* | Oshawa, Ontario | 2021 | Environmental Scientist

Review of environmental records for the site and surrounding properties. Completion of a site inspection and interview with the site owners. Production of an Assessment of Past Uses to the requirements of Ontario Regulation 406/19.

Phase I and II ESA and Transformer Removal* | Oshawa, Ontario, Canada | 2020-2021 | Project Coordinator

Participation in the site assessment for the Phase I ESA. Coordination of the fieldwork and composition of the Phase II ESA report. Supervision of the removal of two pad mounted transformers and verification soil sampling.

Phase I and II ESA and Record of Site Condition* | Oshawa, Ontario | 2018-2020 | Project Coordinator

Execution of the Phase I and II ESAs, including a records review, Site visit, soil and groundwater sampling, delineation of impacted surficial soil, and writing of the reports. Assist with the filing of a Record of Site Condition for the property.

Phase II ESA and Removal of Cyanide-Impacted Soil* | Oakville, Ontario | 2020-2021 | Project Coordinator

Organization of field staff and subcontractors contributing to the fieldwork for the Phase II ESA and impacted soil removal program. Arrange for the necessary equipment and supplies and for the required analysis of samples with

** denotes projects completed with other firms*

the laboratory. Support the writing of the Phase II ESA and remediation reports.

Phase I ESA Portfolio* | Toronto, Ontario | 2018 | Environmental Scientist

Inspect several commercial and light industrial facilities and interview site owners on the property uses. Compile relevant environmental information regarding the sites from various records. Composition of Phase I ESA reports for due diligence purposes.

** denotes projects completed with other firms*

Appendix D

Supporting Documentation

DATABASE REPORT

Project Property:	*MHAC* *300 Pine Street* *Bracebridge ON P1L 1Z5*
Project No:	*140022038*
Report Type:	*RSC Report - Quote*
Order No:	*23100200574*
Requested by:	*Stantec Consulting Ltd.*
Date Completed:	*October 5, 2023*

Environmental Risk Information Services
A division of Glacier Media Inc.
1.866.517.5204 | info@erisinfo.com | erisinfo.com

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Notice: IMPORTANT LIMITATIONS and YOUR LIABILITY

Reliance on information in Report: This report DOES NOT replace a full Phase I Environmental Site Assessment but is solely intended to be used as a database review of environmental records.

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Executive Summary

Property Information:

Project Property:	*MHAC* *300 Pine Street Bracebridge ON P1L 1Z5*
Project No:	*140022038*

Order Information:

Order No:	*23100200574*
Date Requested:	*October 2, 2023*
Requested by:	*Stantec Consulting Ltd.*
Report Type:	*RSC Report - Quote*

Historical/Products:

Aerial Photographs	*Aerials - National Collection*
City Directory Search	*CD - Subject Site plus 10 Adjacent Properties*
ERIS Xplorer	*ERIS Xplorer*
Insurance Products	*Fire Insurance Maps/Inspection Reports/Site Plans*
Topographic Map	*RSC Maps*

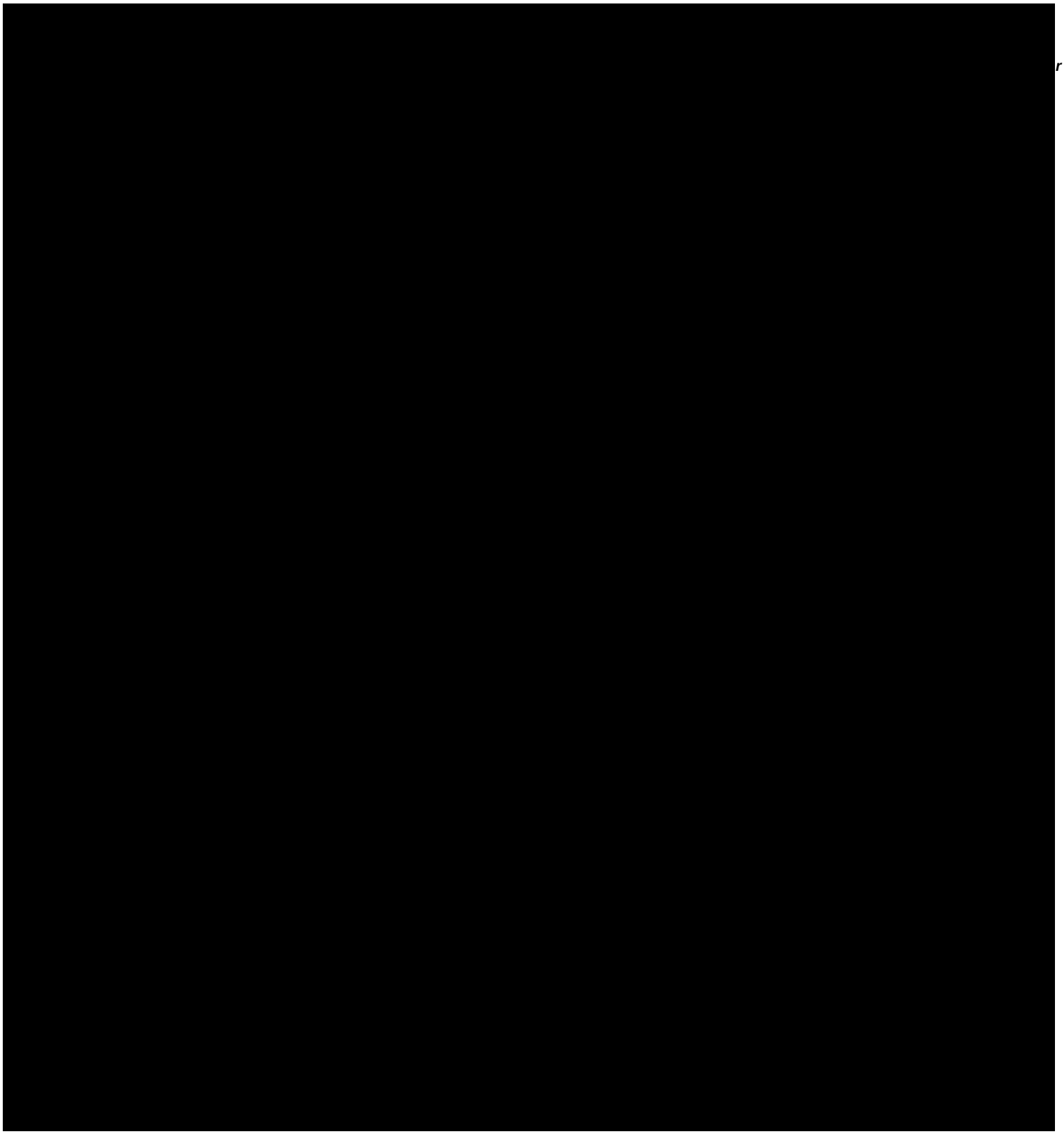
Executive Summary: Report Summary

Database	Name	Searched	Project Property	Boundary to 0.30km	Total
AAGR	Abandoned Aggregate Inventory	Y	0	0	0
AGR	Aggregate Inventory	Y	0	0	0
AMIS	Abandoned Mine Information System	Y	0	0	0
ANDR	Anderson's Waste Disposal Sites	Y	0	0	0
AST	Aboveground Storage Tanks	Y	0	0	0
AUWR	Automobile Wrecking & Supplies	Y	0	0	0
BORE	Borehole	Y	0	0	0
CA	Certificates of Approval	Y	0	2	2
CDRY	Dry Cleaning Facilities	Y	0	0	0
CFOT	Commercial Fuel Oil Tanks	Y	0	0	0
CHEM	Chemical Manufacturers and Distributors	Y	0	0	0
CHM	Chemical Register	Y	0	0	0
CNG	Compressed Natural Gas Stations	Y	0	0	0
COAL	Inventory of Coal Gasification Plants and Coal Tar Sites	Y	0	0	0
CONV	Compliance and Convictions	Y	0	0	0
CPU	Certificates of Property Use	Y	0	0	0
DRL	Drill Hole Database	Y	0	0	0
DTNK	Delisted Fuel Tanks	Y	0	2	2
EASR	Environmental Activity and Sector Registry	Y	0	1	1
EBR	Environmental Registry	Y	0	2	2
ECA	Environmental Compliance Approval	Y	6	4	10
EEM	Environmental Effects Monitoring	Y	0	0	0
EHS	ERIS Historical Searches	Y	1	9	10
EIIS	Environmental Issues Inventory System	Y	0	0	0
EMHE	Emergency Management Historical Event	Y	0	0	0
EPAR	Environmental Penalty Annual Report	Y	0	0	0
EXP	List of Expired Fuels Safety Facilities	Y	0	0	0
FCON	Federal Convictions	Y	0	0	0
FCS	Contaminated Sites on Federal Land	Y	0	0	0
FOFT	Fisheries & Oceans Fuel Tanks	Y	0	0	0
FRST	Federal Identification Registry for Storage Tank Systems (FIRSTS)	Y	0	0	0
FST	Fuel Storage Tank	Y	0	1	1
FSTH	Fuel Storage Tank - Historic	Y	0	0	0
GEN	Ontario Regulation 347 Waste Generators Summary	Y	0	90	90
GHG	Greenhouse Gas Emissions from Large Facilities	Y	0	0	0
HINC	TSSA Historic Incidents	Y	0	1	1

Database	Name	Searched	Project Property	Boundary to 0.30km	Total
IAFT	Indian & Northern Affairs Fuel Tanks	Y	0	0	0
INC	Fuel Oil Spills and Leaks	Y	0	0	0
LIMO	Landfill Inventory Management Ontario	Y	0	0	0
MINE	Canadian Mine Locations	Y	0	0	0
MNR	Mineral Occurrences	Y	0	1	1
NATE	National Analysis of Trends in Emergencies System (NATES)	Y	0	0	0
NCPL	Non-Compliance Reports	Y	0	0	0
NDFT	National Defense & Canadian Forces Fuel Tanks	Y	0	0	0
NDSP	National Defense & Canadian Forces Spills	Y	0	0	0
NDWD	National Defence & Canadian Forces Waste Disposal Sites	Y	0	0	0
NEBI	National Energy Board Pipeline Incidents	Y	0	0	0
NEBP	National Energy Board Wells	Y	0	0	0
NEES	National Environmental Emergencies System (NEES)	Y	0	0	0
NPCB	National PCB Inventory	Y	0	0	0
NPR2	National Pollutant Release Inventory 1993-2020	Y	0	0	0
NPRI	National Pollutant Release Inventory - Historic	Y	0	0	0
OGWE	Oil and Gas Wells	Y	0	0	0
OOGW	Ontario Oil and Gas Wells	Y	0	0	0
OPCB	Inventory of PCB Storage Sites	Y	0	0	0
ORD	Orders	Y	0	0	0
PAP	Canadian Pulp and Paper	Y	0	0	0
PCFT	Parks Canada Fuel Storage Tanks	Y	0	0	0
PES	Pesticide Register	Y	0	3	3
PFCH	NPRI Reporters - PFAS Substances	Y	0	0	0
PFHA	Potential PFAS Handers from NPRI	Y	0	0	0
PINC	Pipeline Incidents	Y	0	0	0
PRT	Private and Retail Fuel Storage Tanks	Y	0	0	0
PTTW	Permit to Take Water	Y	0	0	0
REC	Ontario Regulation 347 Waste Receivers Summary	Y	0	0	0
RSC	Record of Site Condition	Y	0	0	0
RST	Retail Fuel Storage Tanks	Y	0	2	2
SCT	Scott's Manufacturing Directory	Y	0	11	11
SPL	Ontario Spills	Y	0	3	3
SRDS	Wastewater Discharger Registration Database	Y	0	0	0
TANK	Anderson's Storage Tanks	Y	0	0	0
TCFT	Transport Canada Fuel Storage Tanks	Y	0	0	0
VAR	Variances for Abandonment of Underground Storage Tanks	Y	0	0	0
WDS	Waste Disposal Sites - MOE CA Inventory	Y	0	0	0
WDSH	Waste Disposal Sites - MOE 1991 Historical Approval Inventory	Y	0	0	0
WWIS	Water Well Information System	Y	5	13	18

Database	Name	Searched	Project Property	Boundary to 0.30km	Total
Total:			12	145	157

Executive Summary: Site Report Summary - Project Property



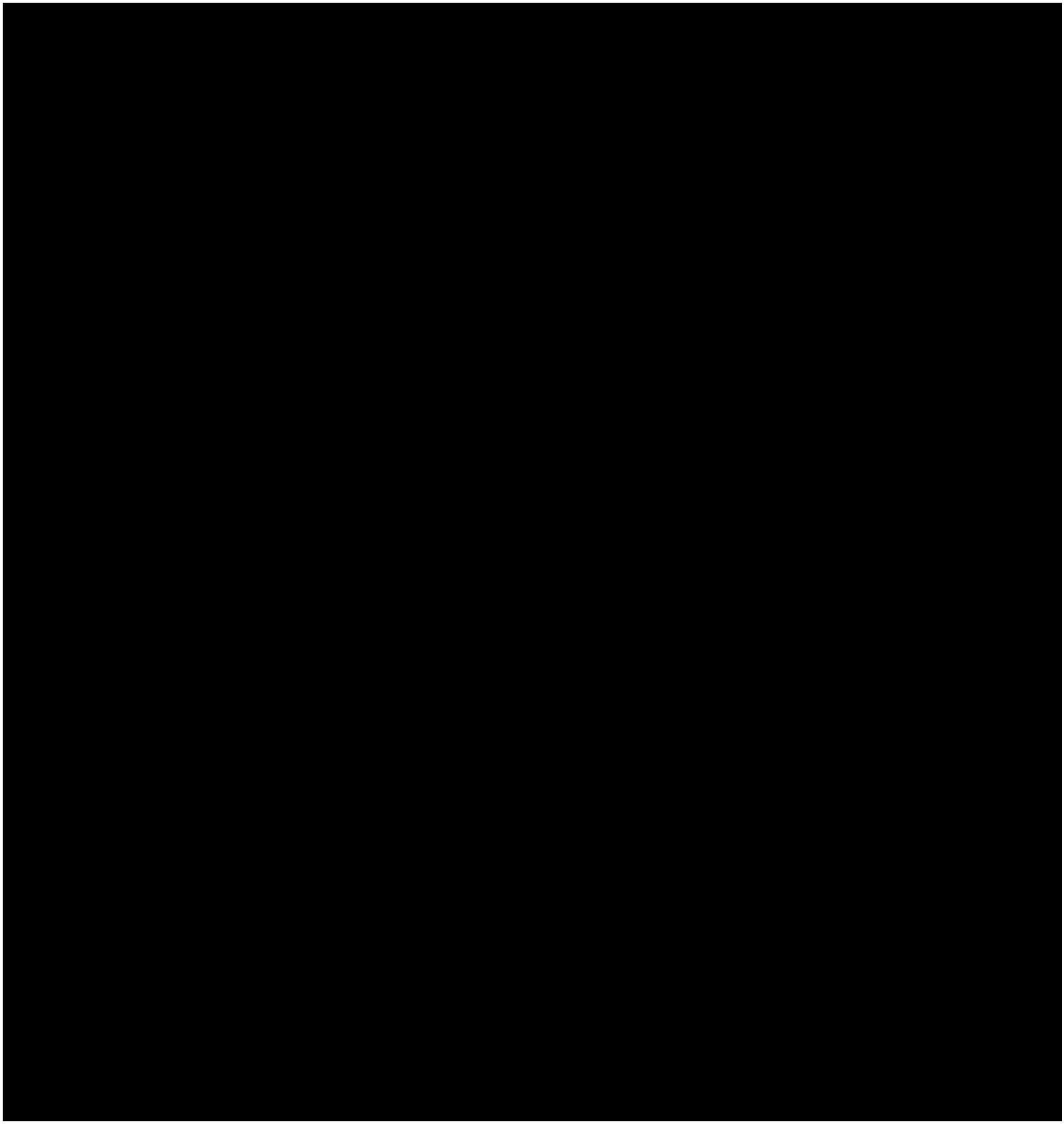
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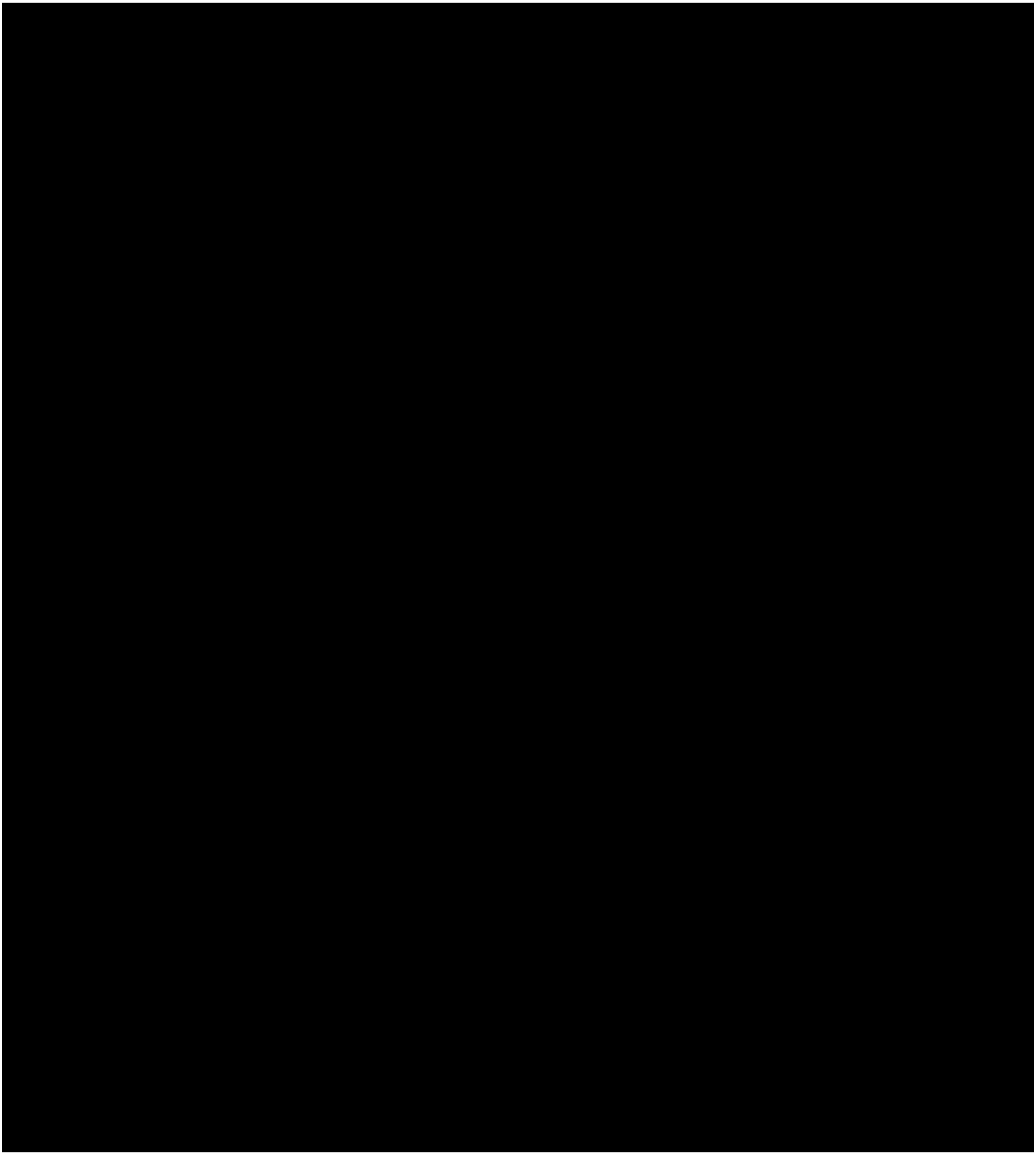
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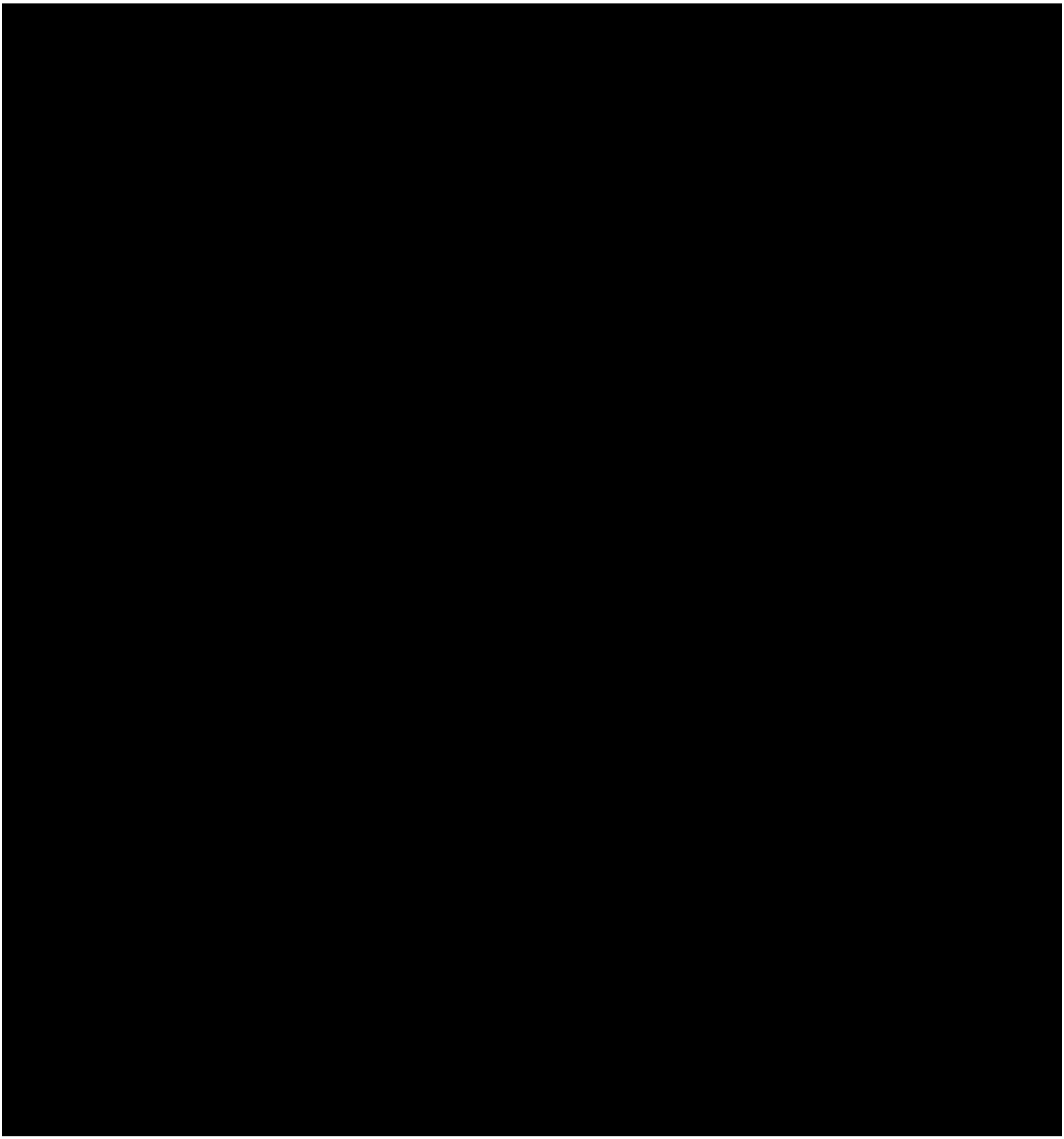
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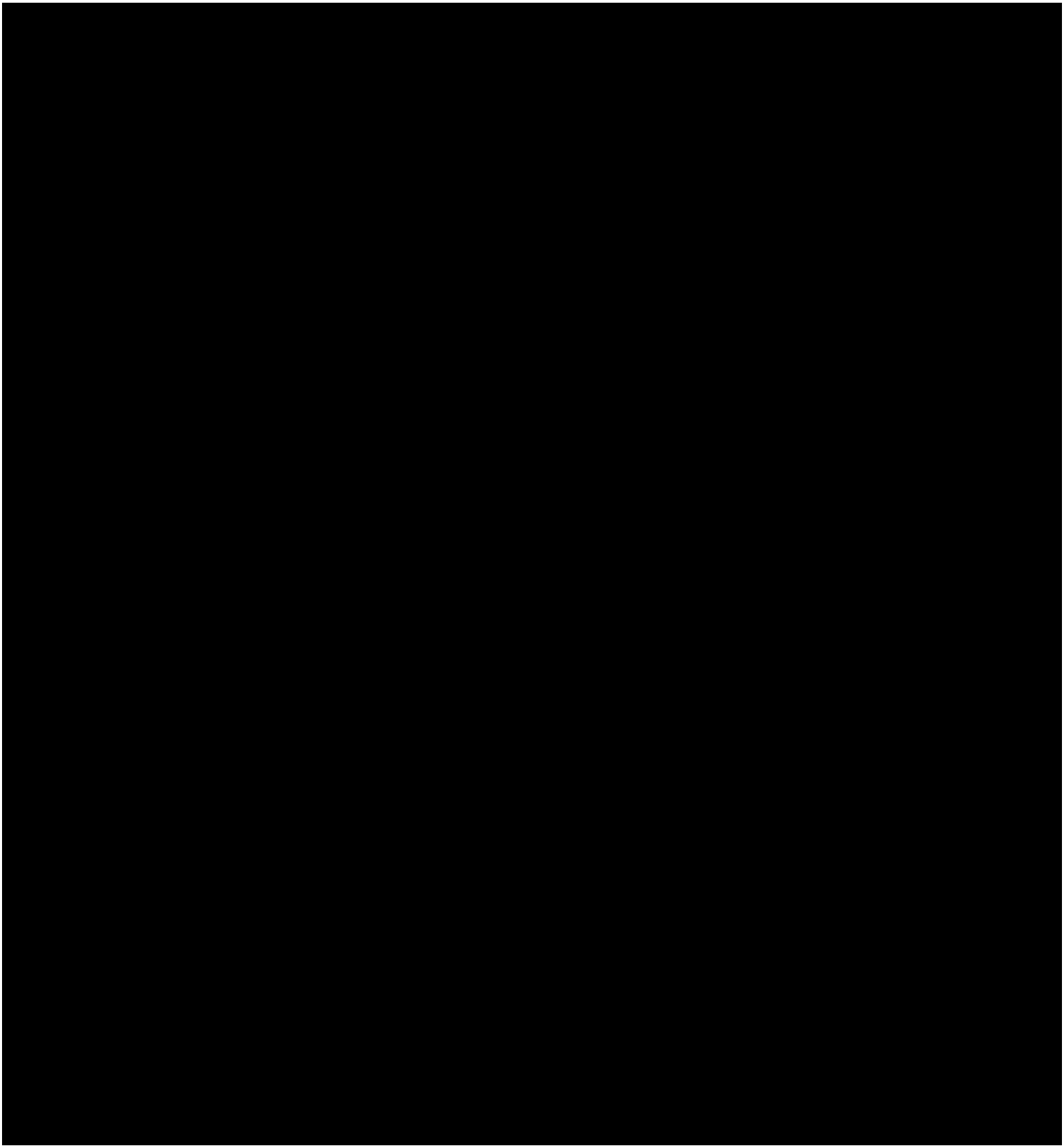
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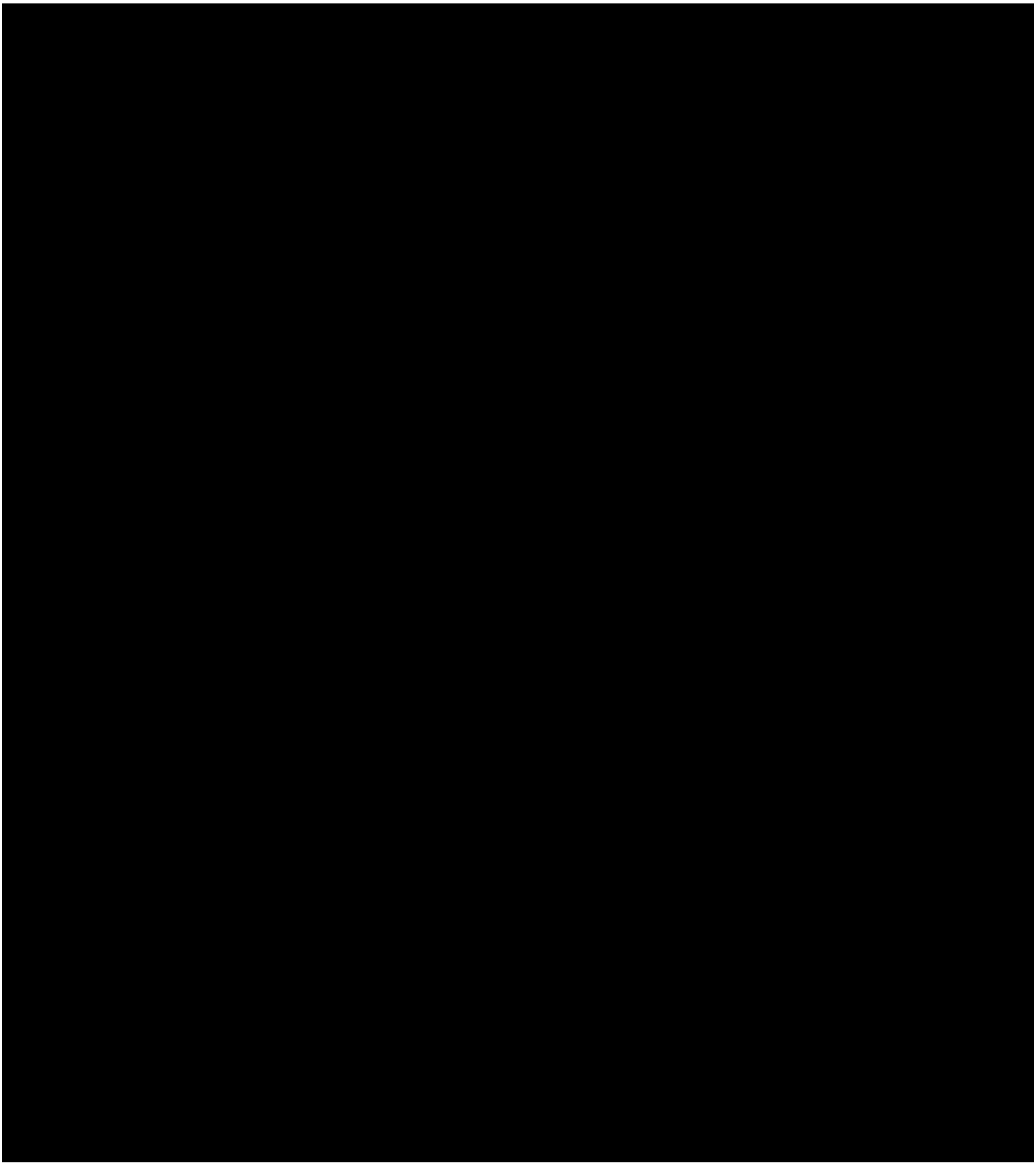
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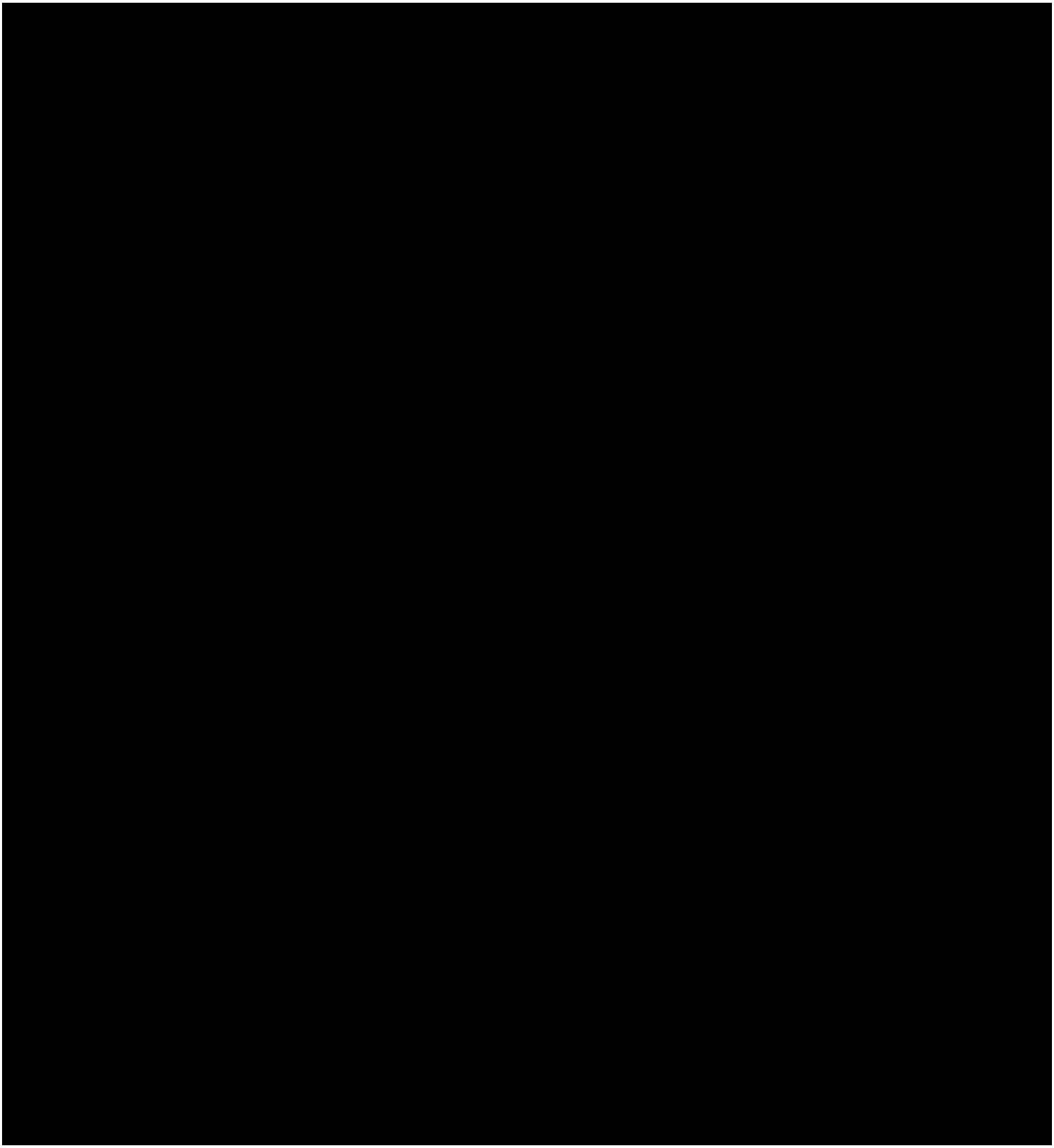
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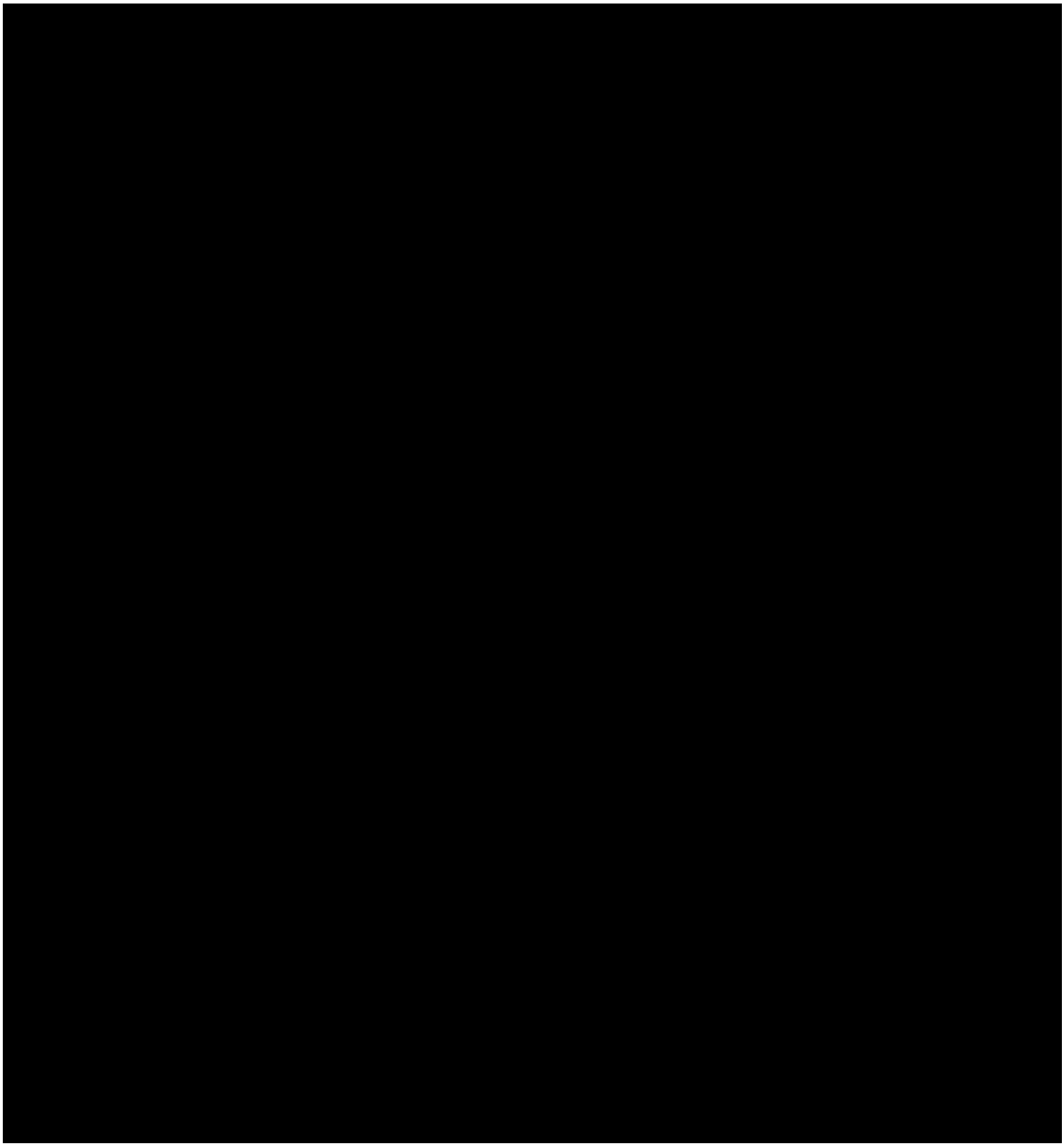
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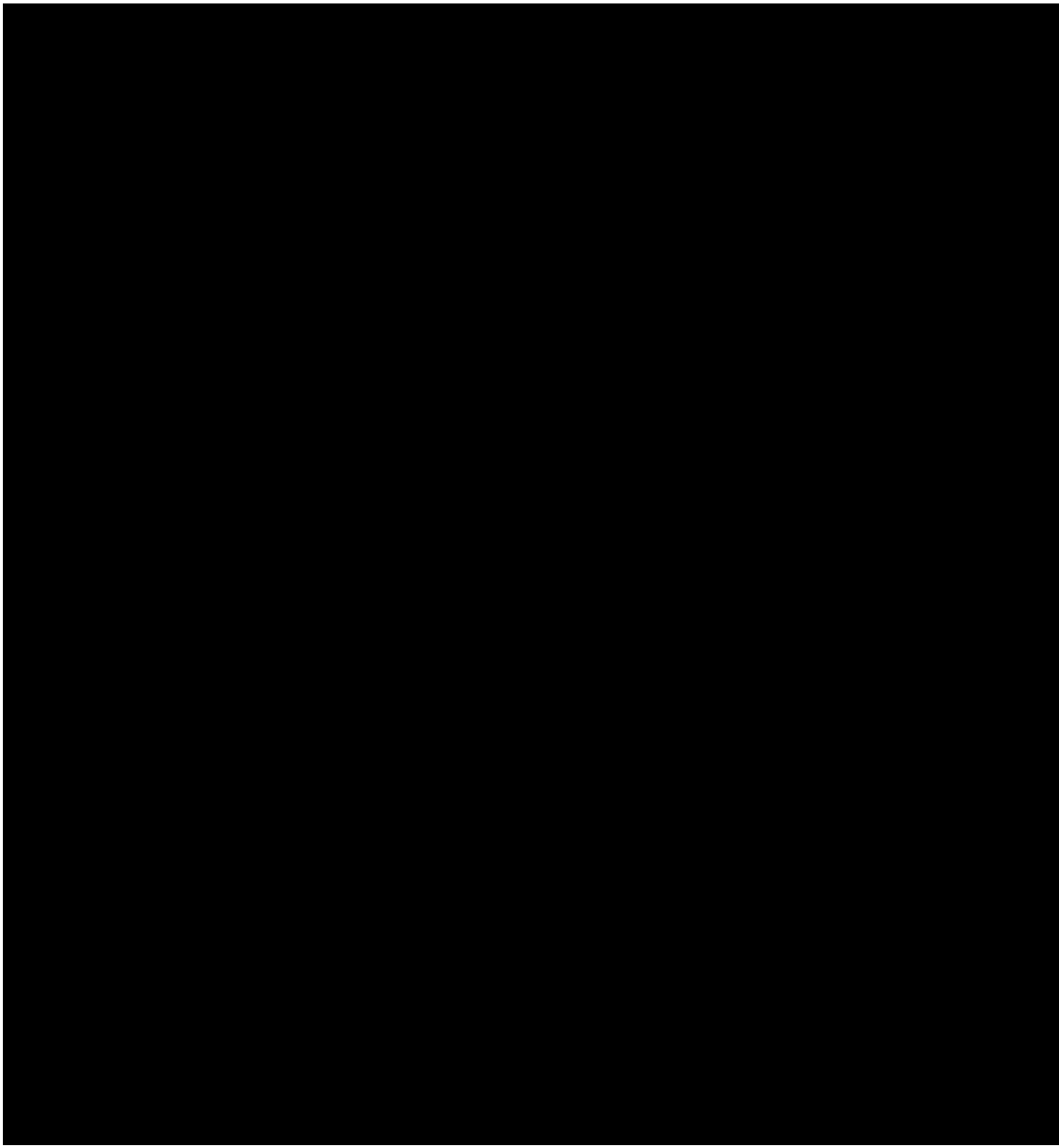
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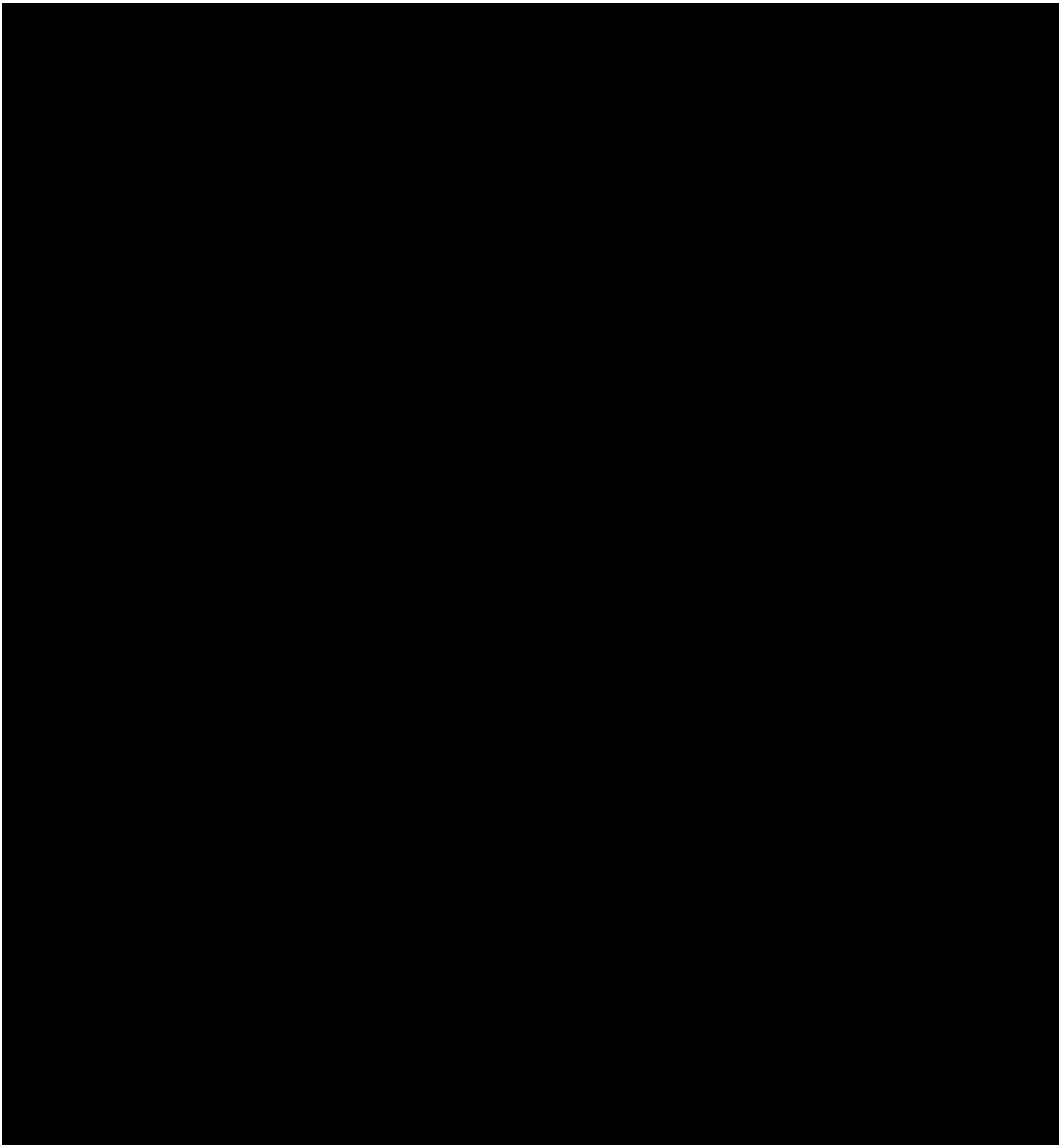
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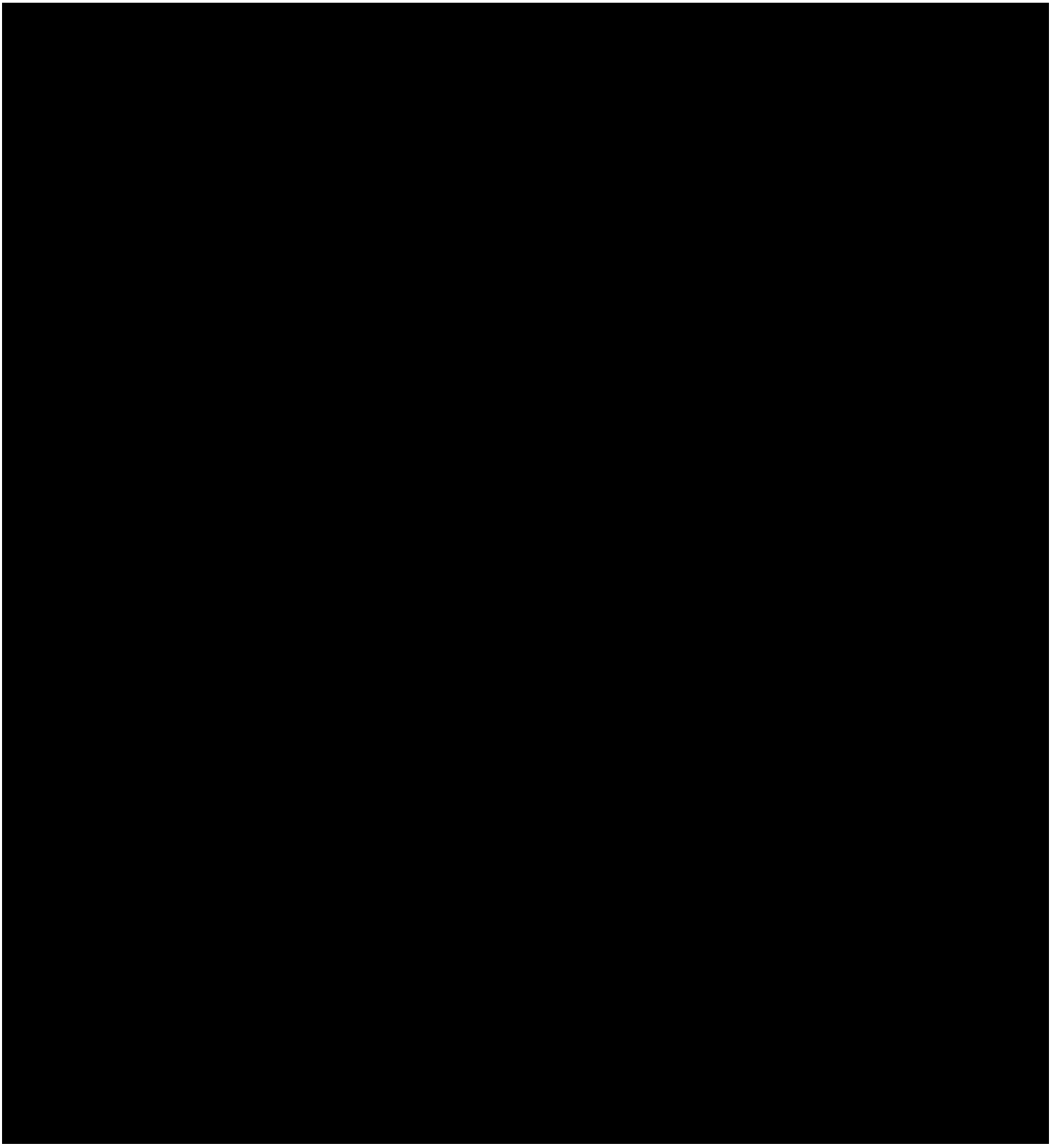
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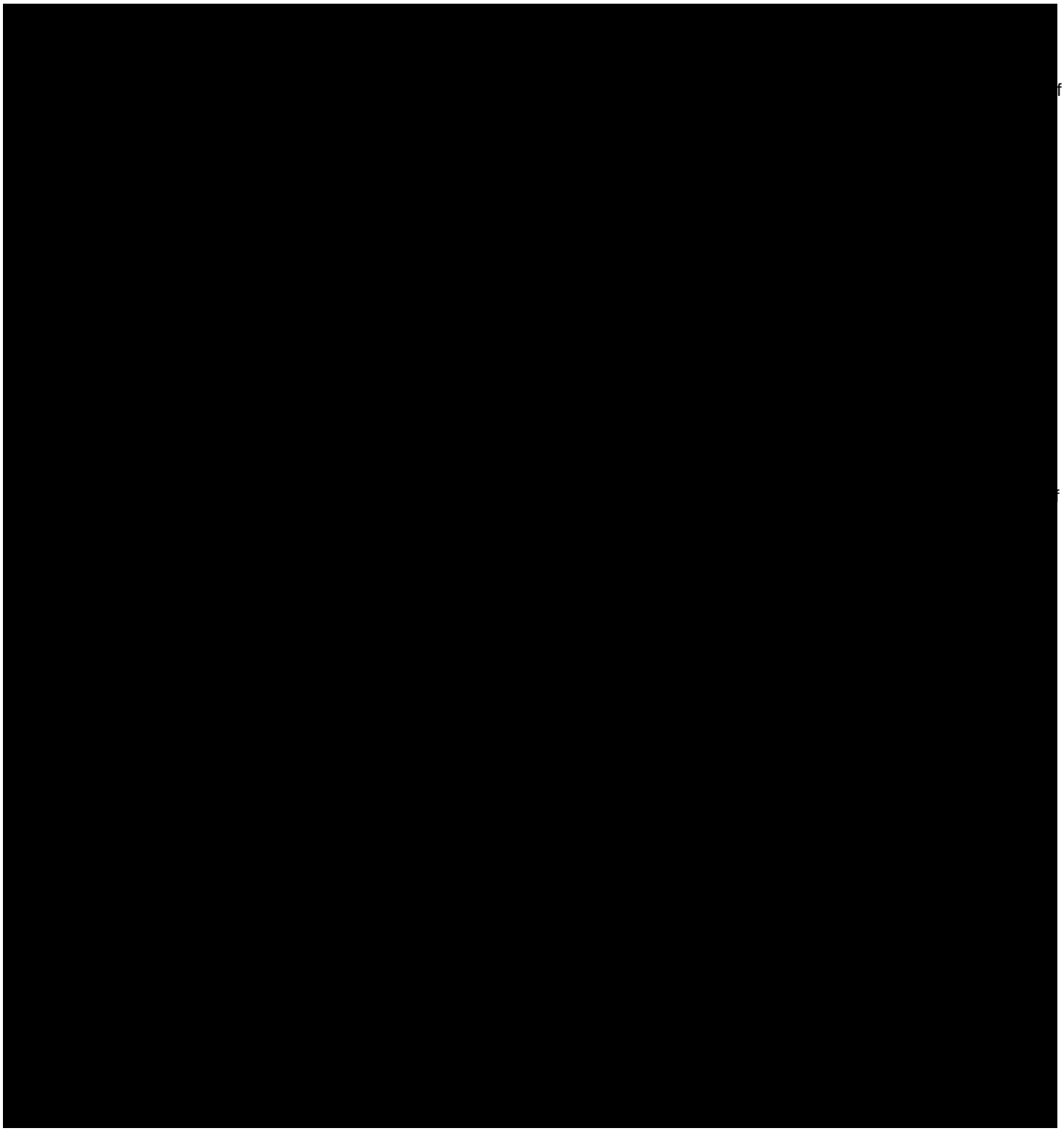
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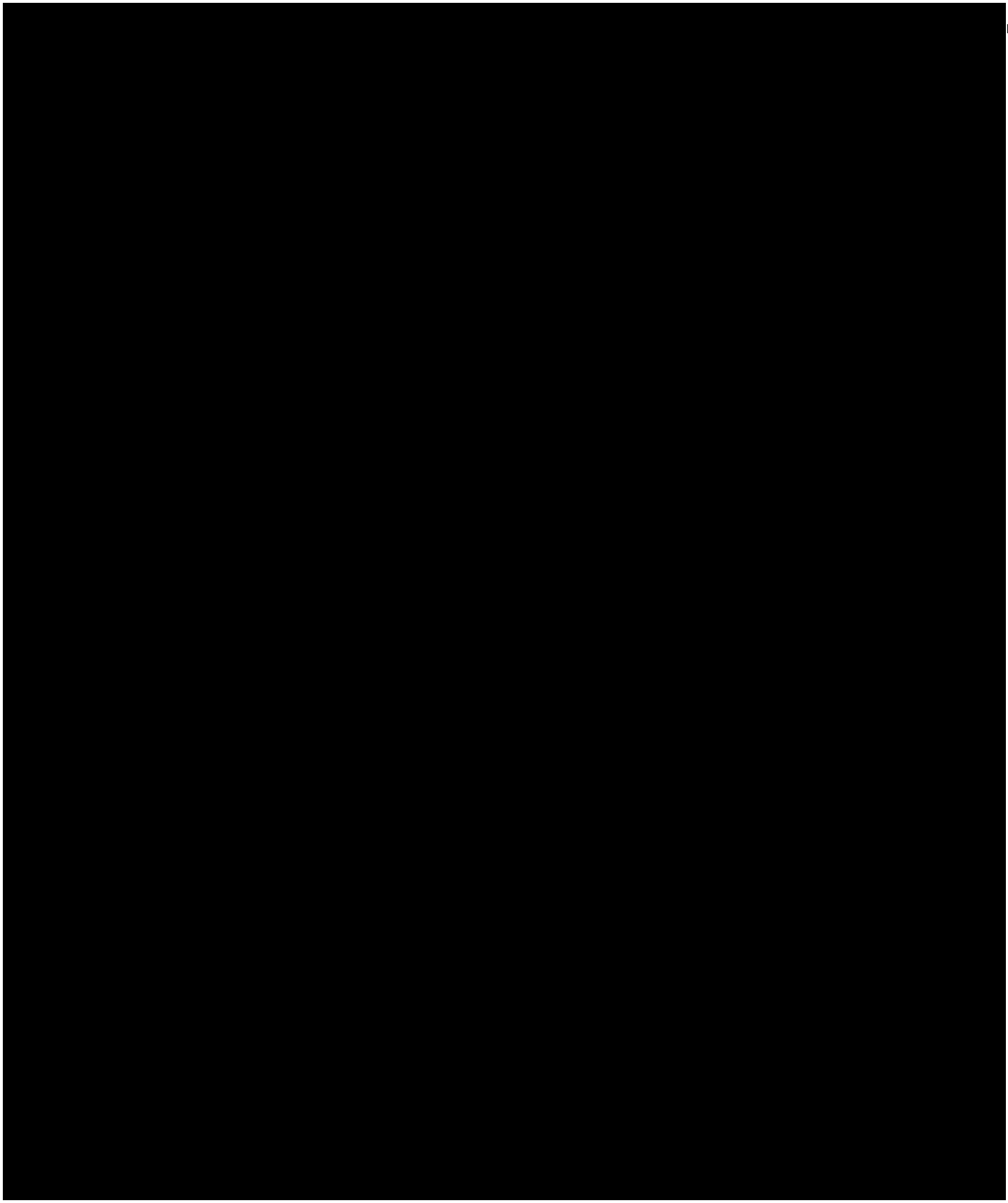
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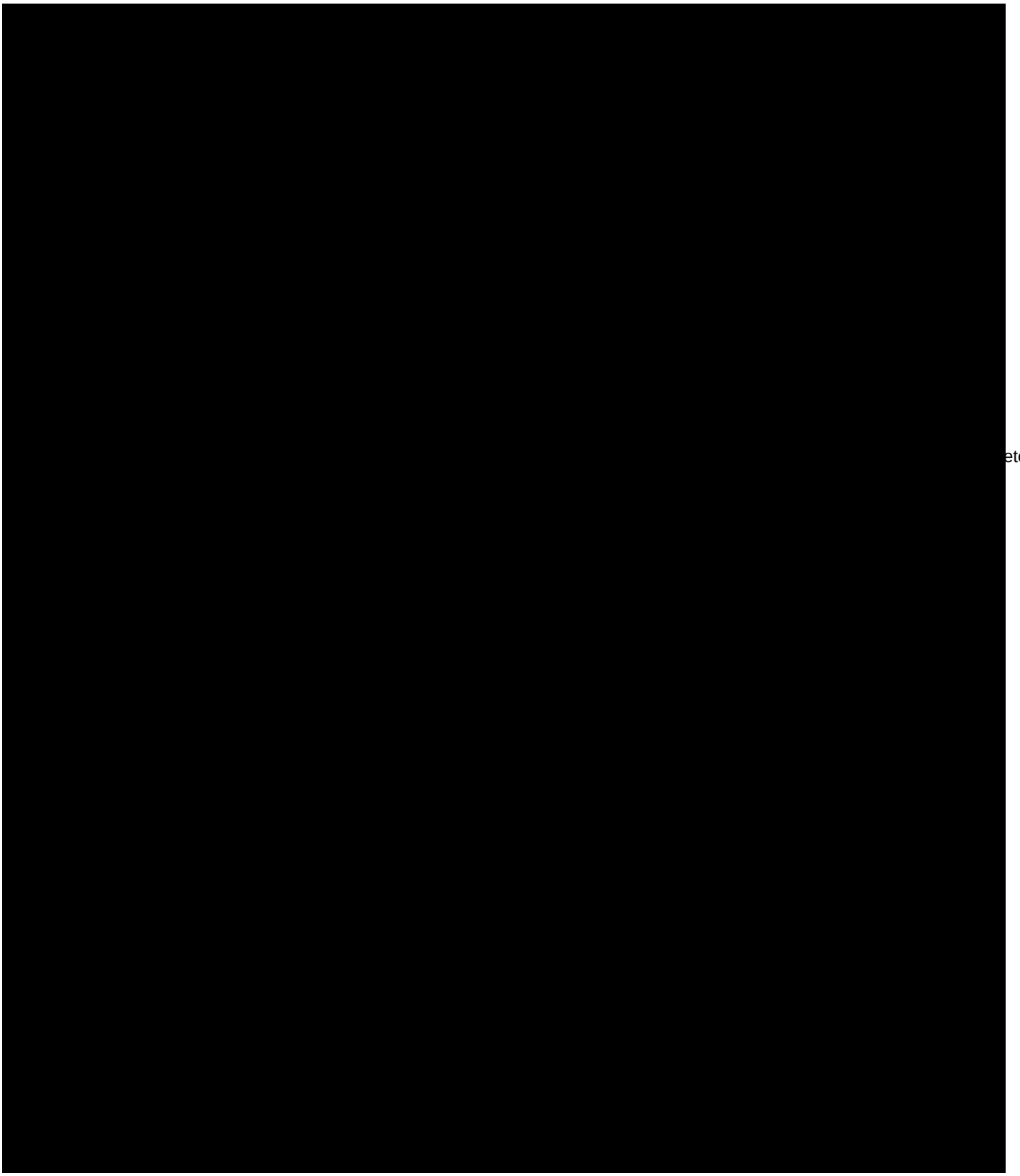
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EBR - Environmental Registry

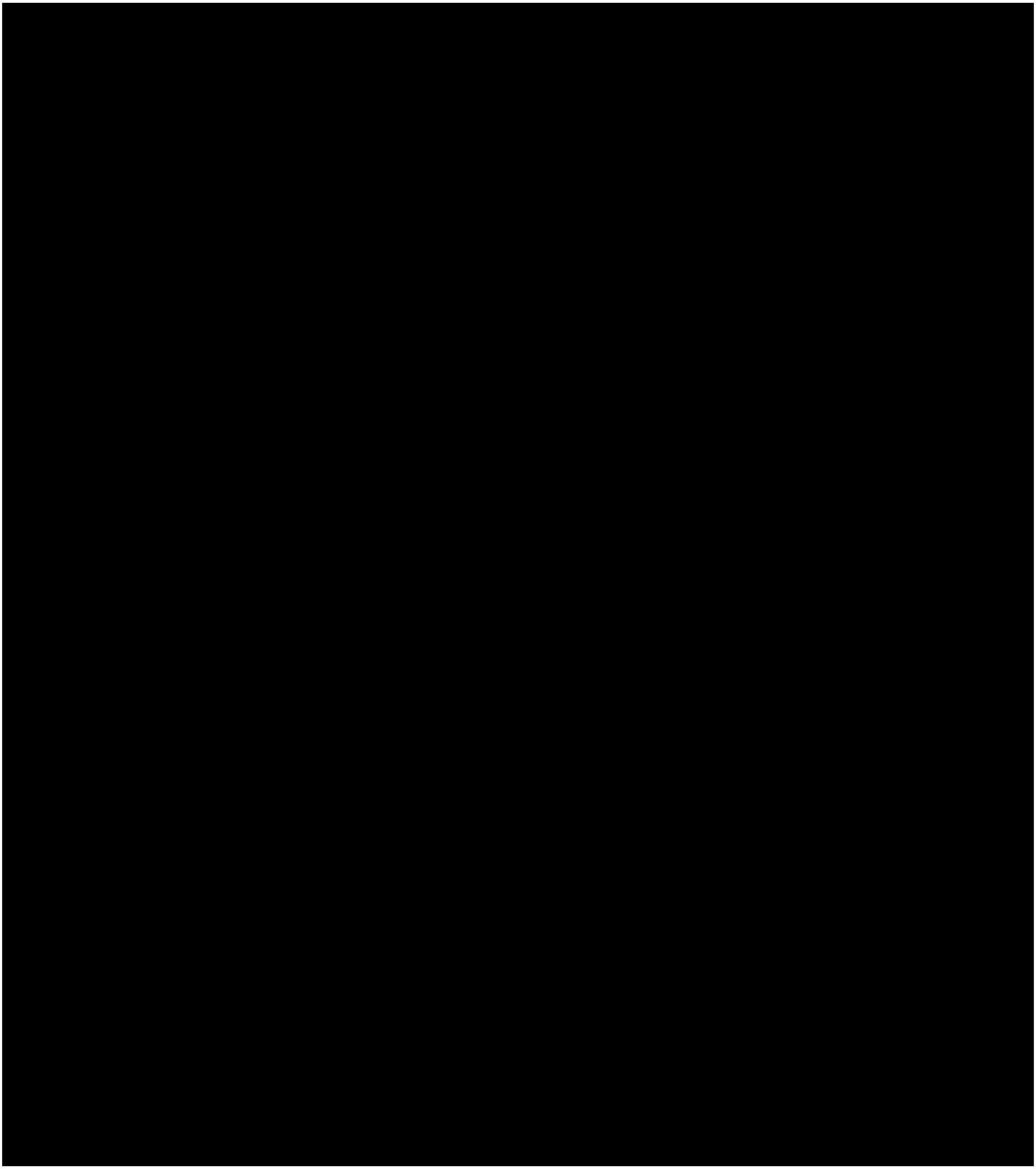


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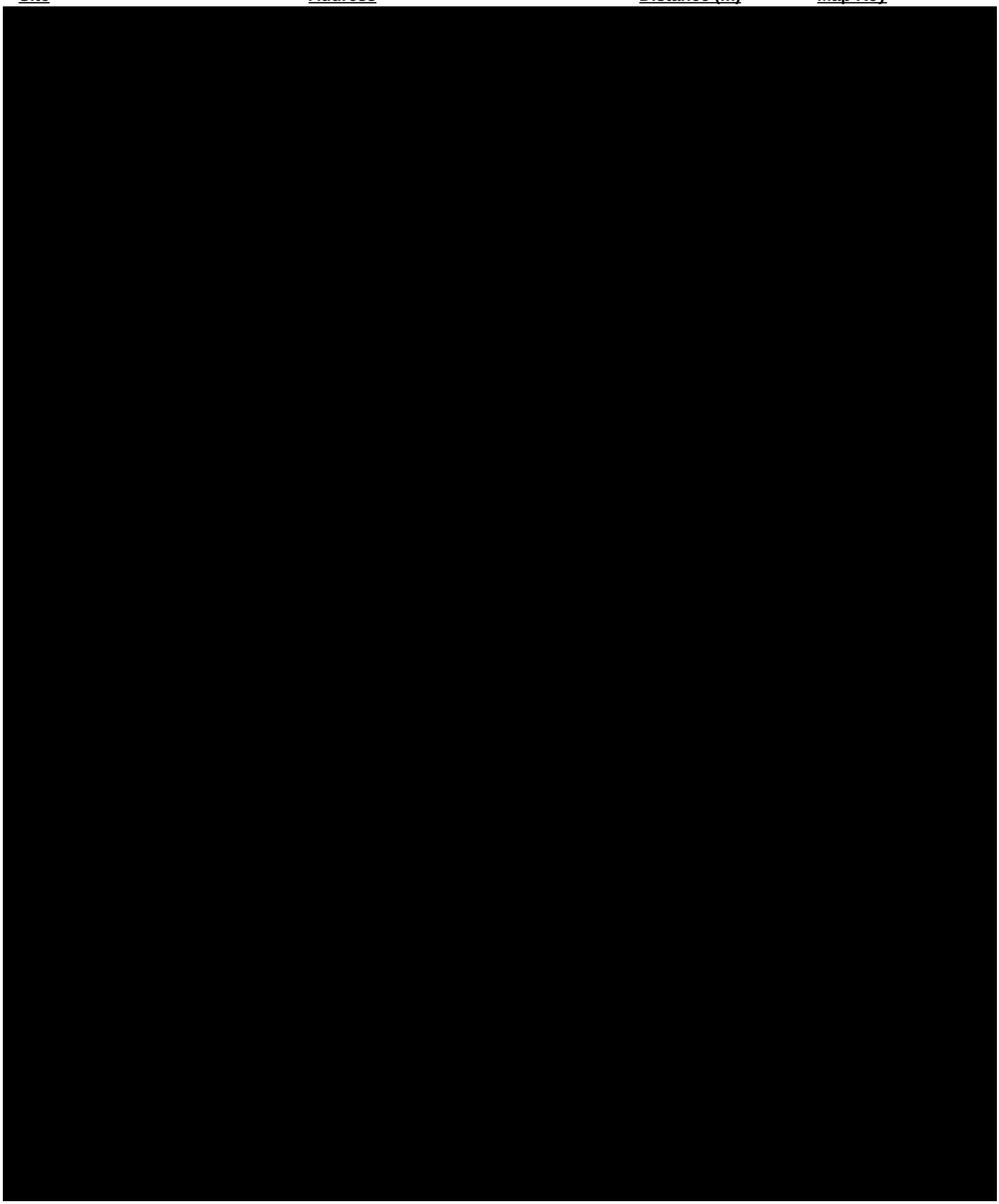


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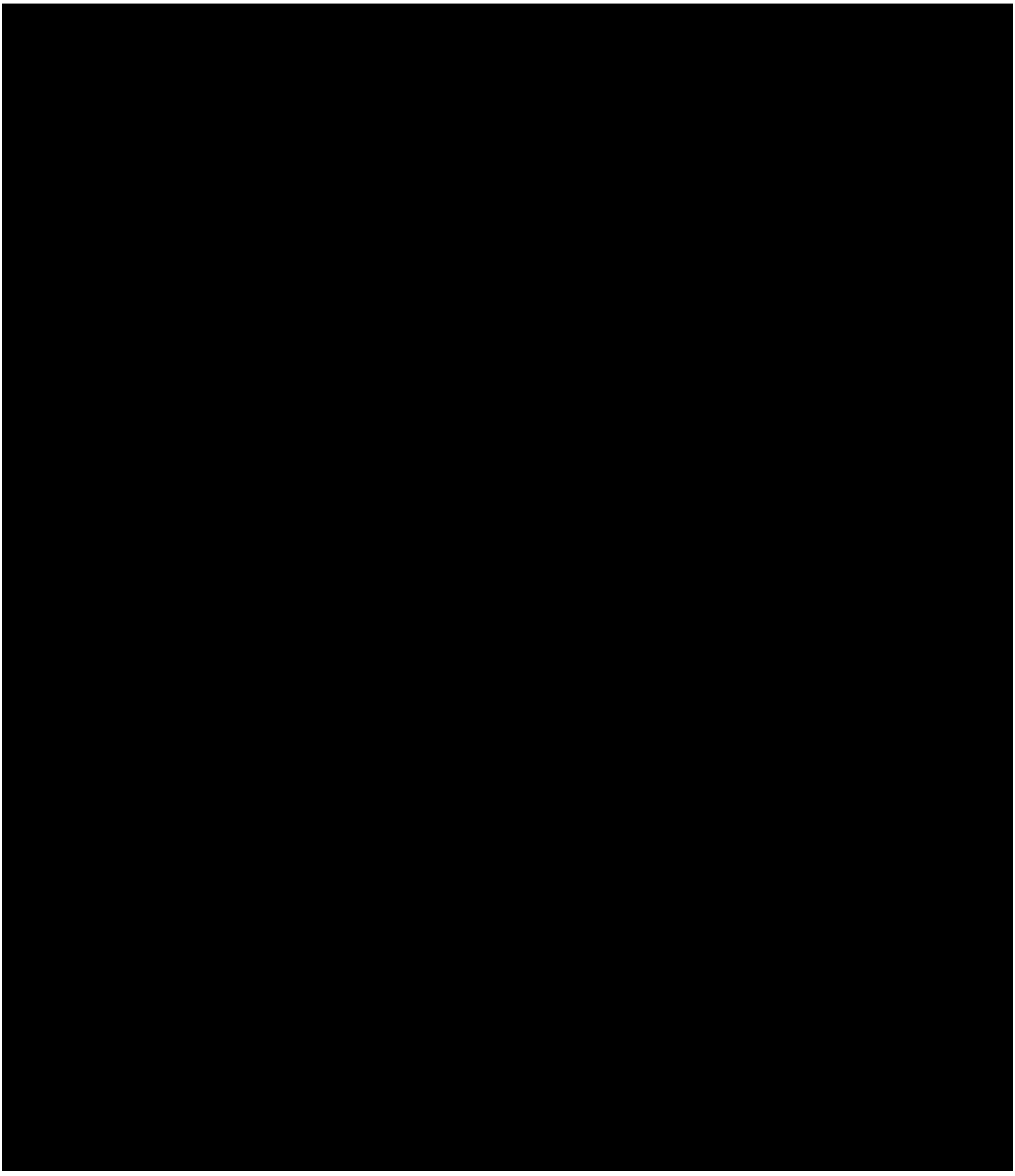
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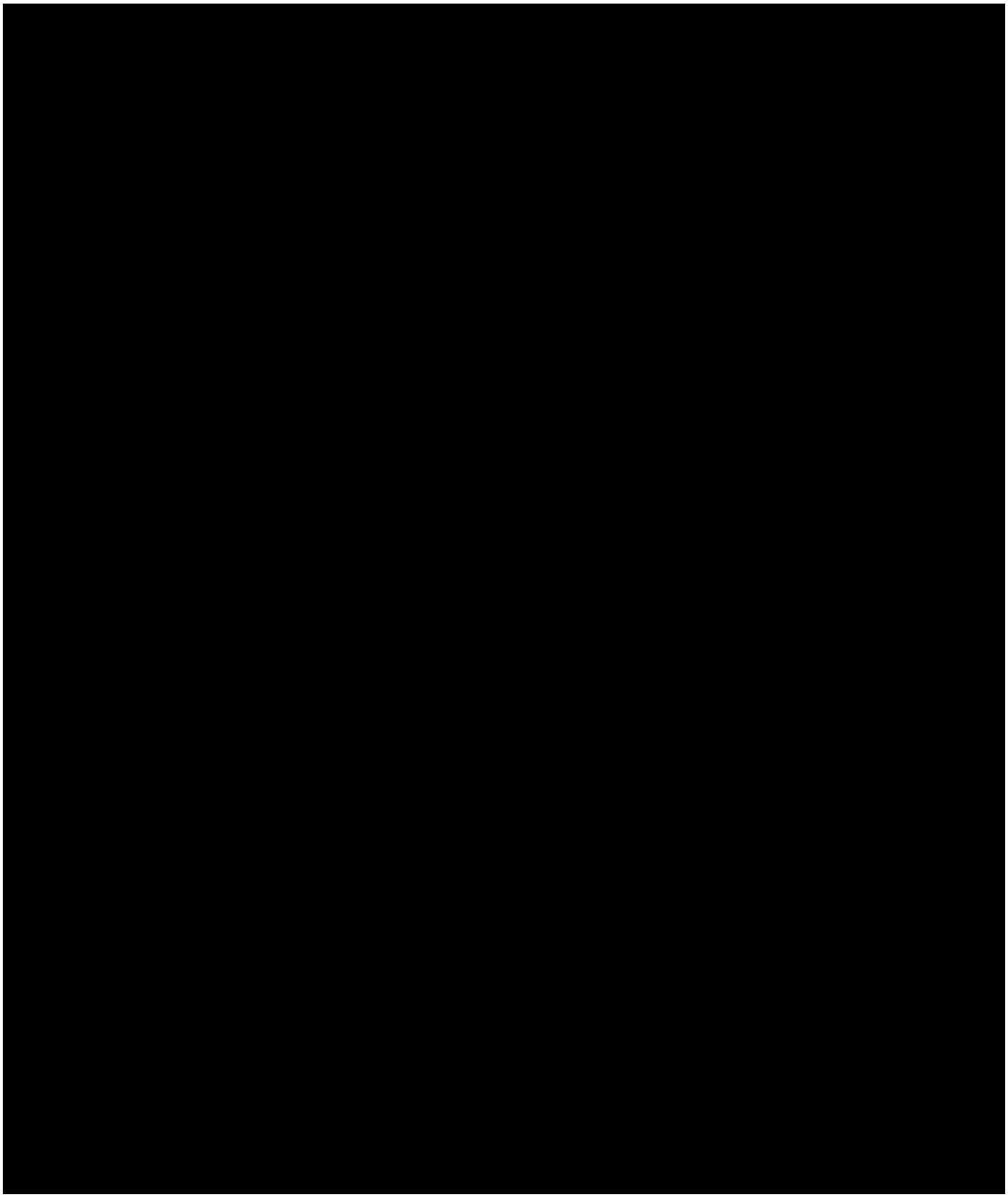


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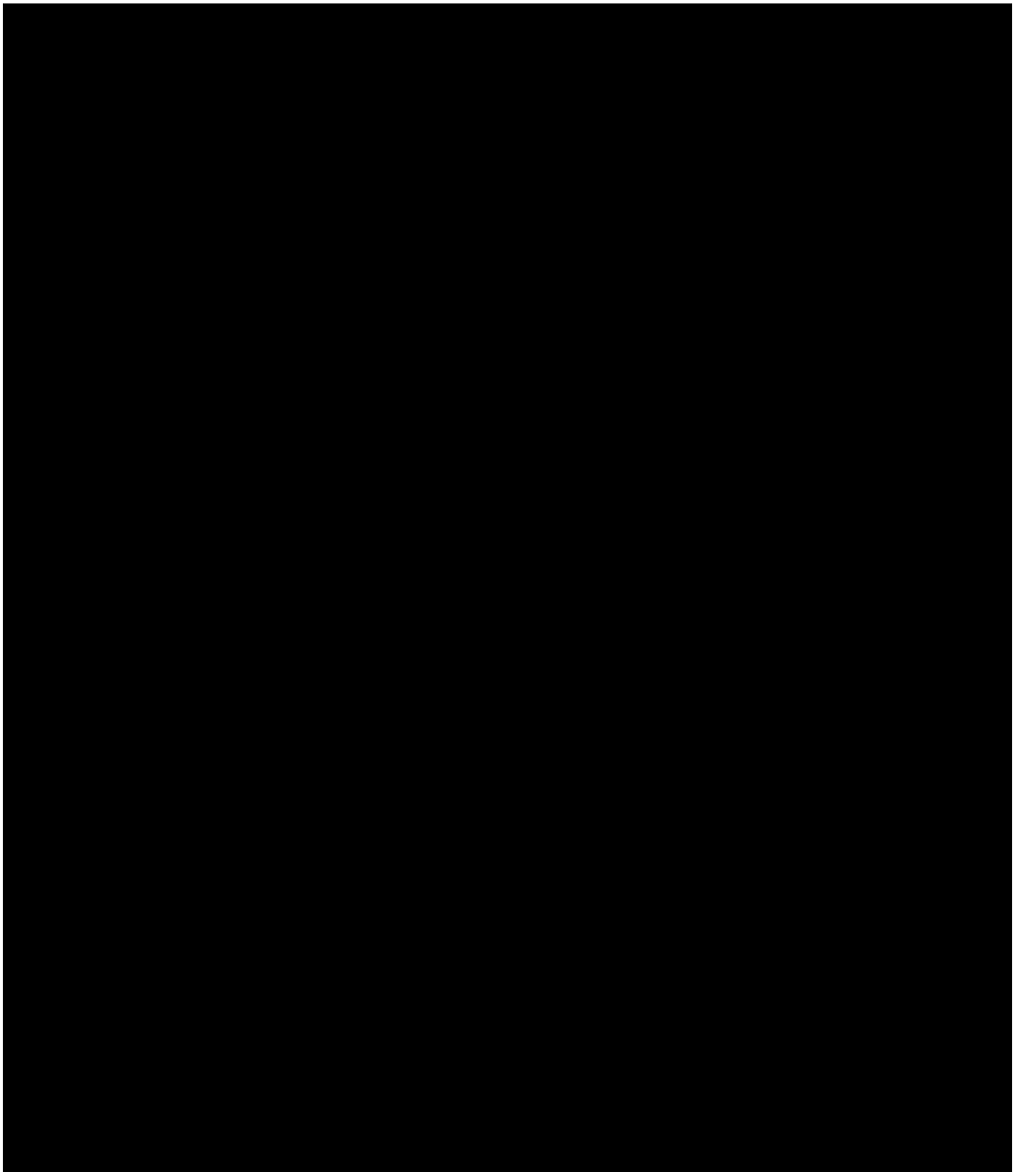


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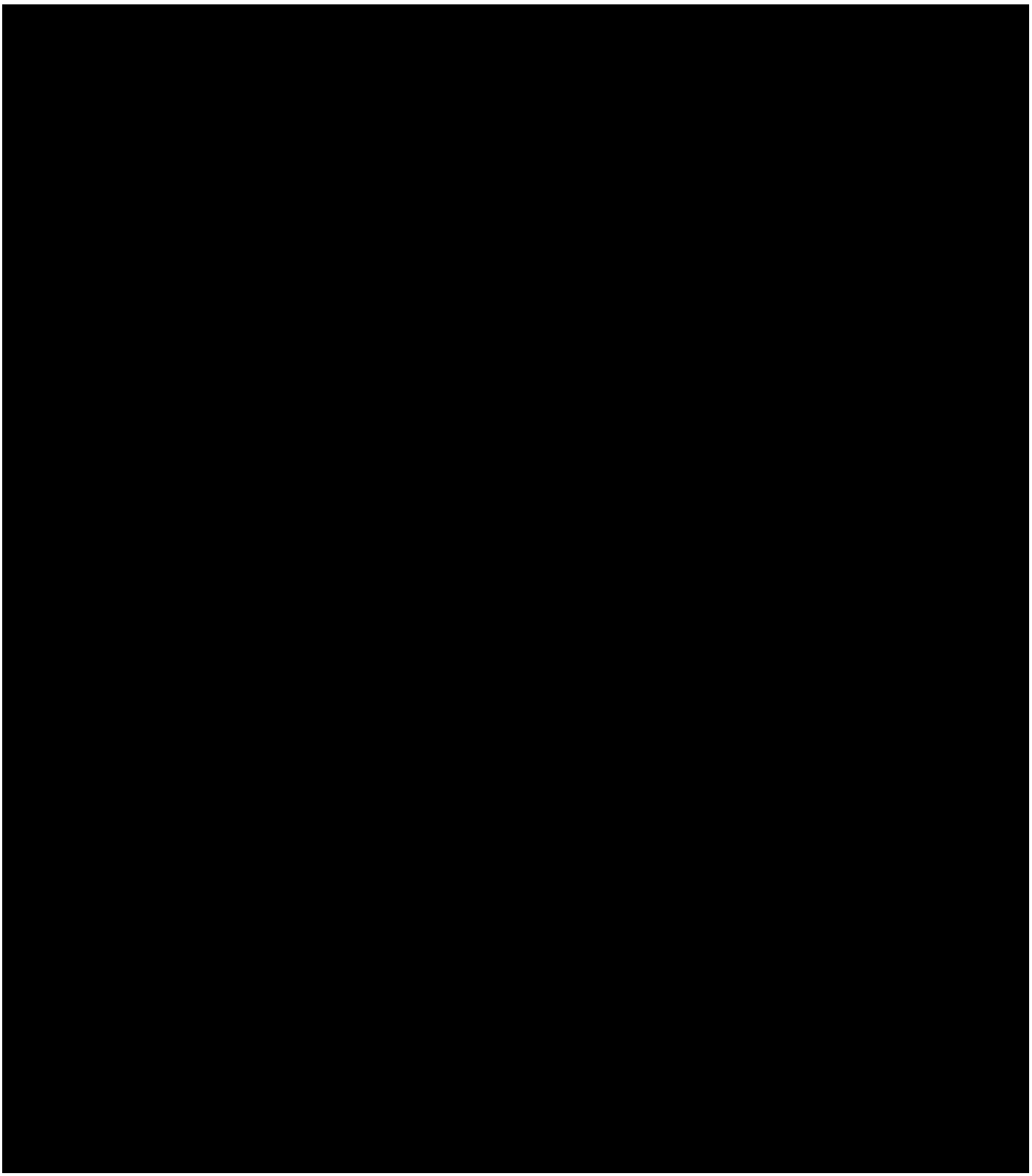
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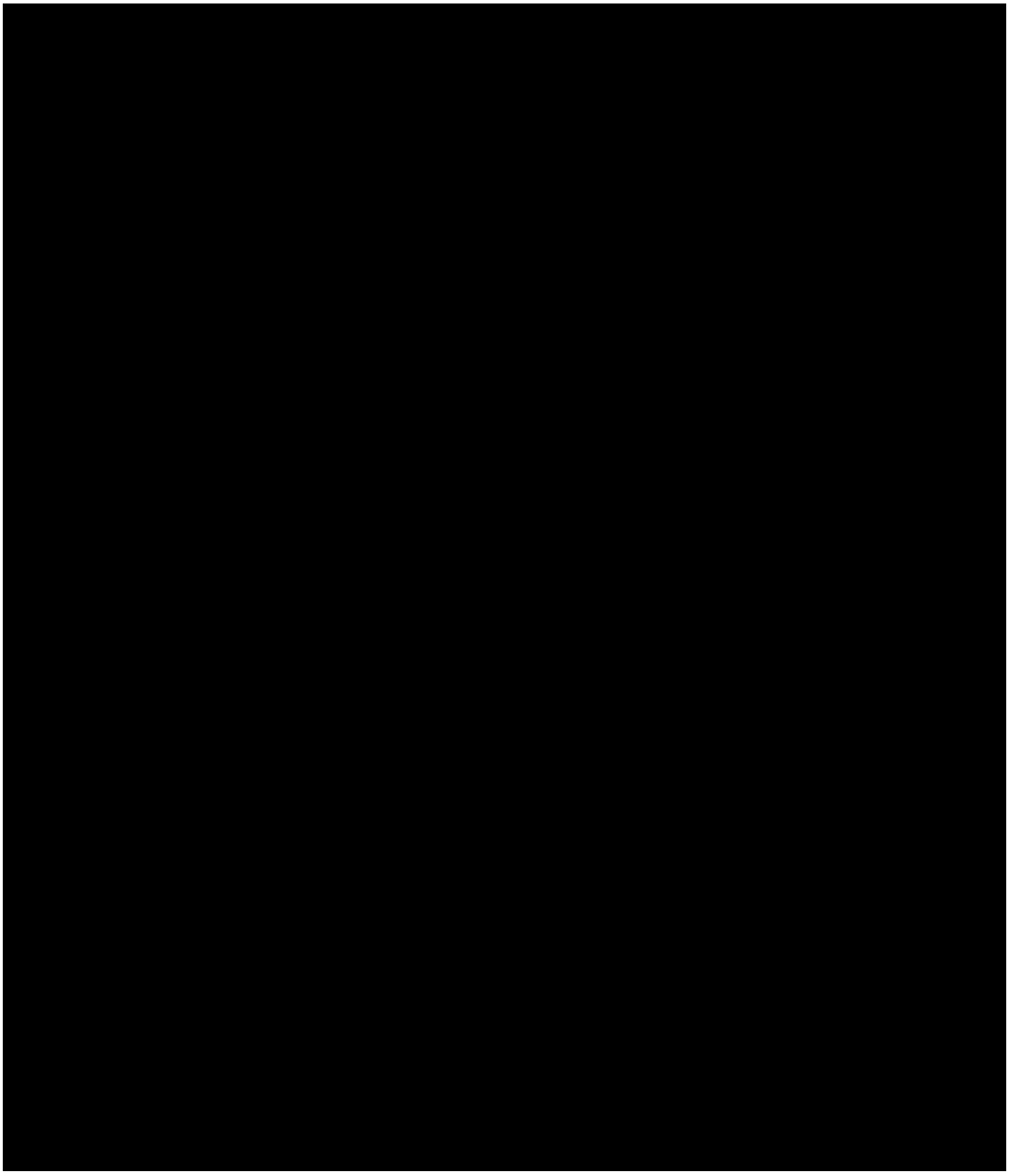
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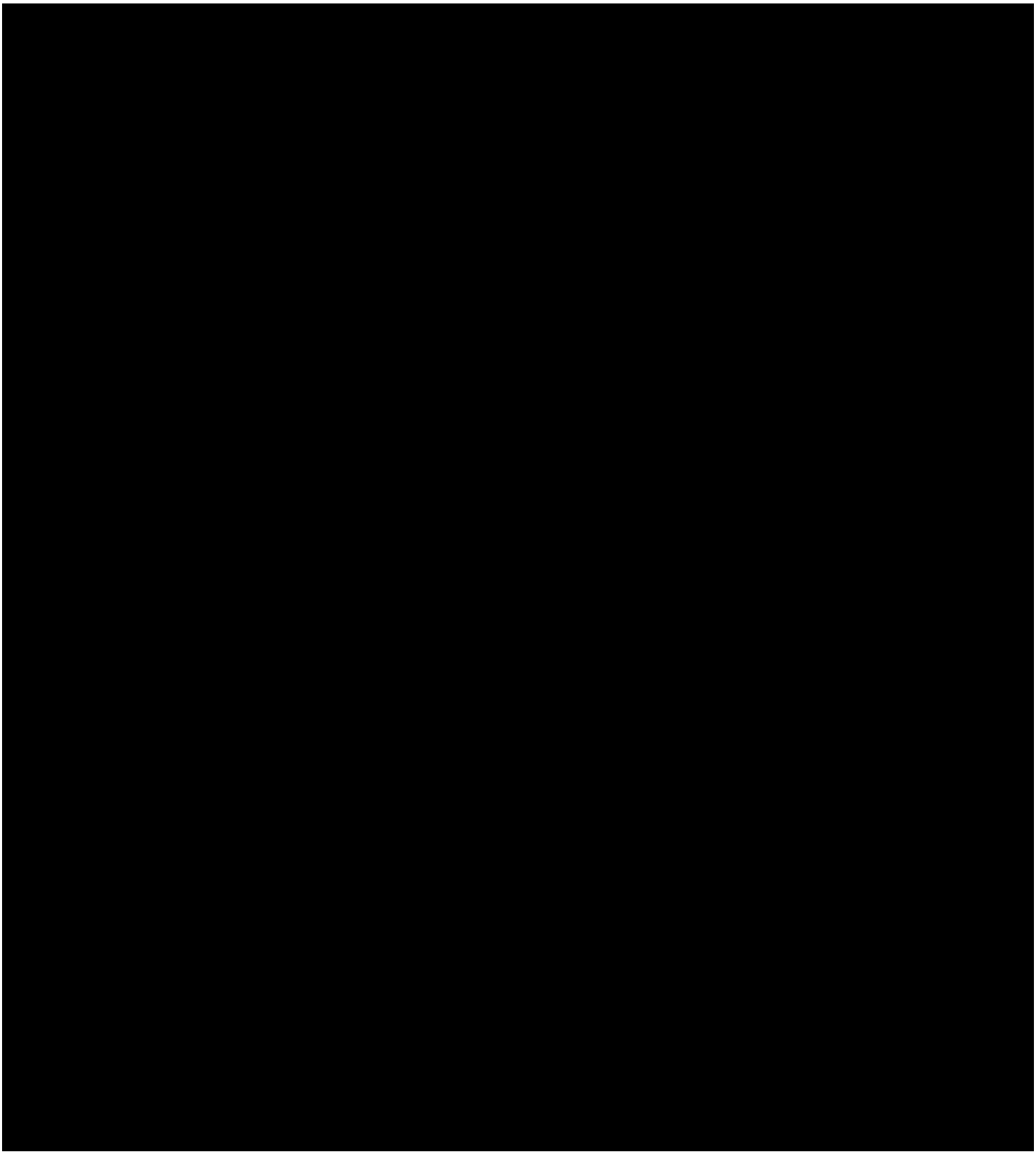
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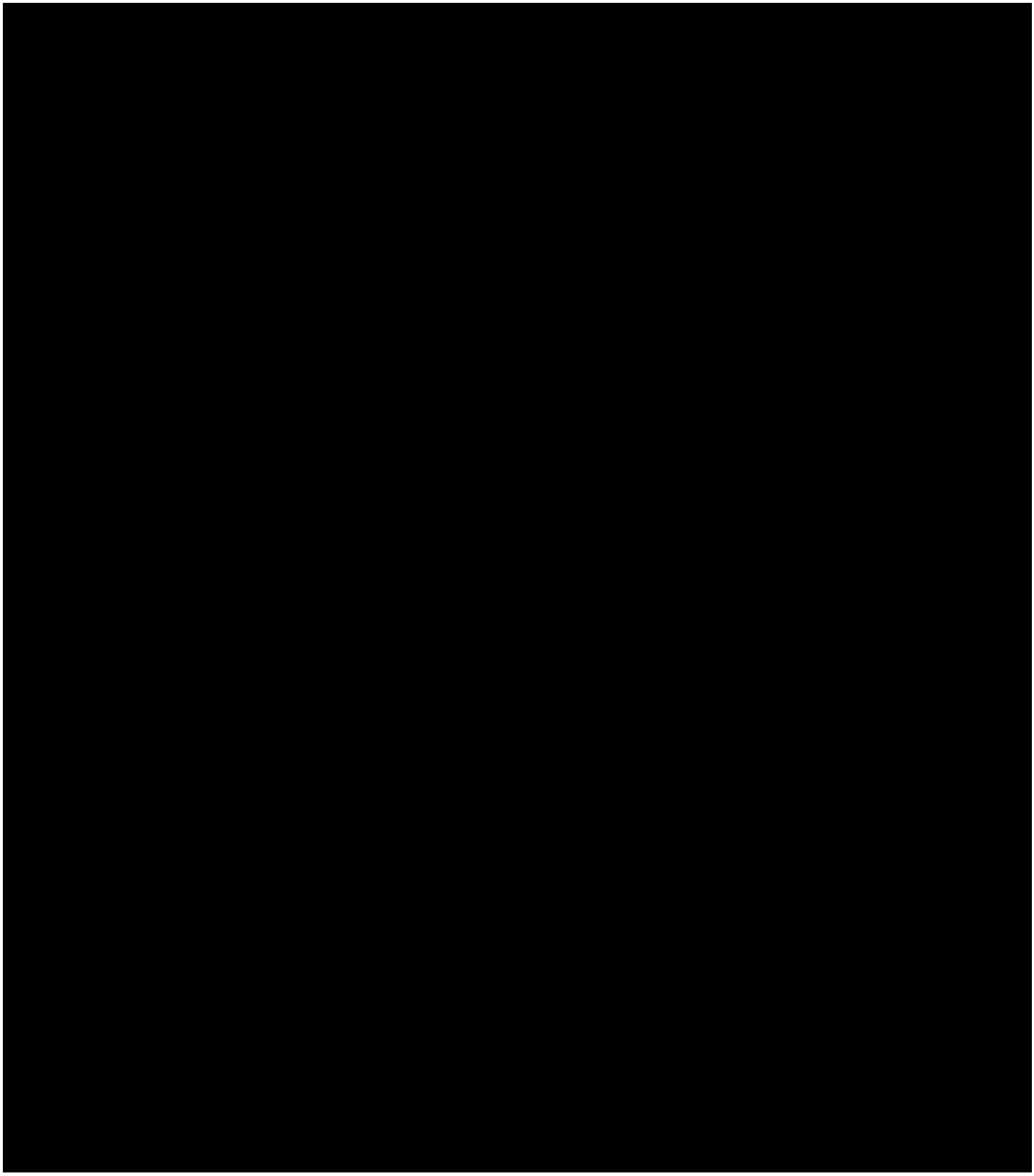
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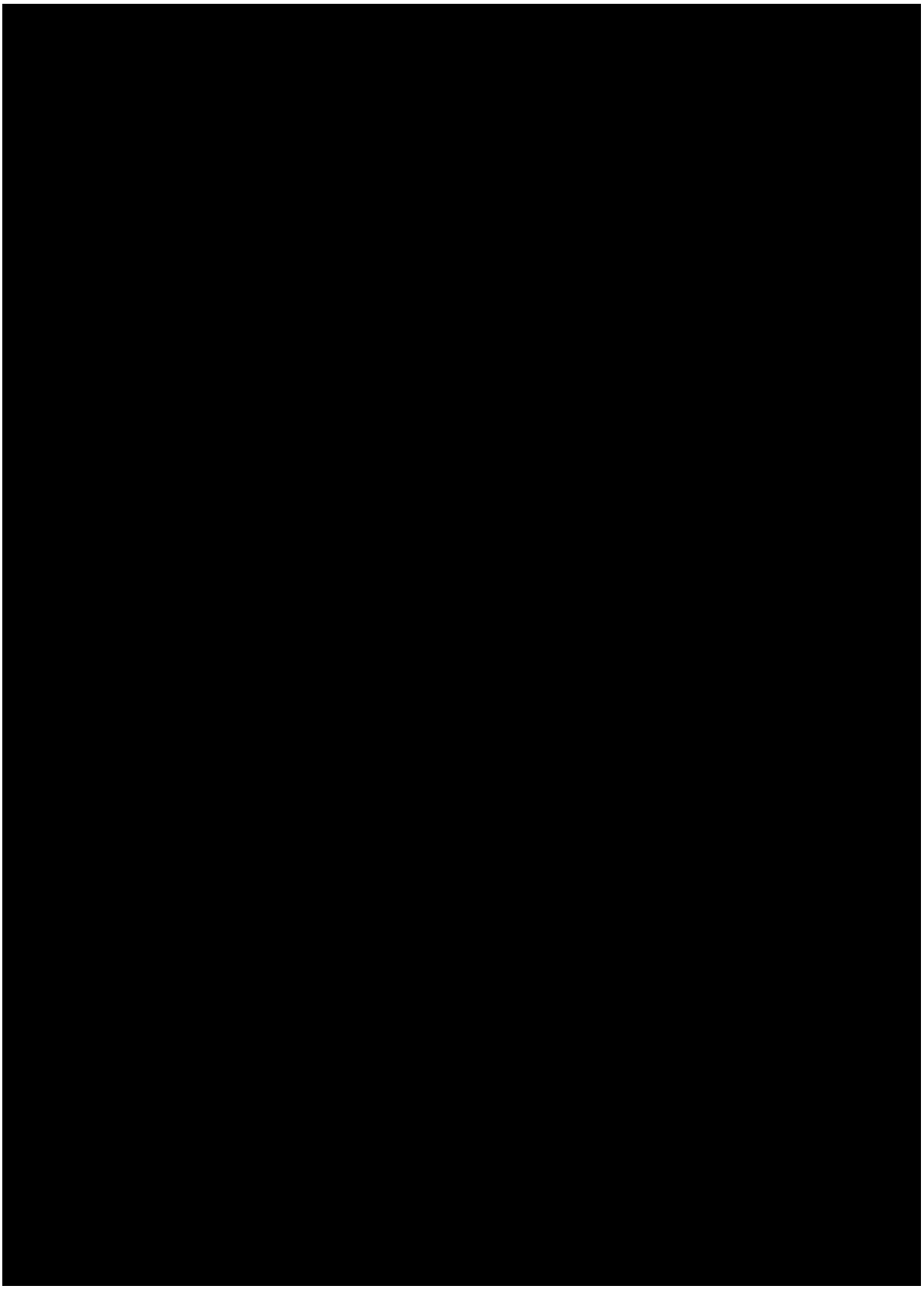
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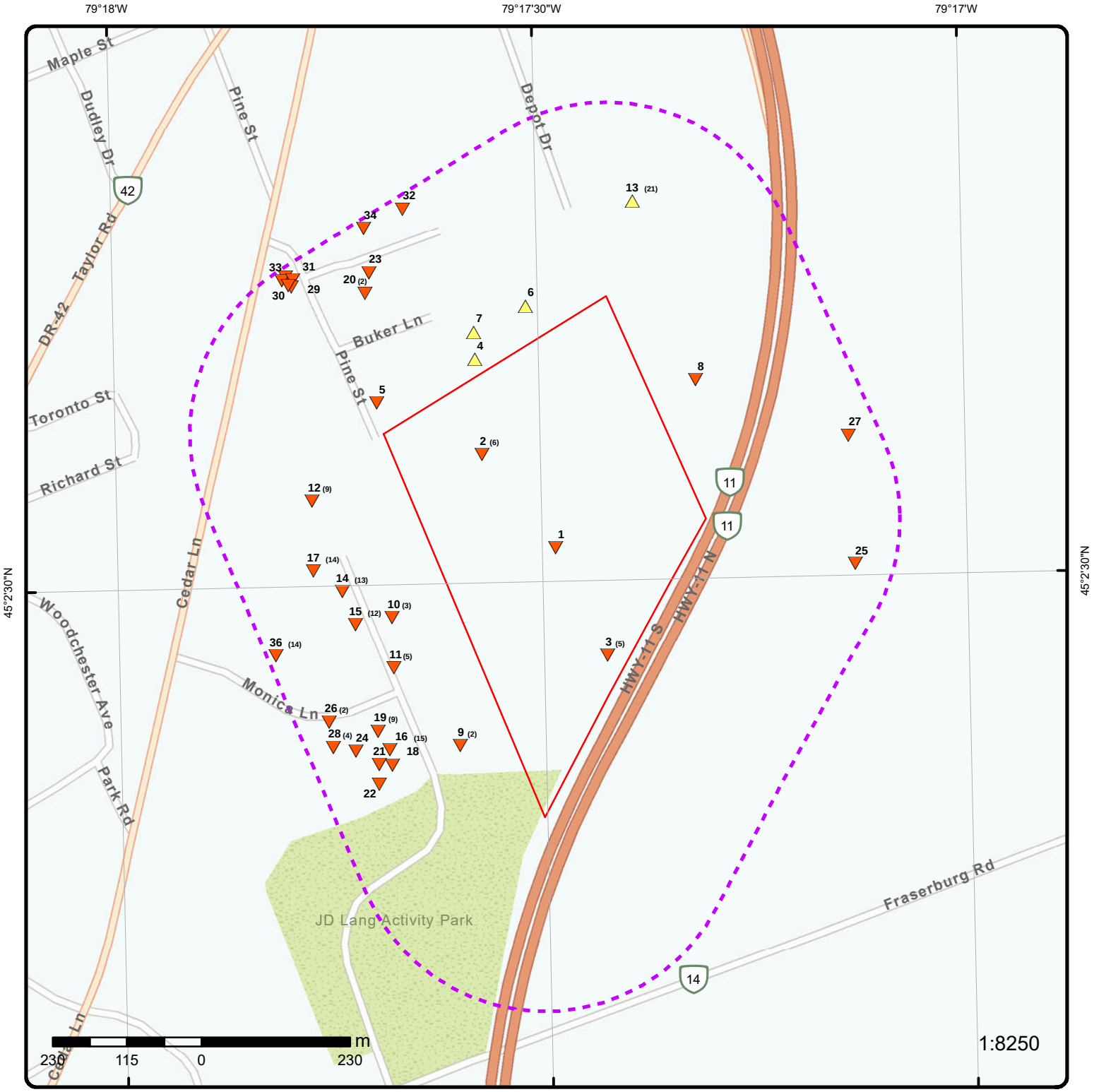
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Site	Address	Distance (m)	Map Key
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Site	Address	Distance (m)	Map Key



Site	Address	Distance (m)	Map Key
	Well ID: 4200844		



Map: 0.3 Kilometer Radius

Order Number: 23100200574

Address: 300 Pine Street, Bracebridge, ON

- Project Property
- Buffer Outline
- Eris Sites with Higher Elevation
- Eris Sites with Same Elevation
- Eris Sites with Lower Elevation
- Eris Sites with Unknown Elevation
- Freeways; Highways
- Traffic Circle; Ramp
- Major Arterial; Minor Arterial
- Local Road
- Service Road; Traffic Circle; Ramp
- Rail
- Beach
- Airport
- Industrial Area
- Military Base
- Aircraft Roads
- Native Reservation
- Hospital
- Shopping & Sports Area
- University/College
- Cemetery; Golf Course
- Parkt (National)
- Park (City/County)

Source: © 2021 ESRI StreetMap Premium.

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Aerial

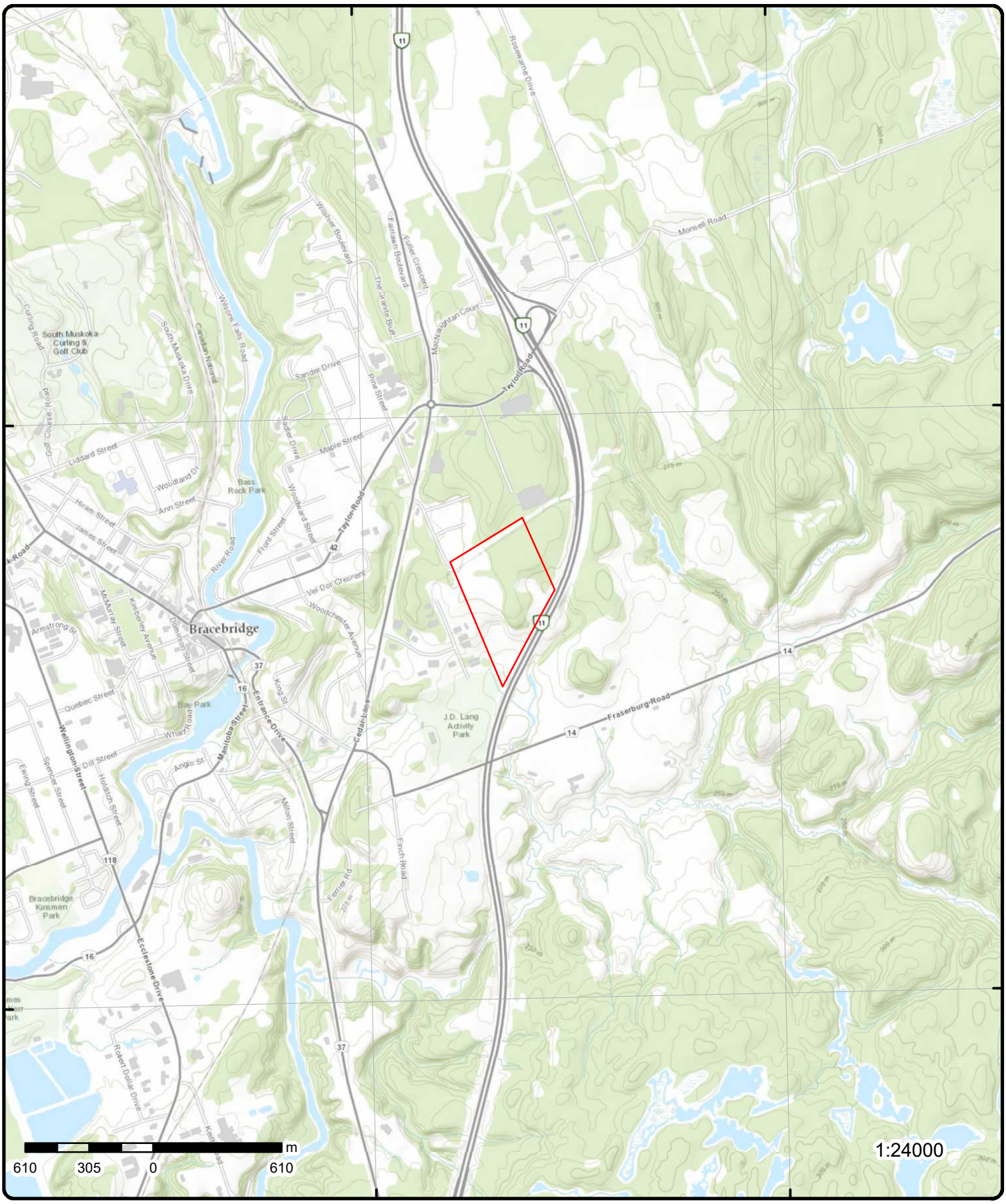
Year: 2022

Order Number: 23100200574

Address: 300 Pine Street, Bracebridge, ON

Source: ESRI World Imagery

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Topographic Map

Address: 300 Pine Street, ON

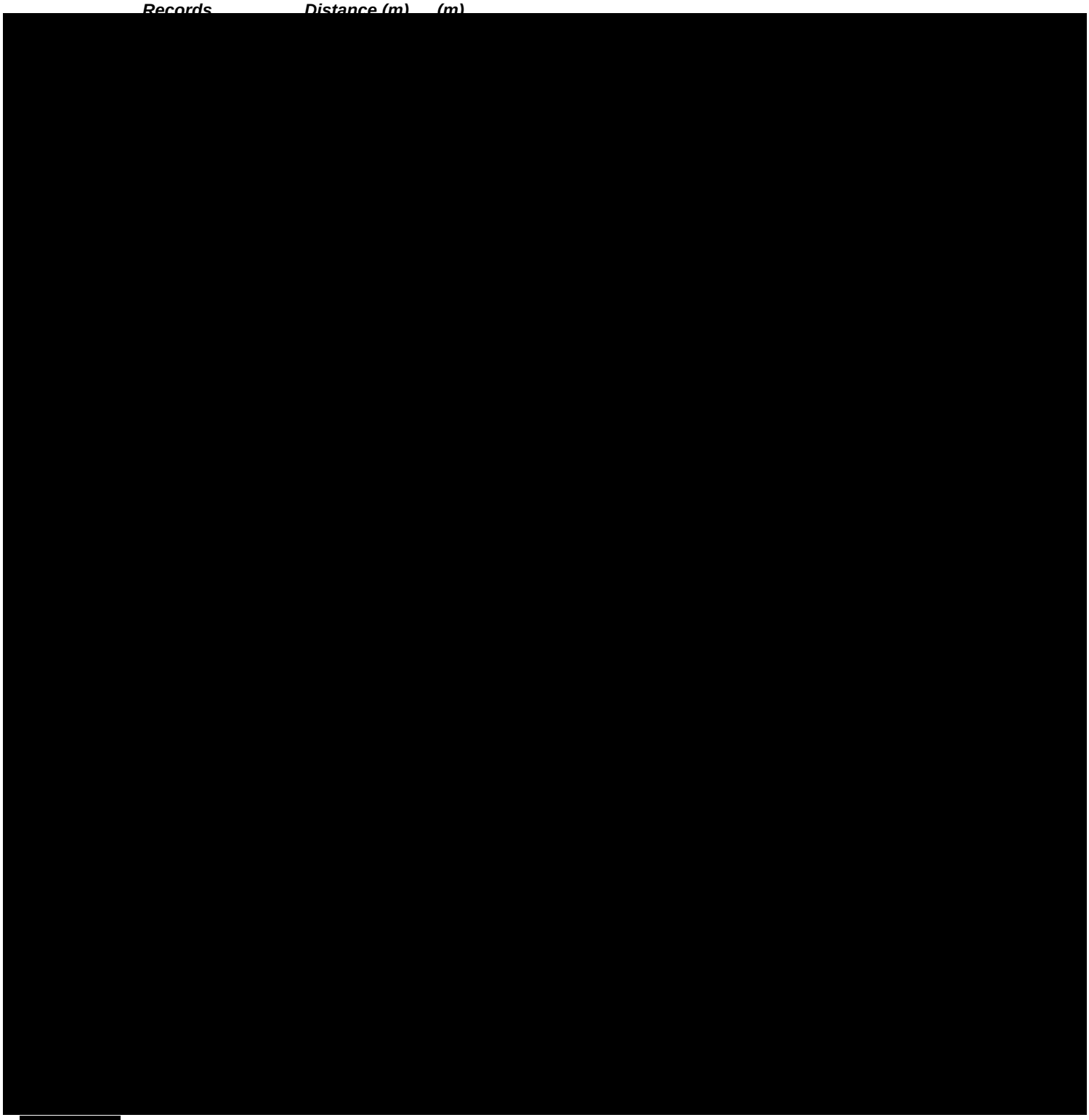
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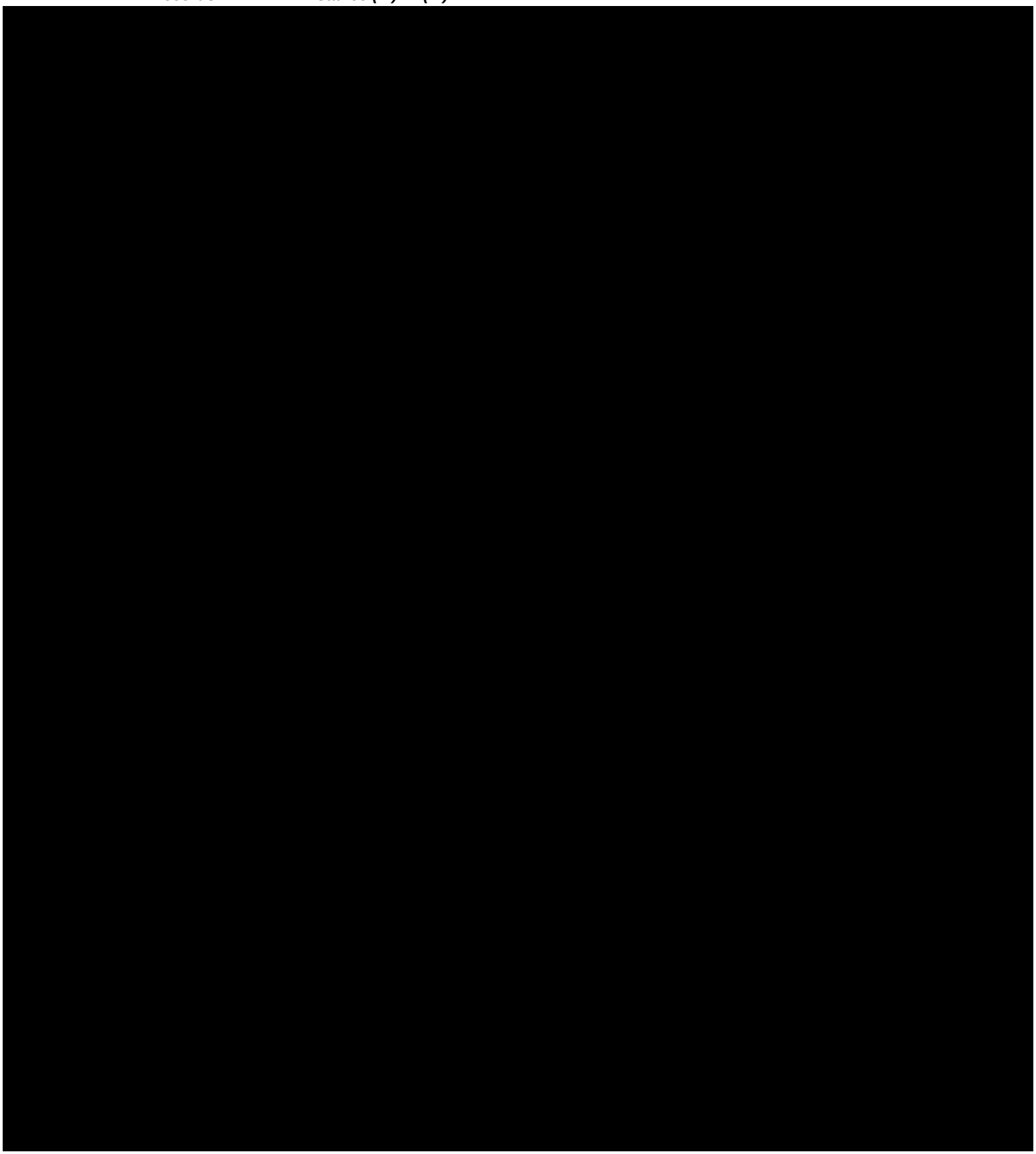
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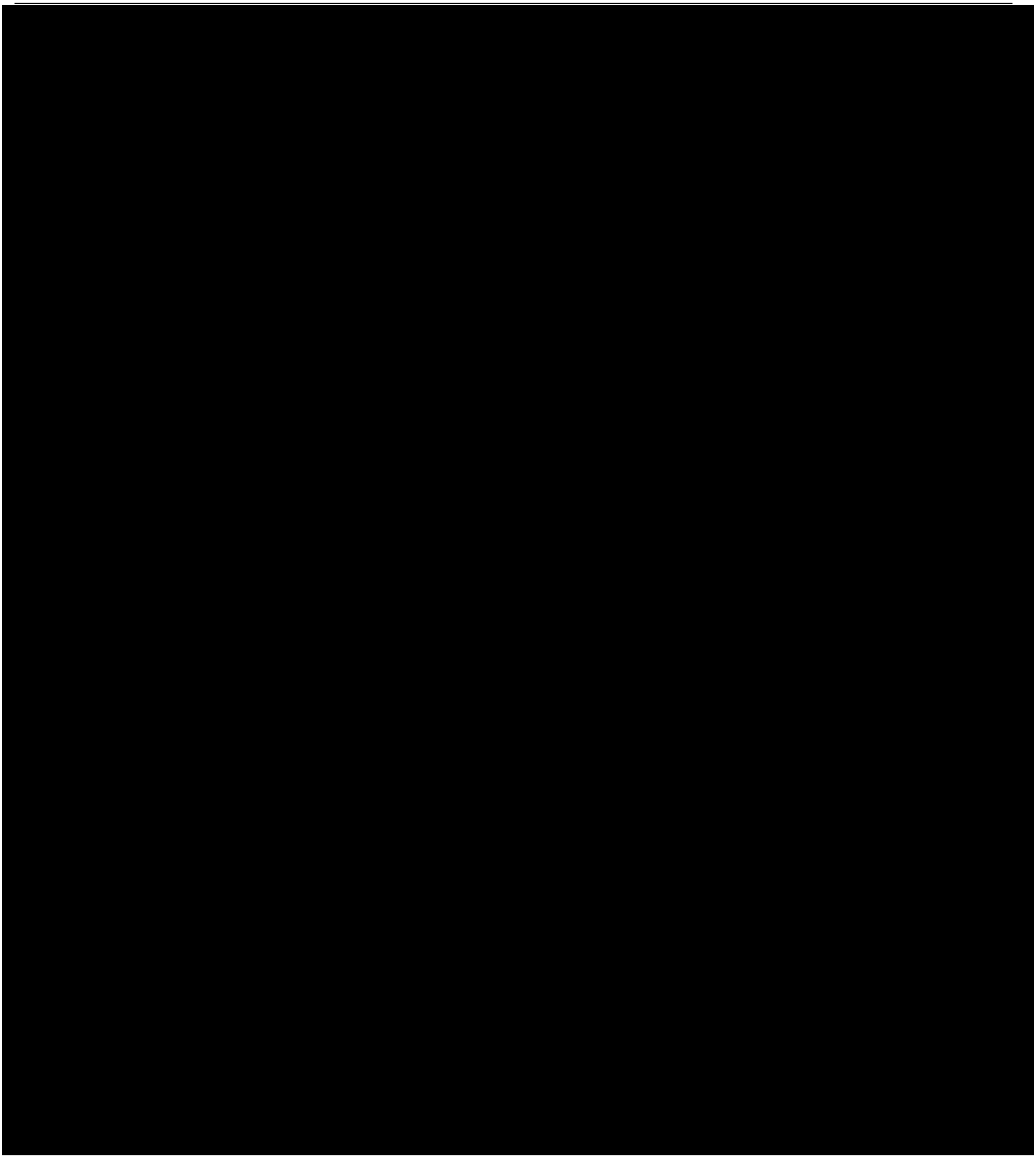
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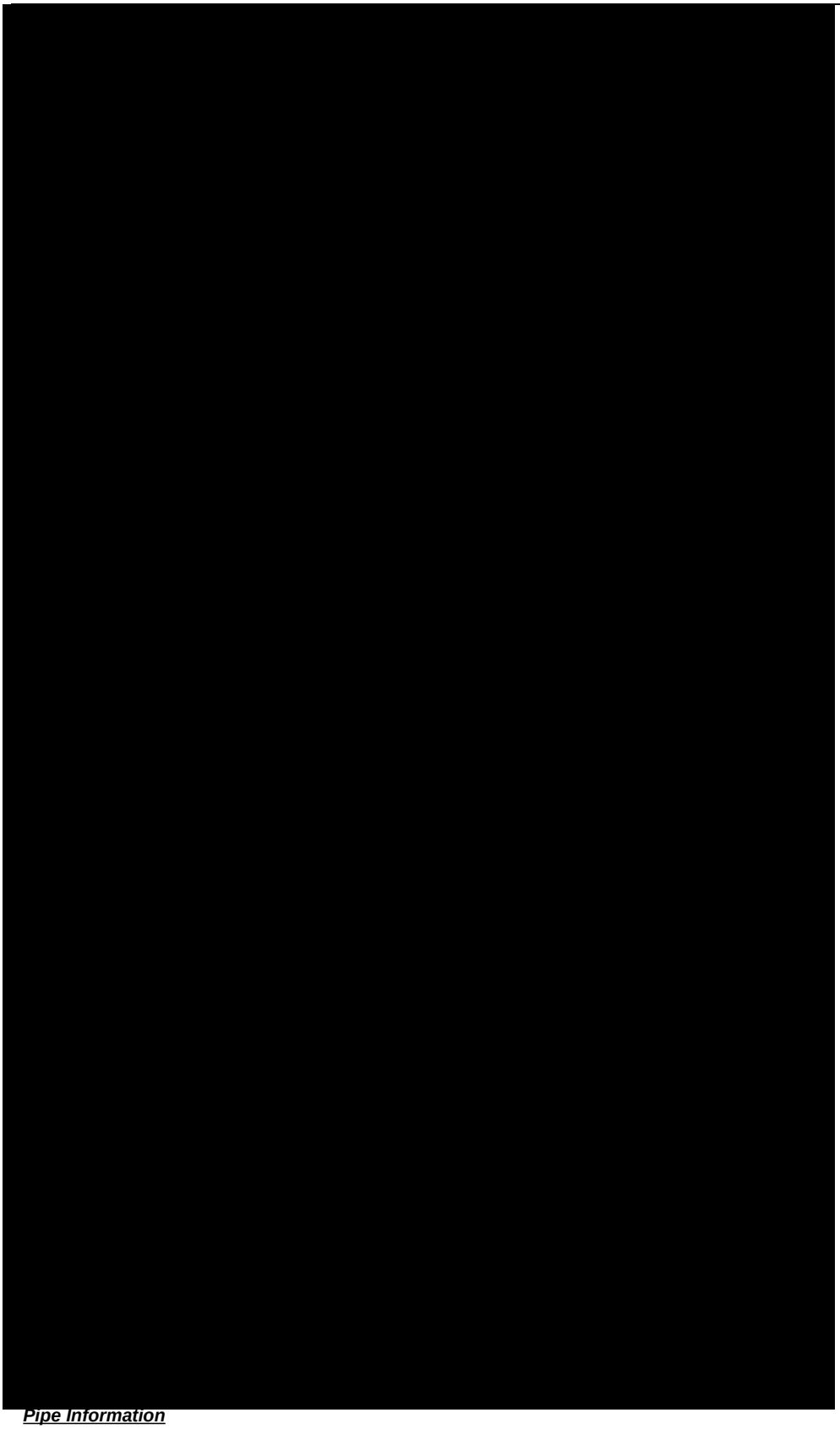
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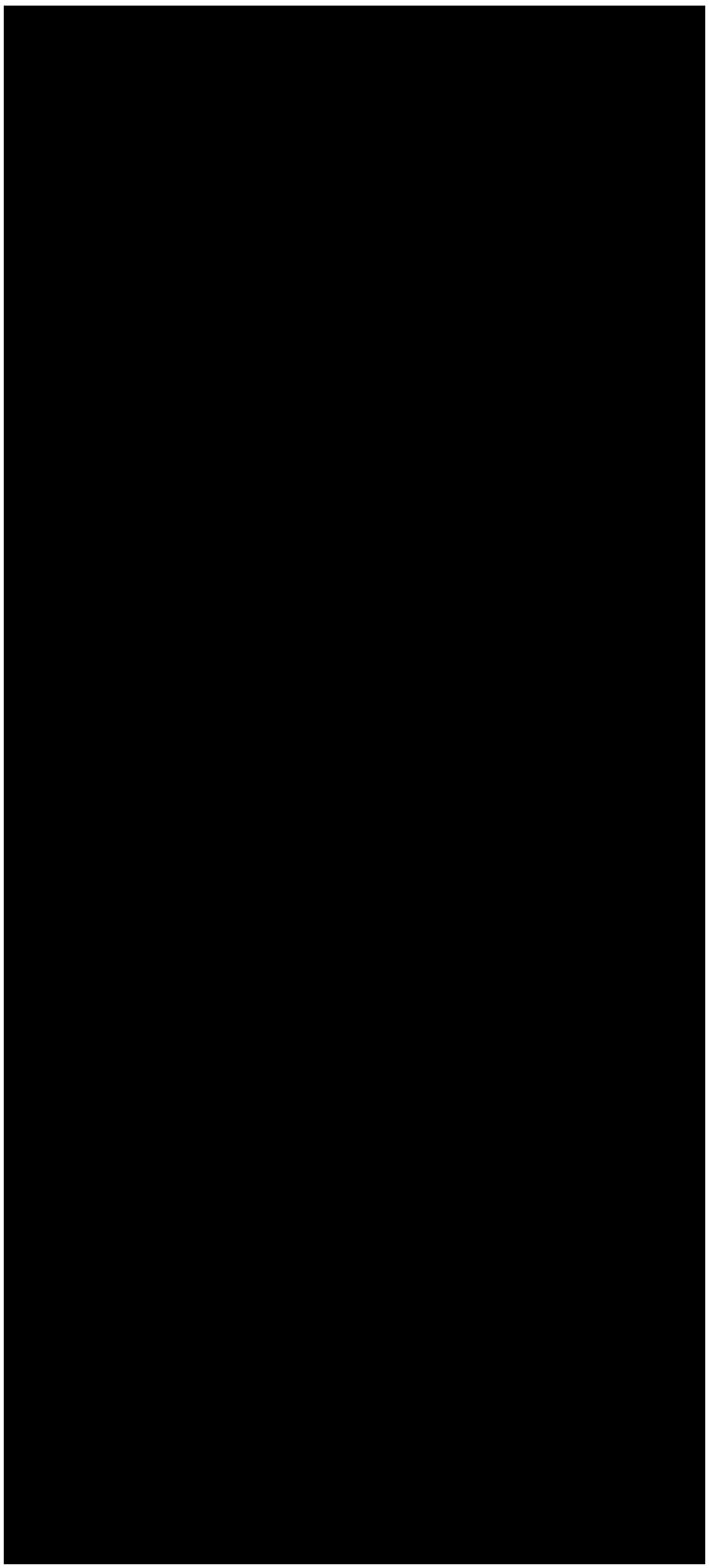
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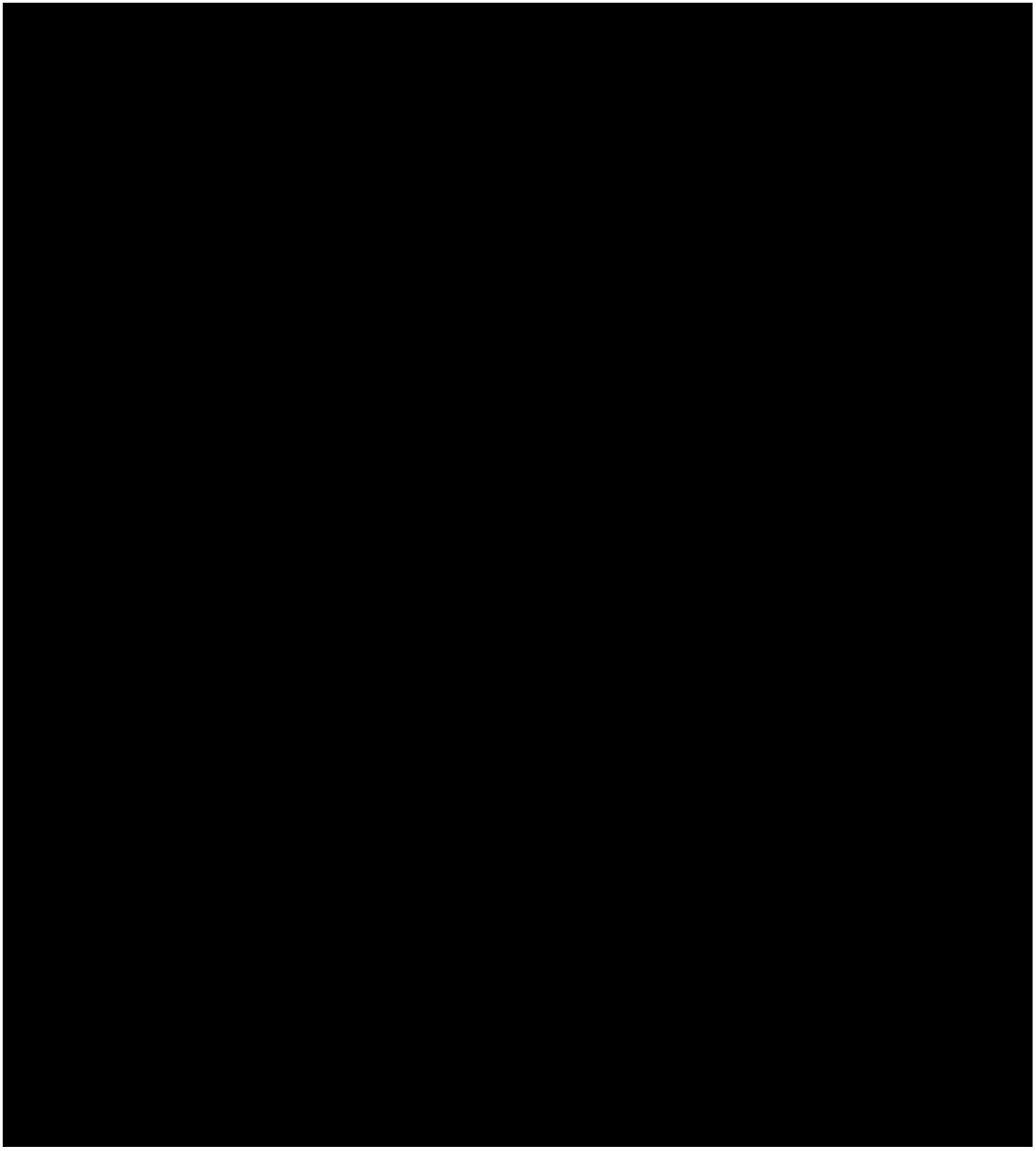


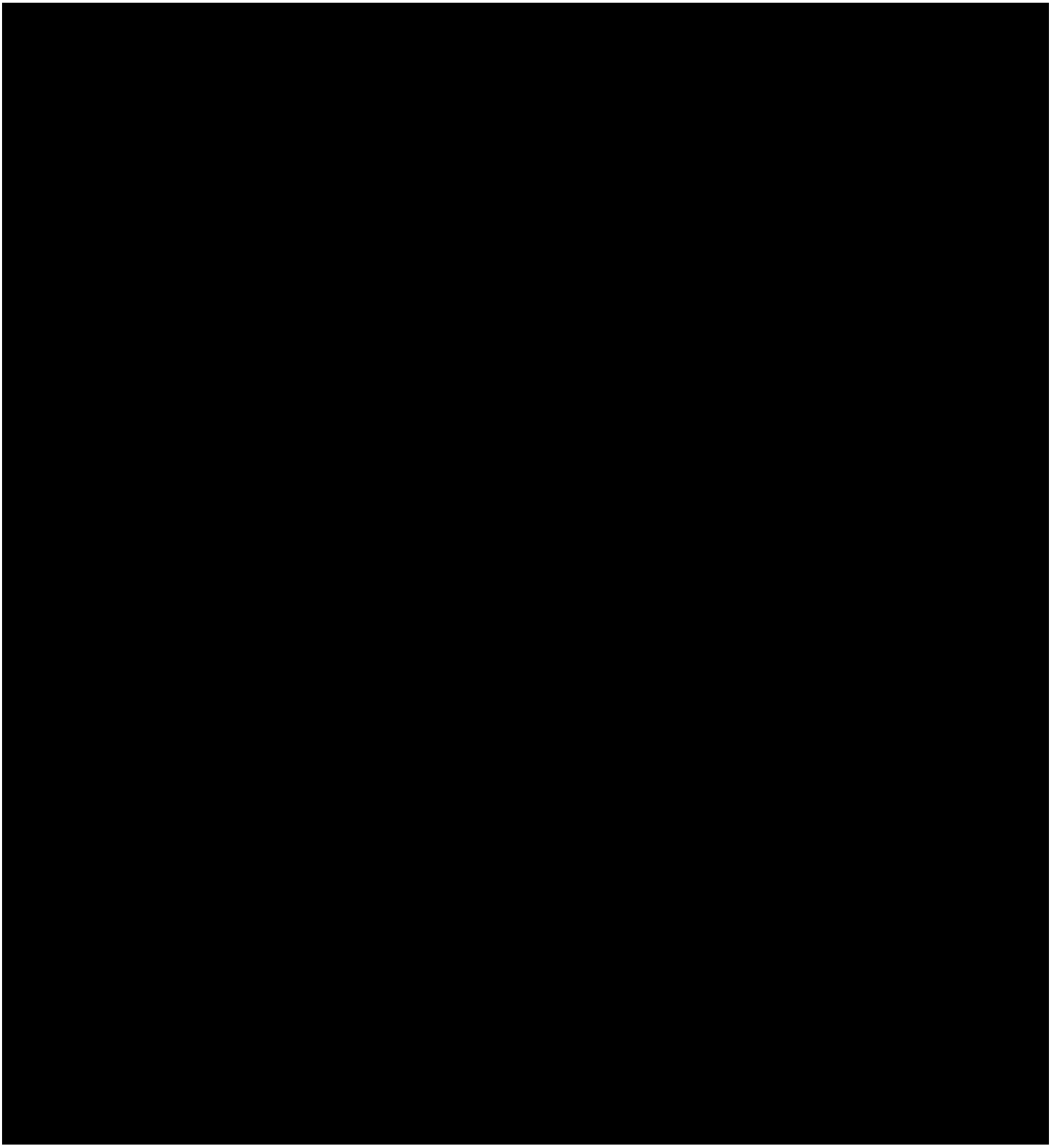


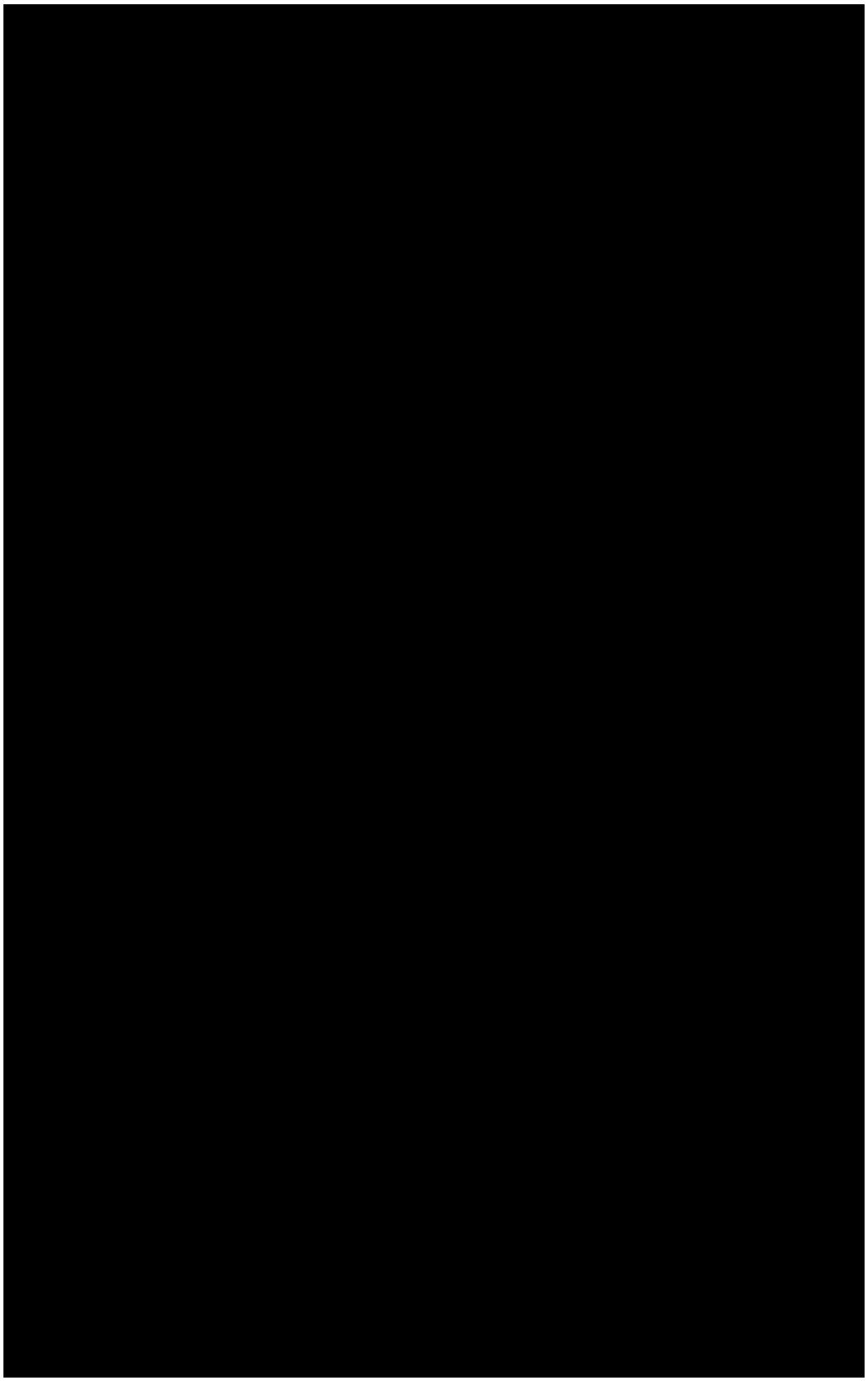


Pipe Information



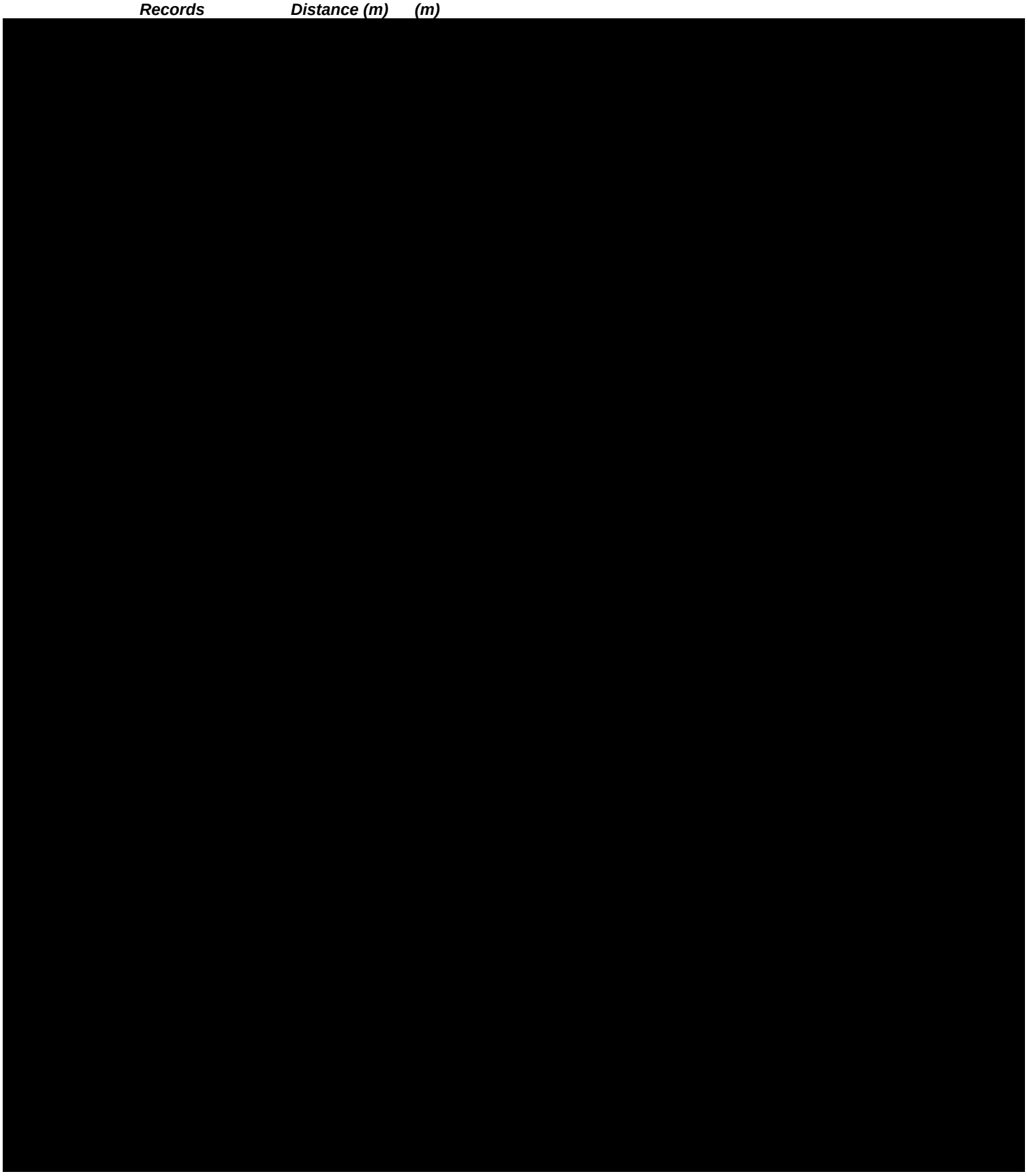




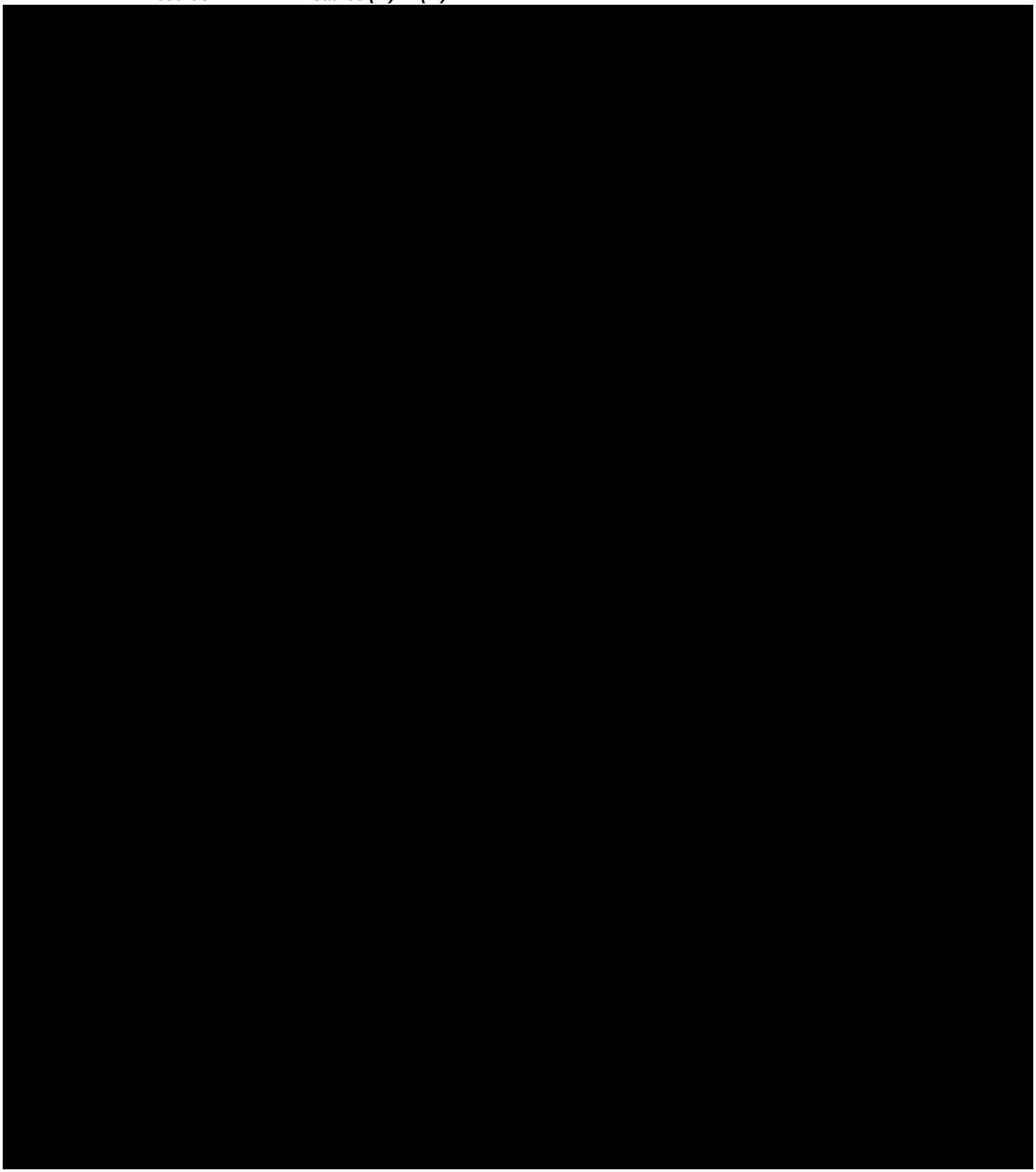


Results of Well Yield Testing

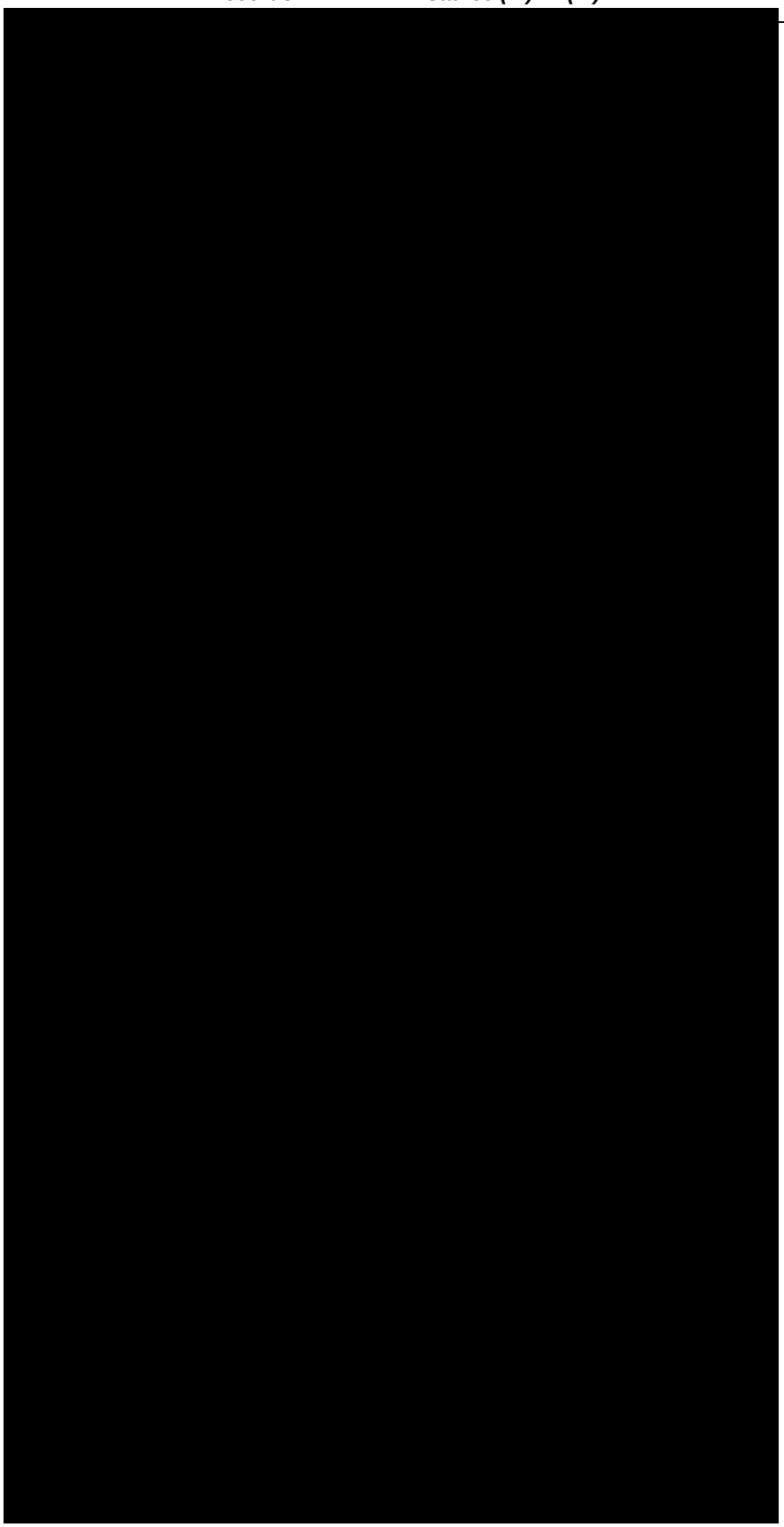
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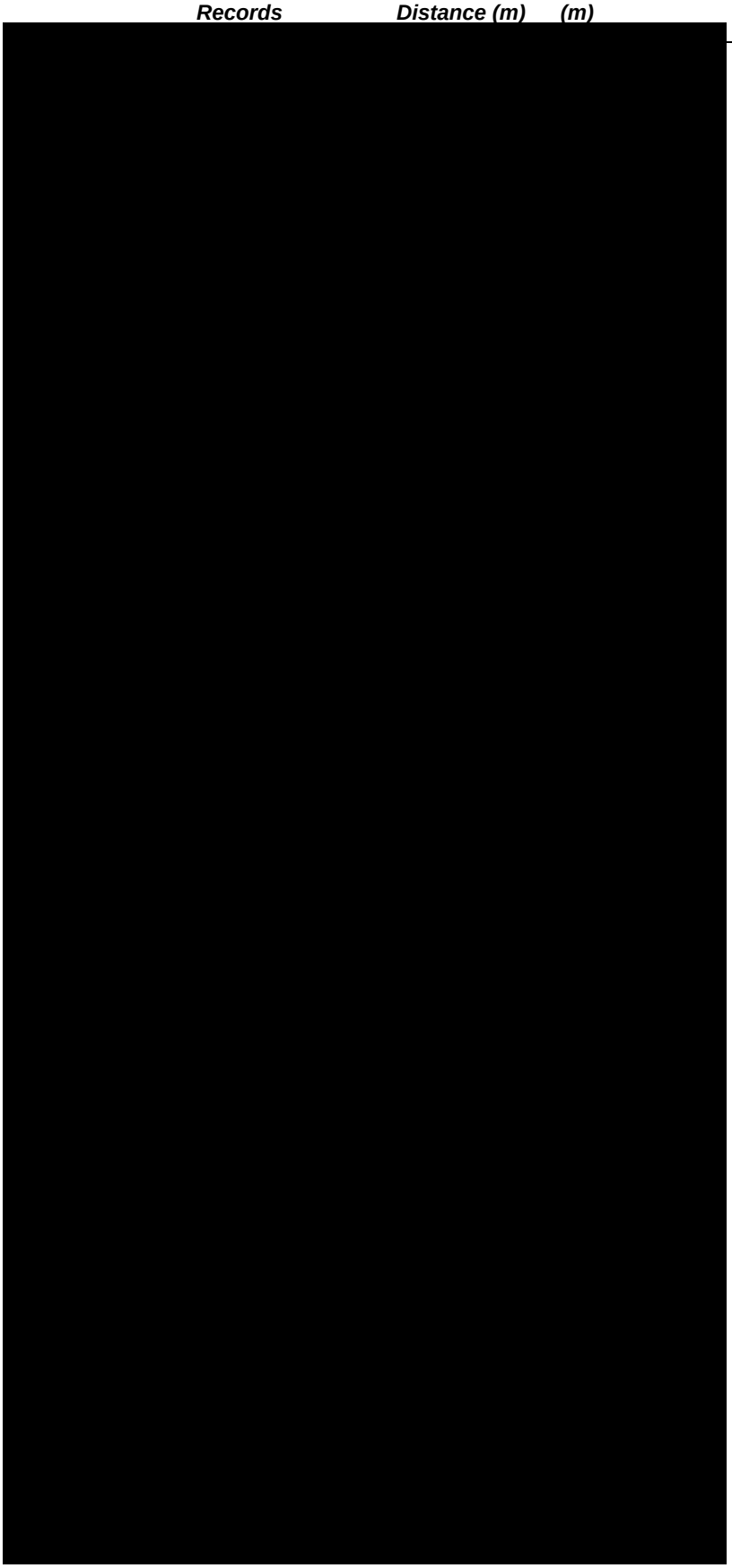


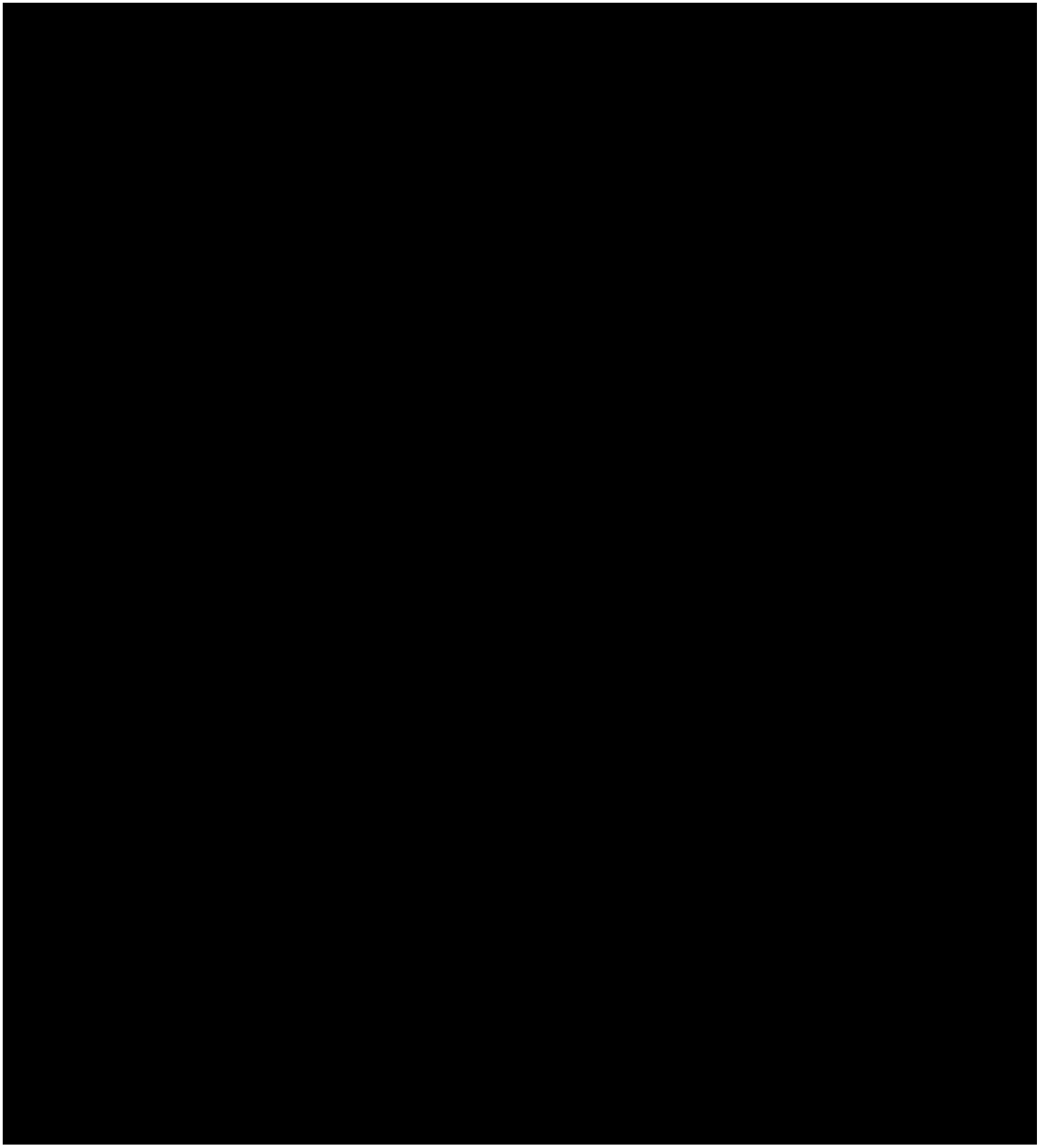
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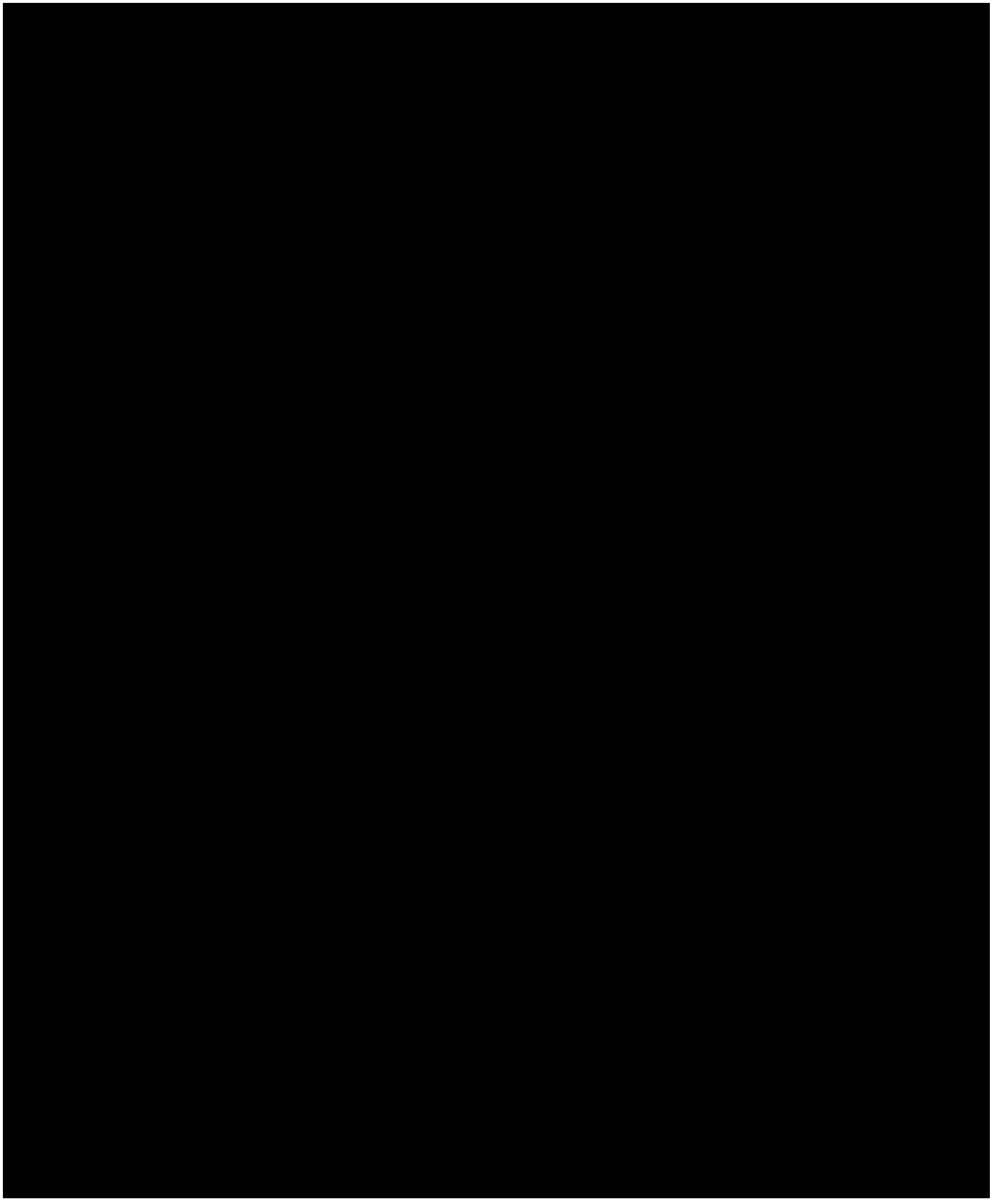


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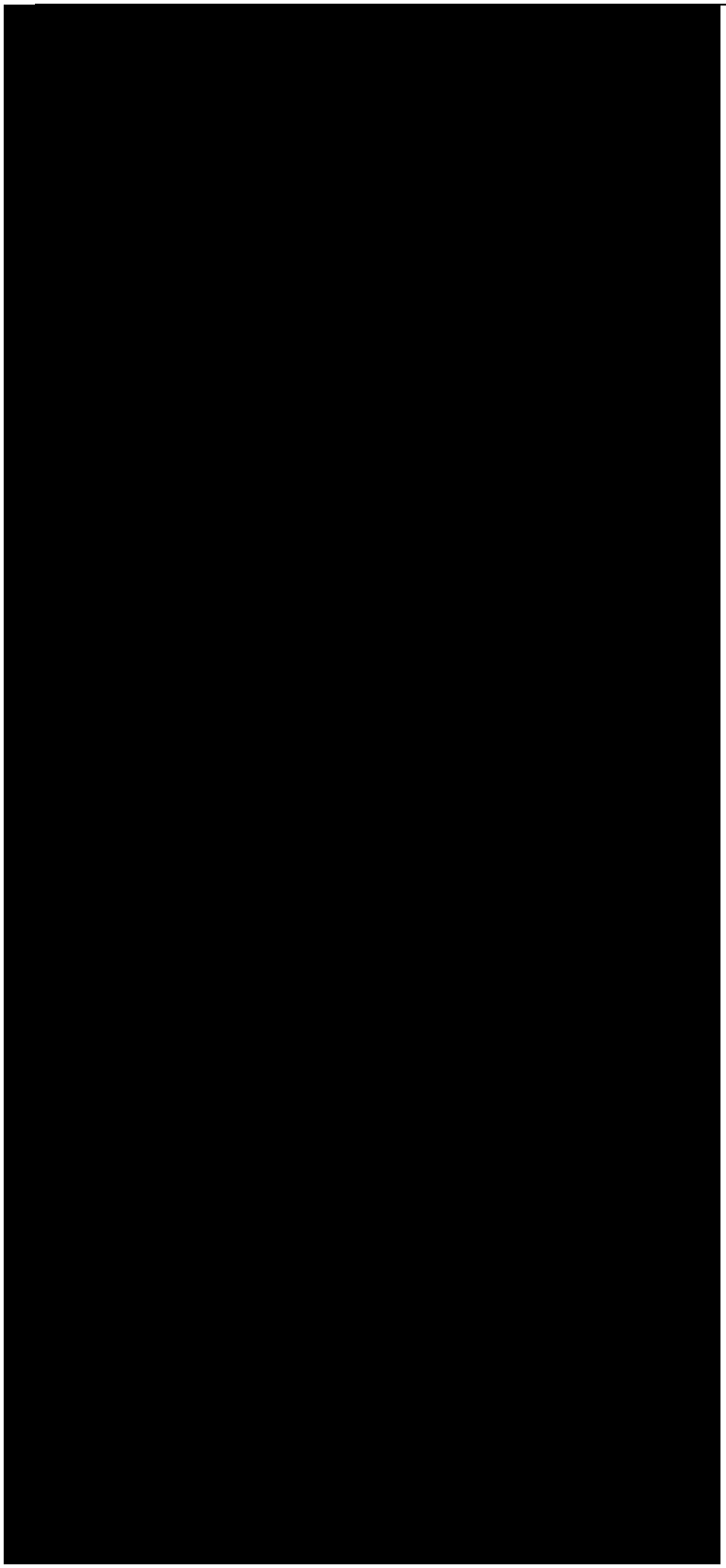


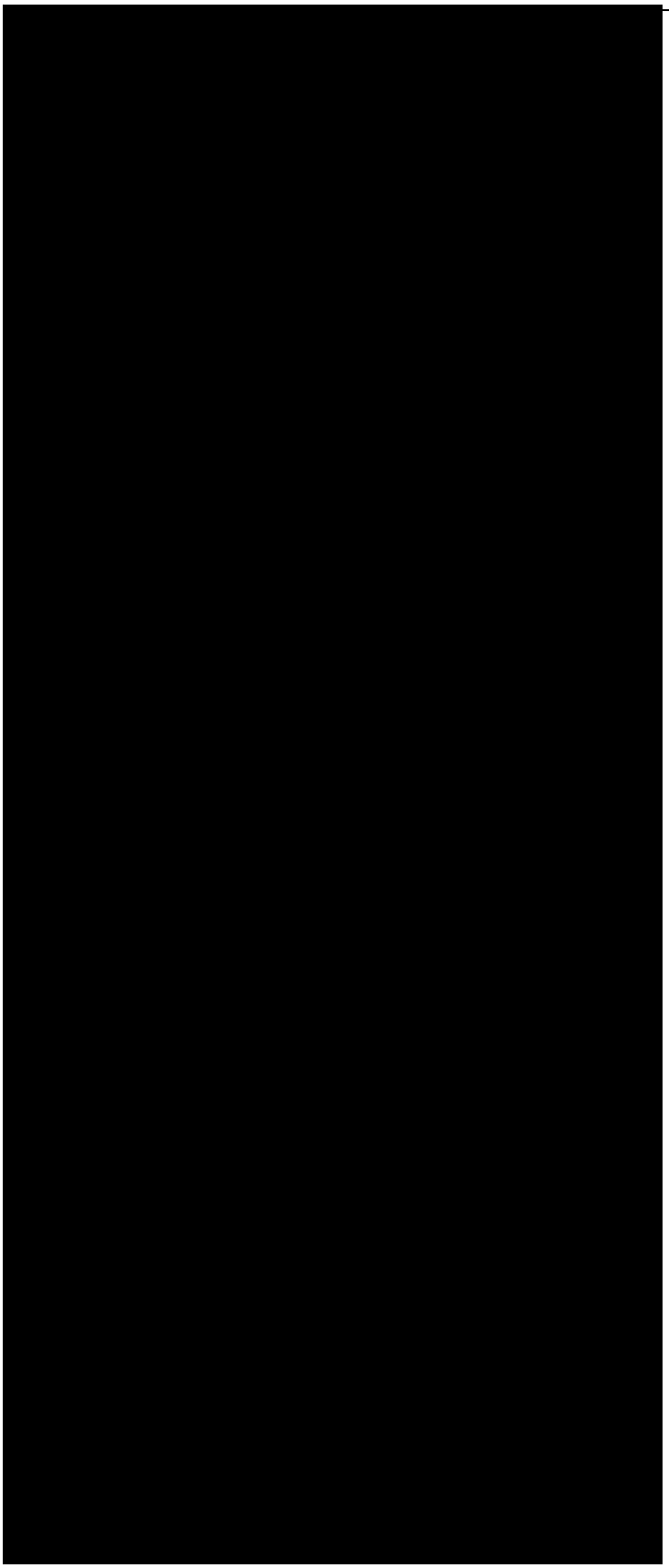




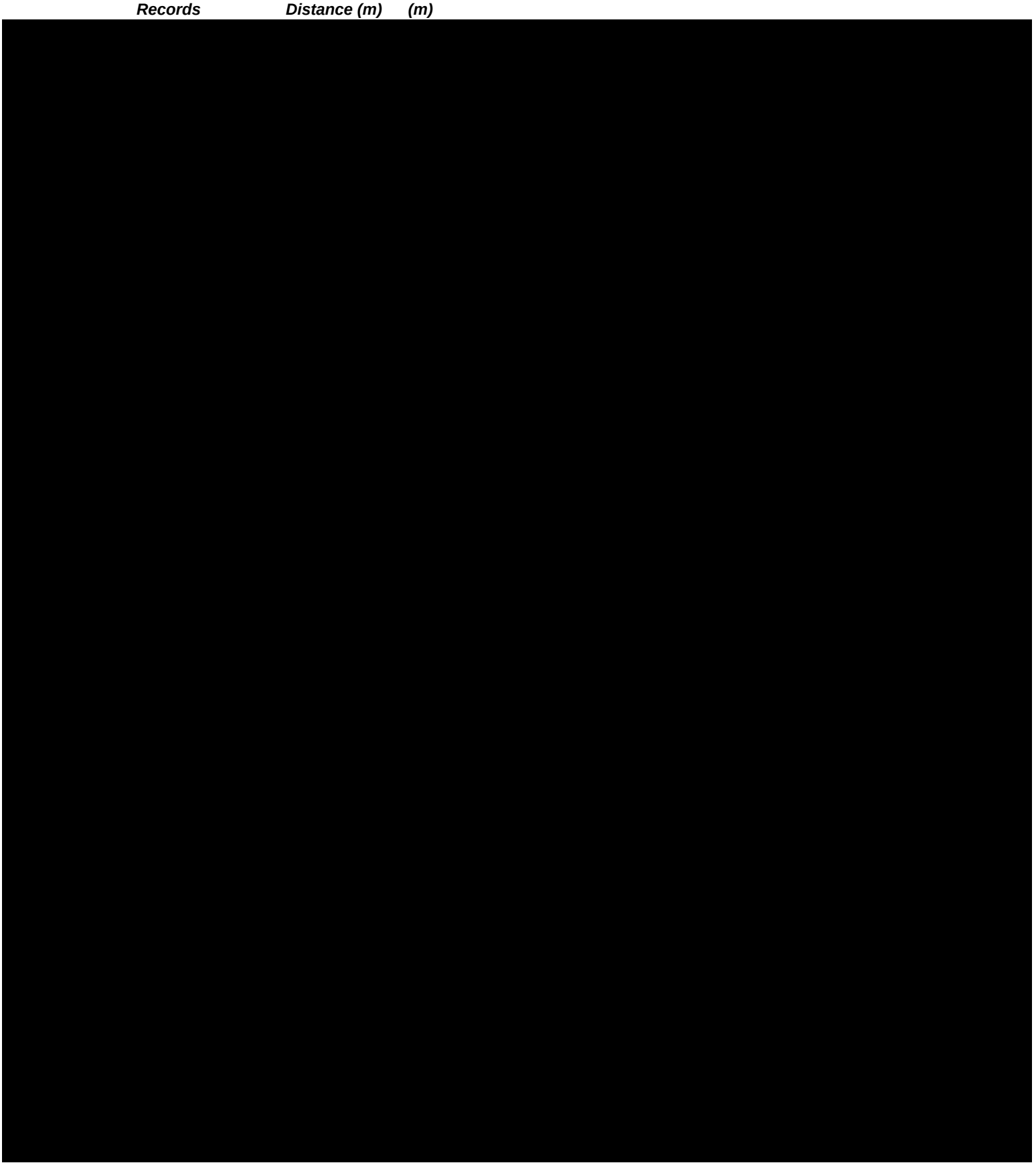


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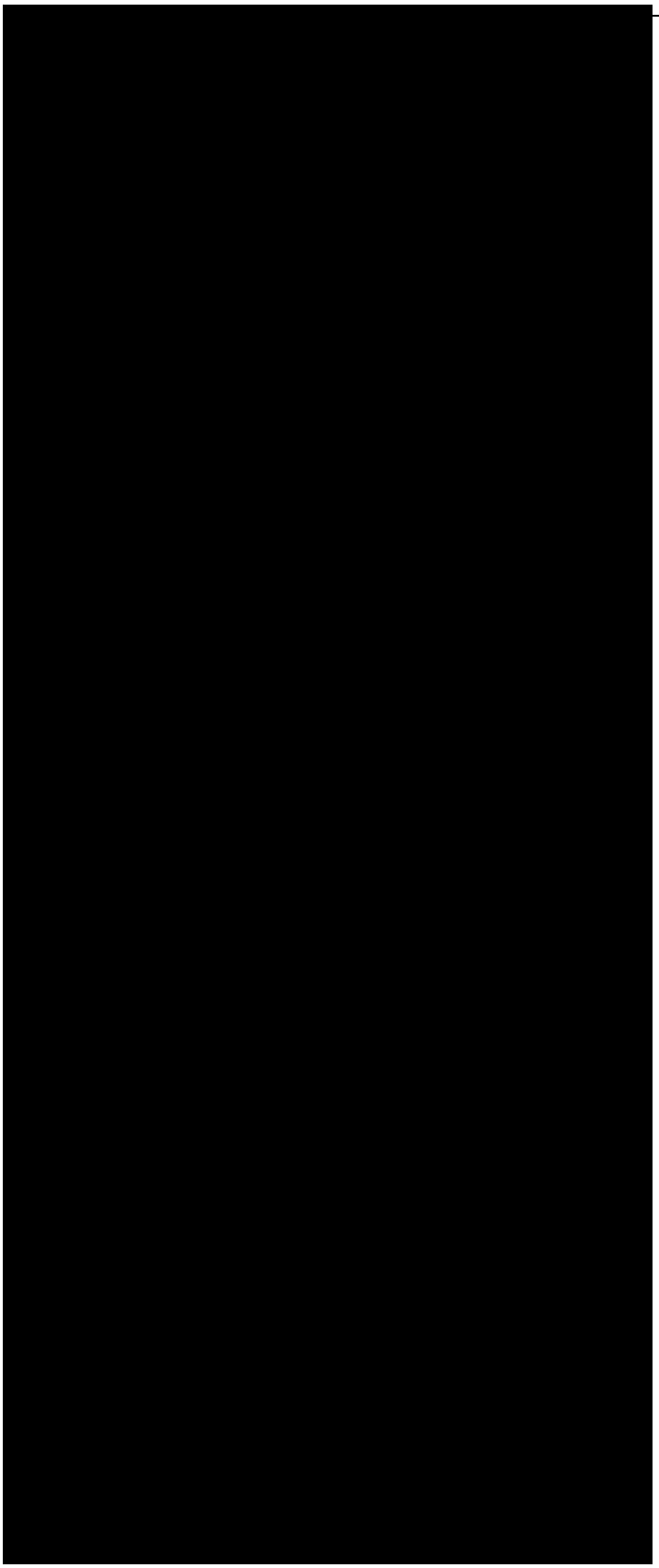




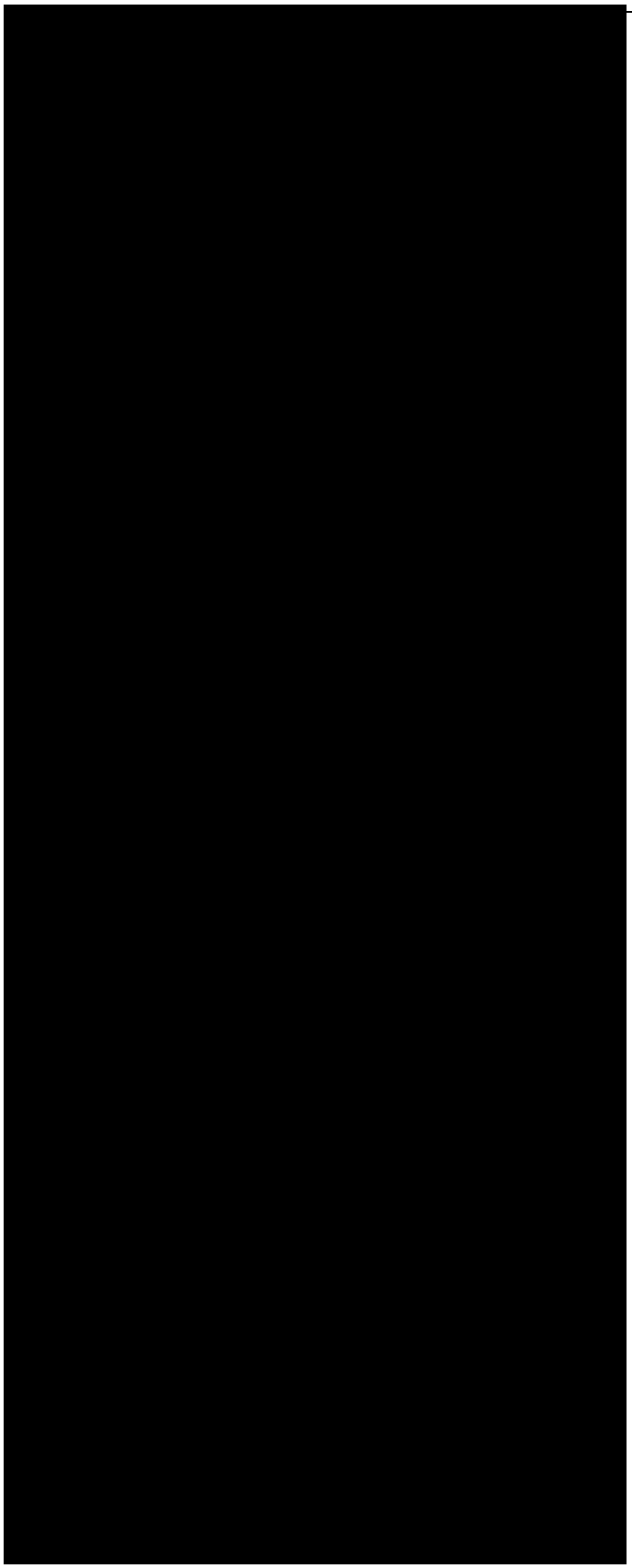
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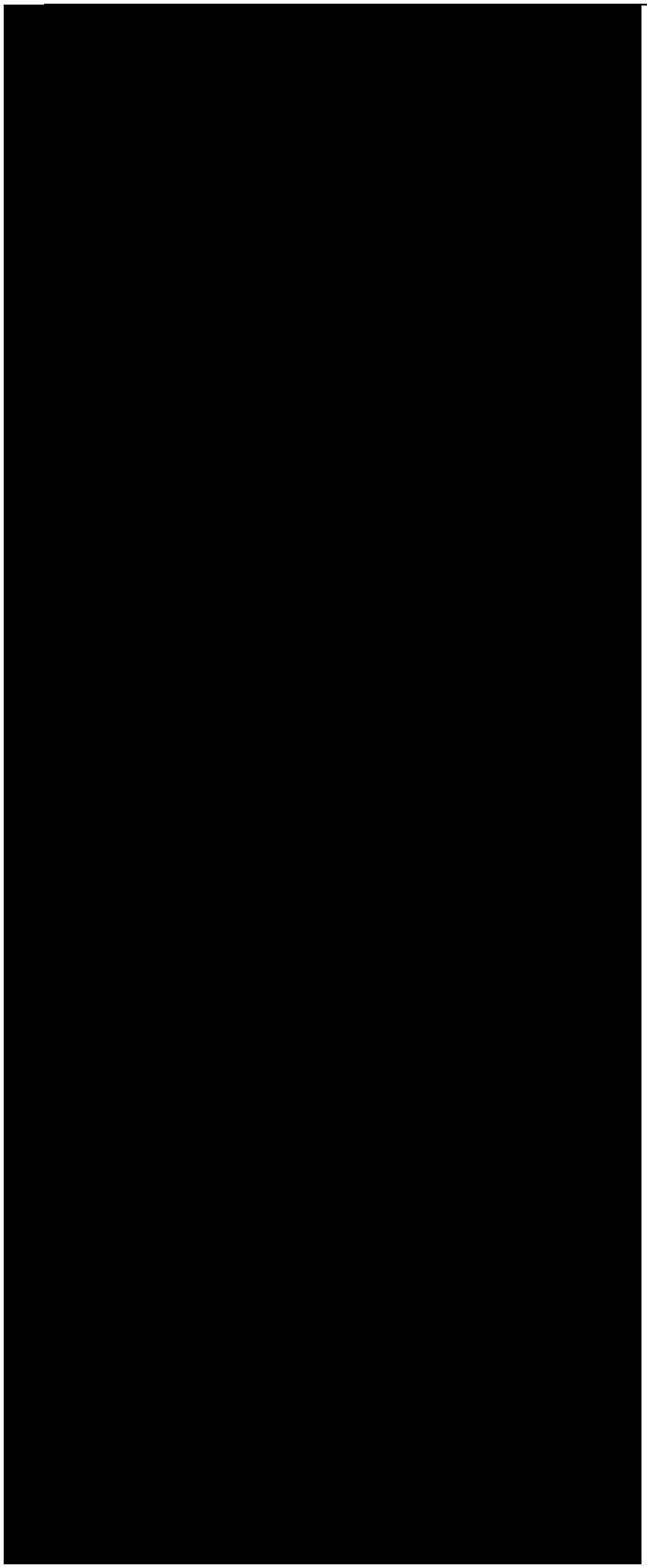
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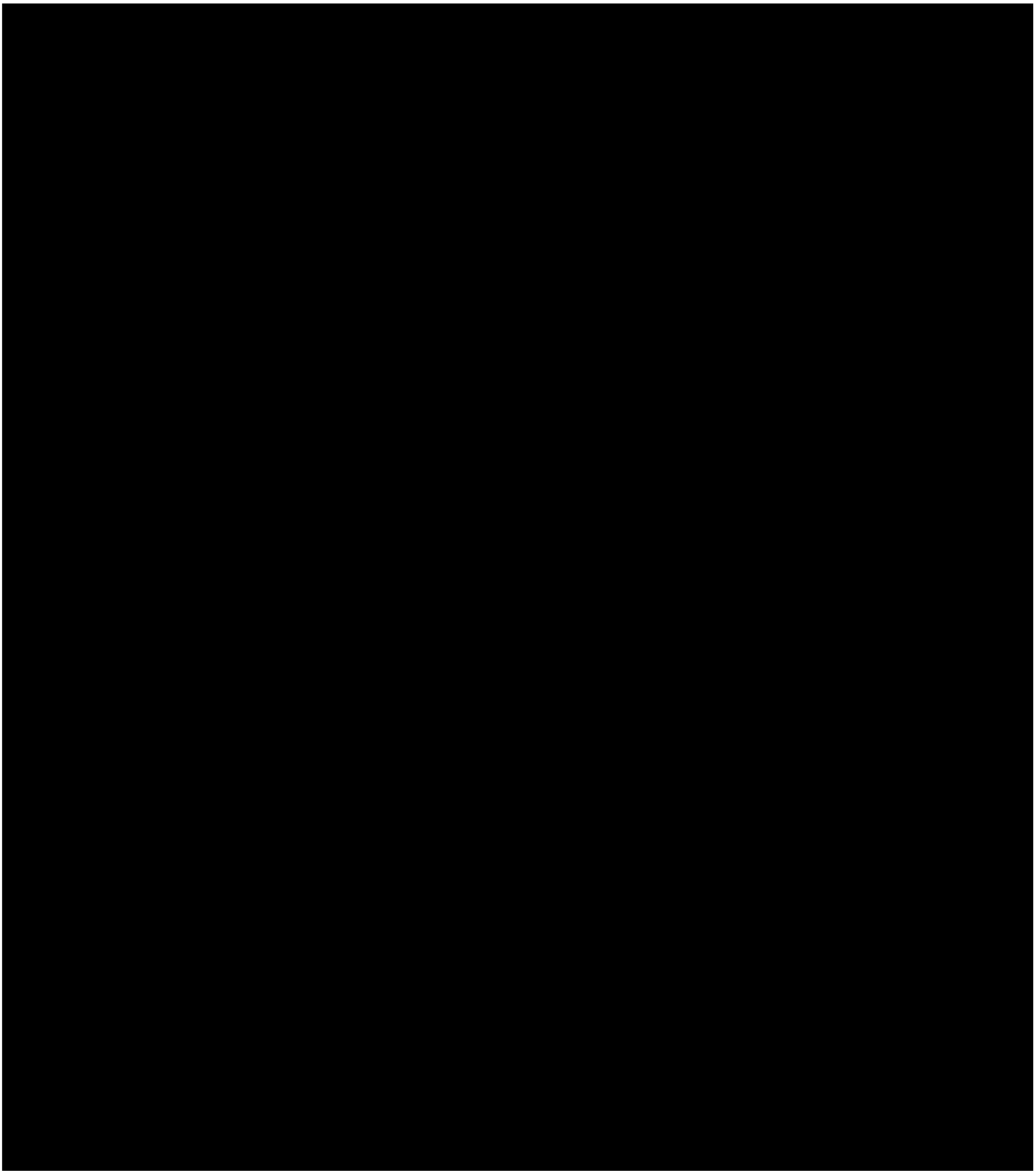
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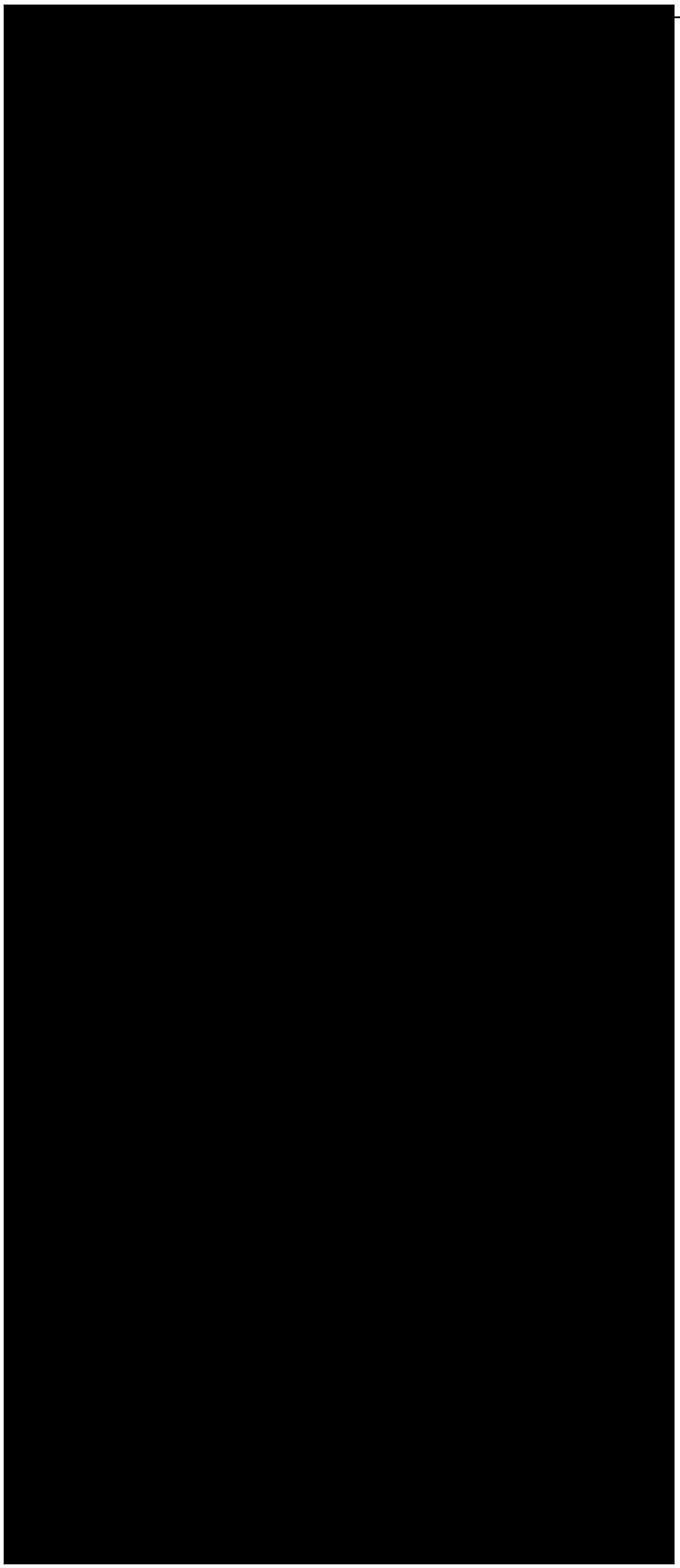


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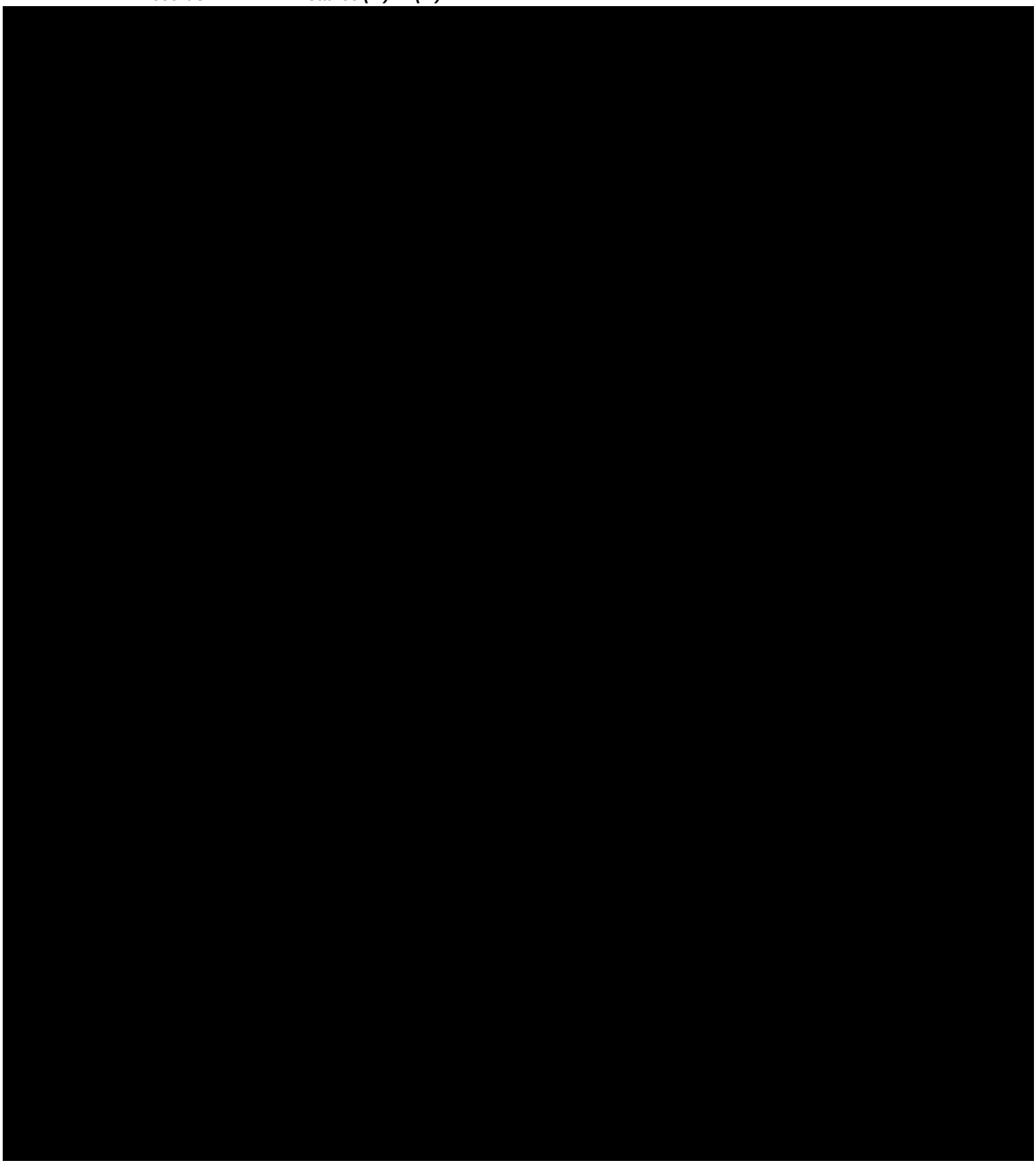


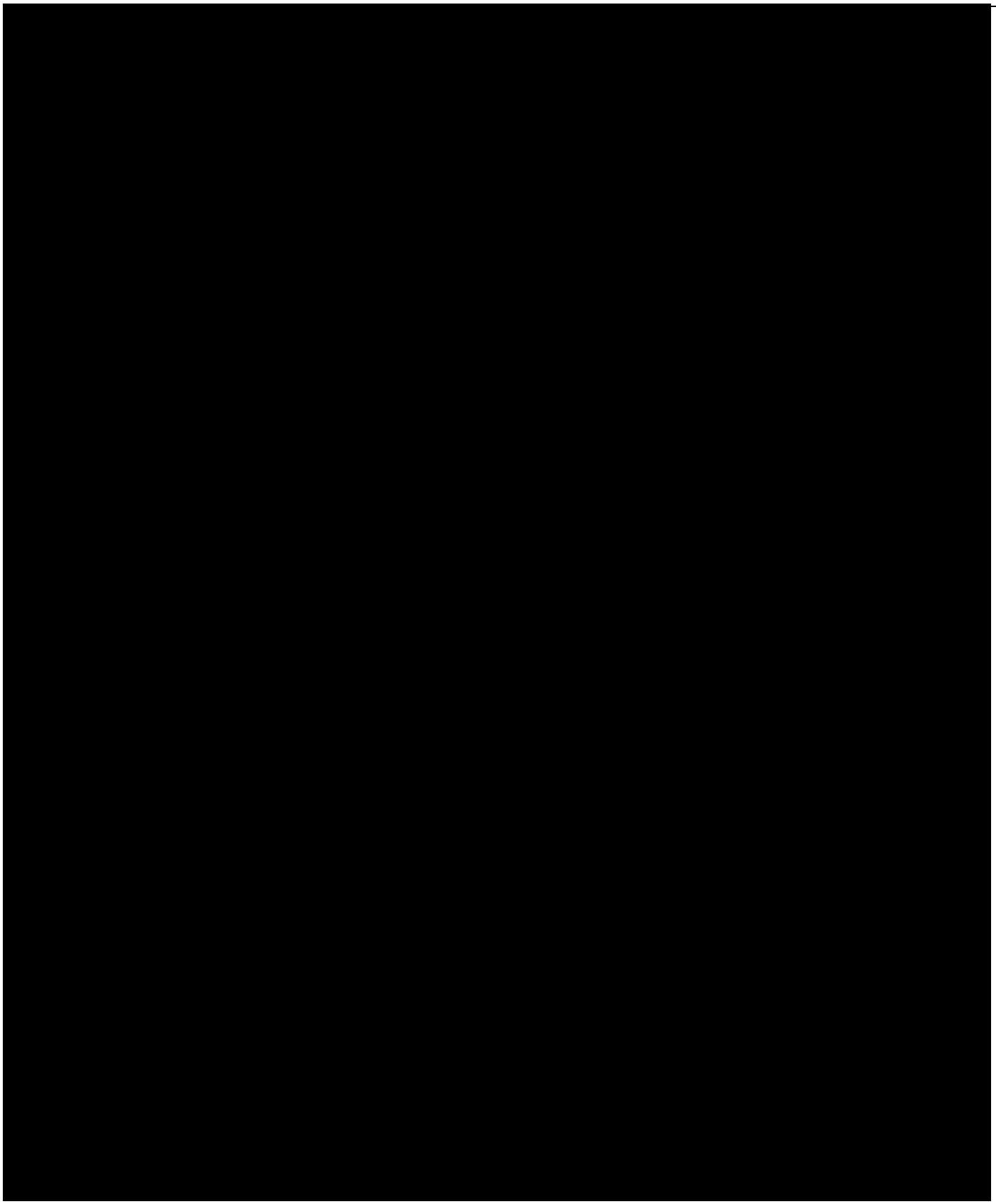
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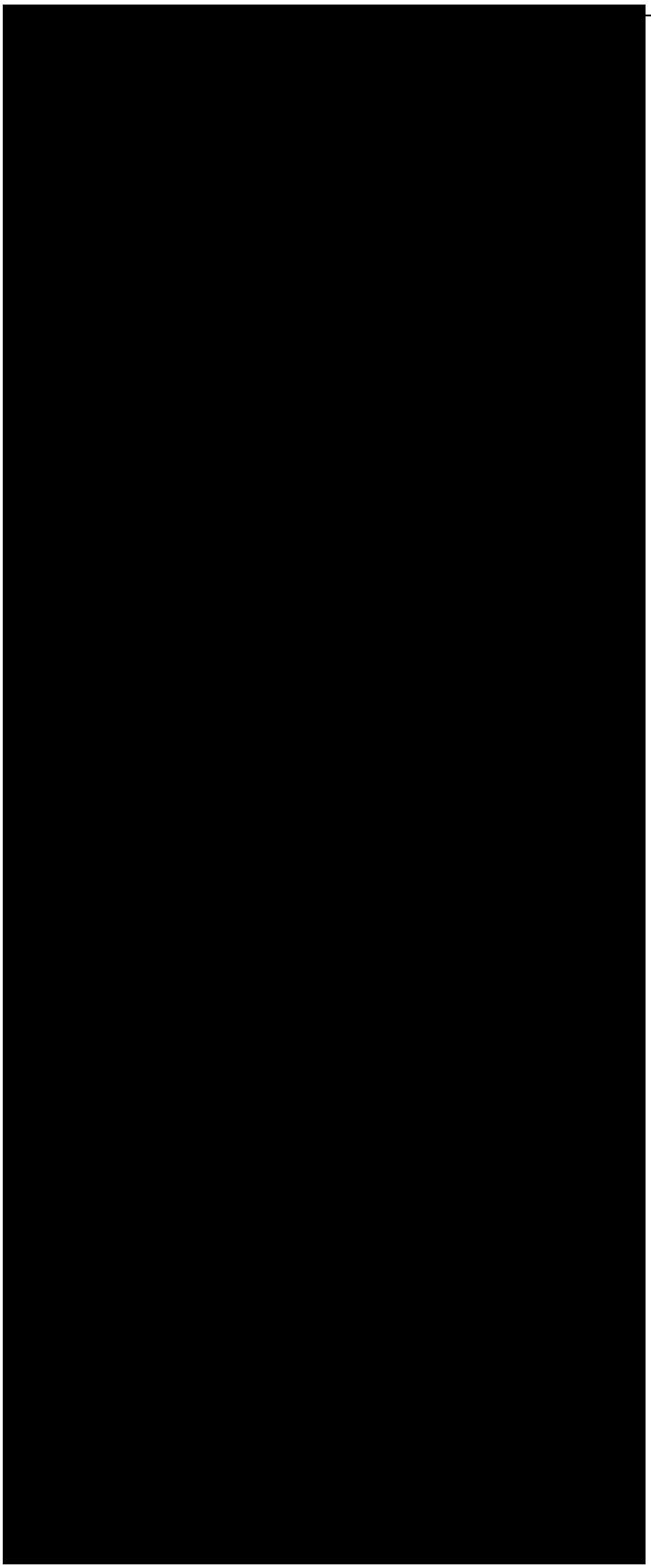


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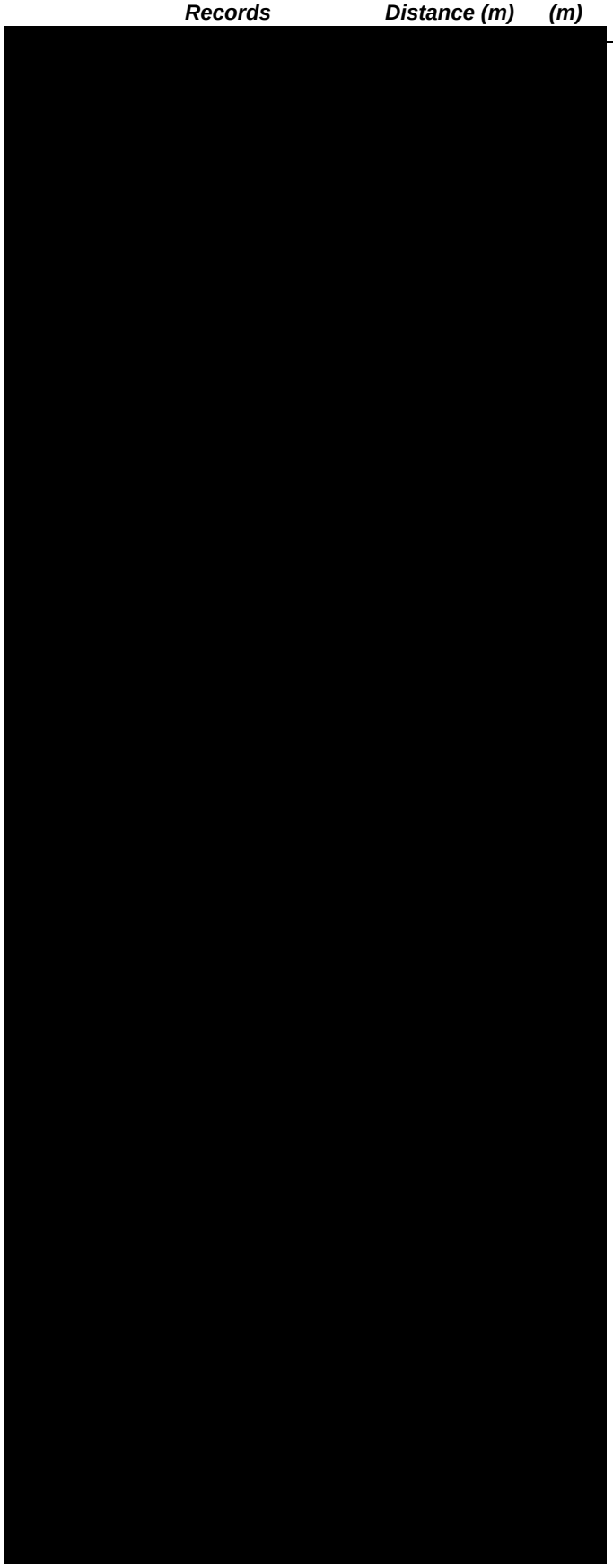


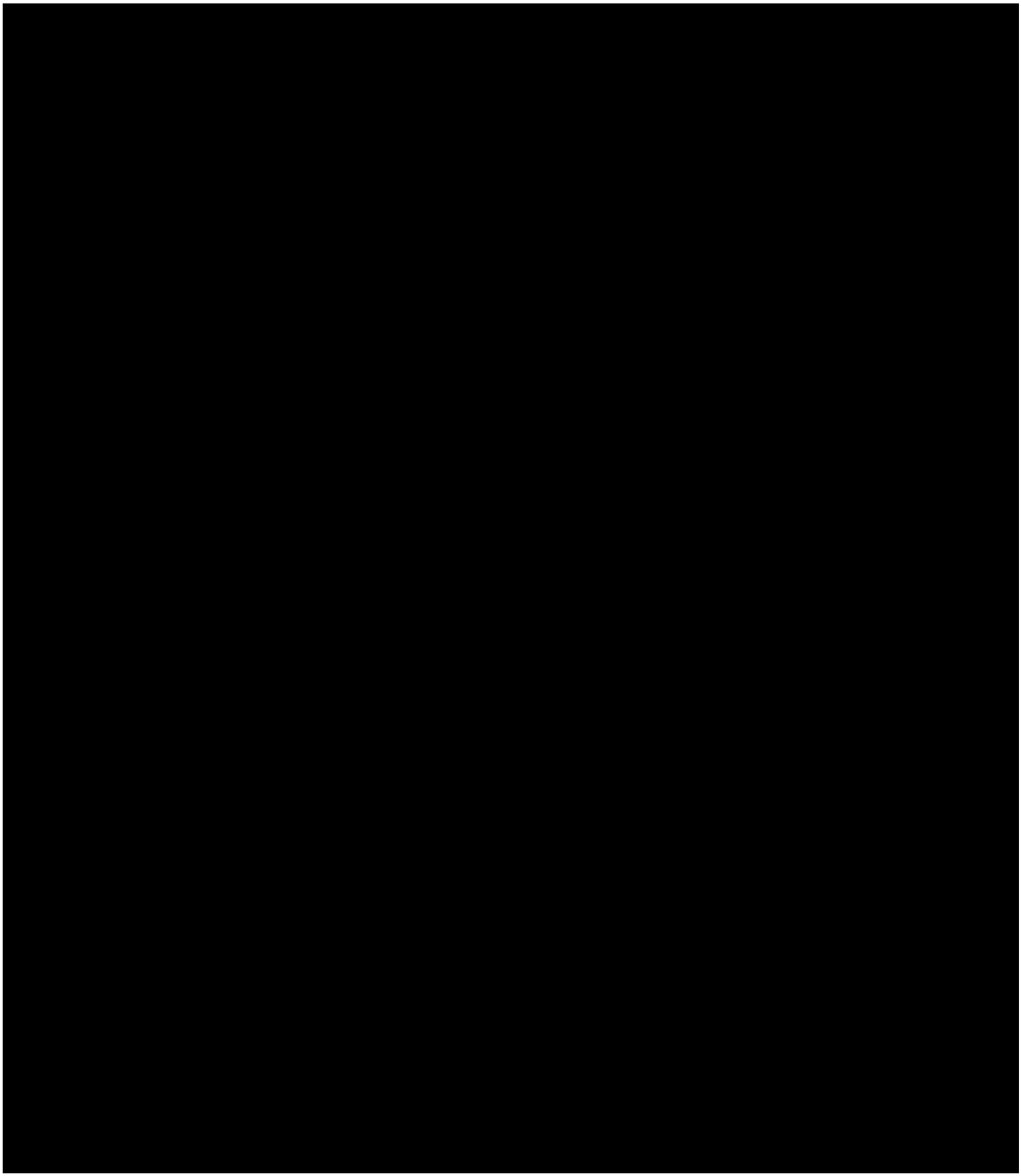


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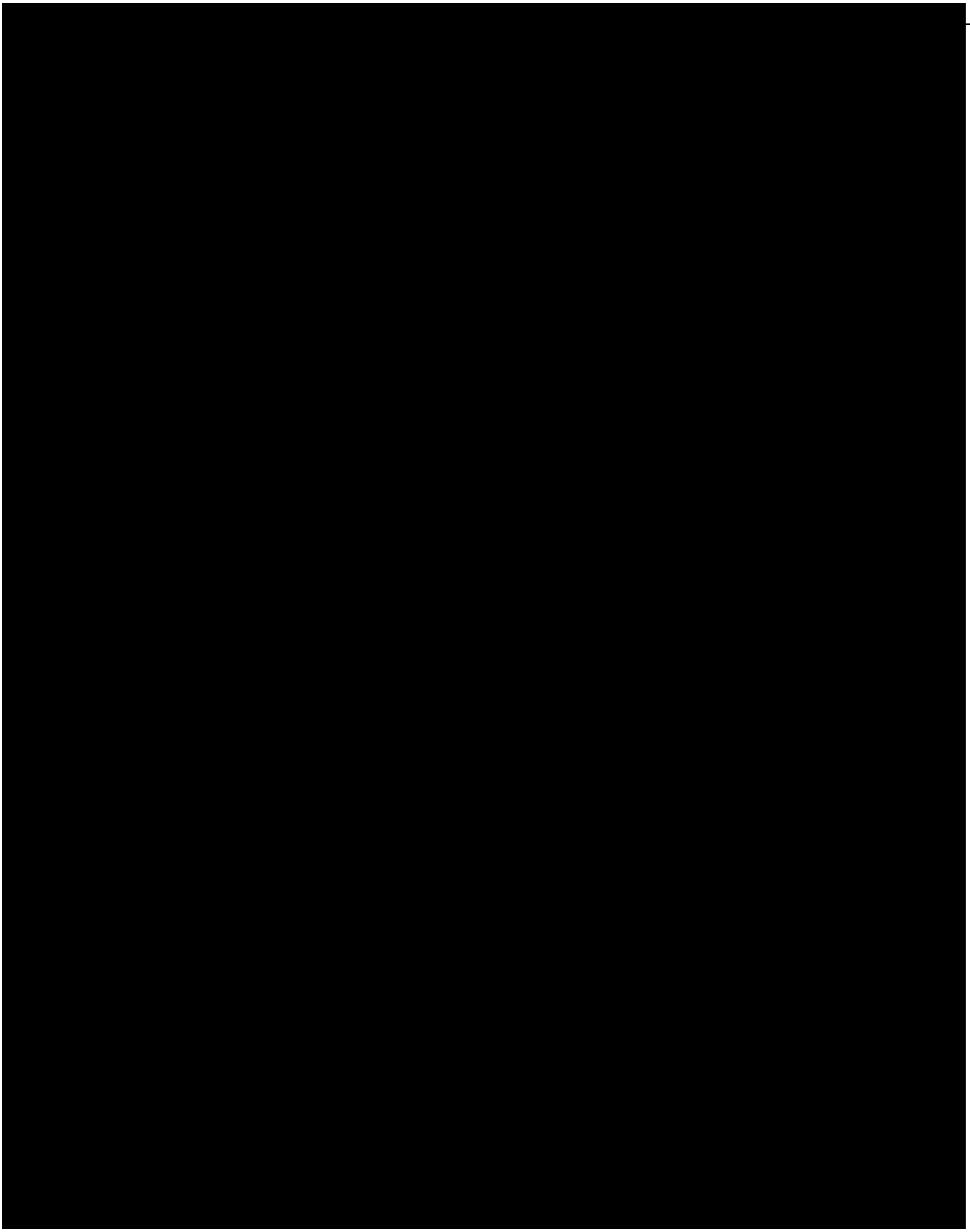


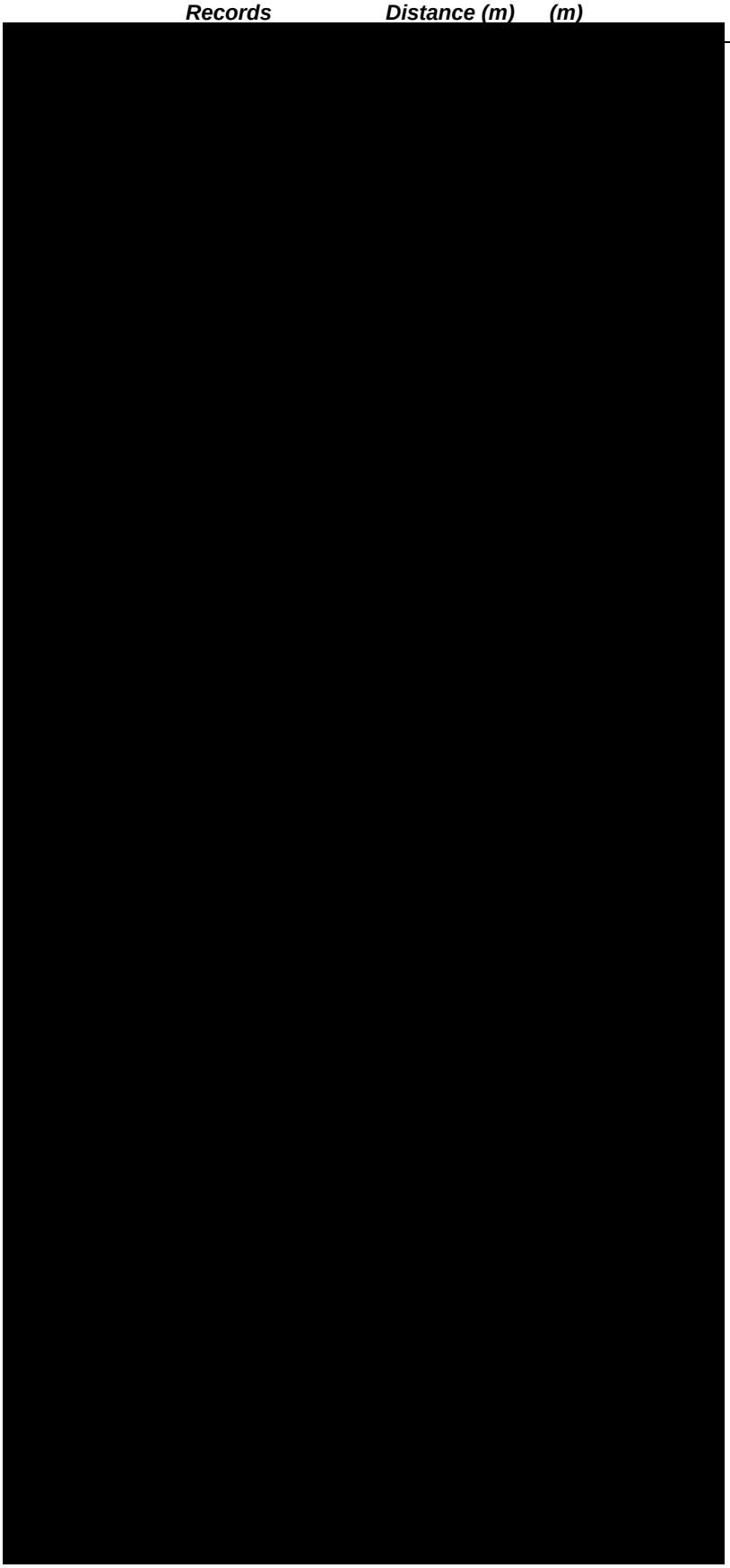
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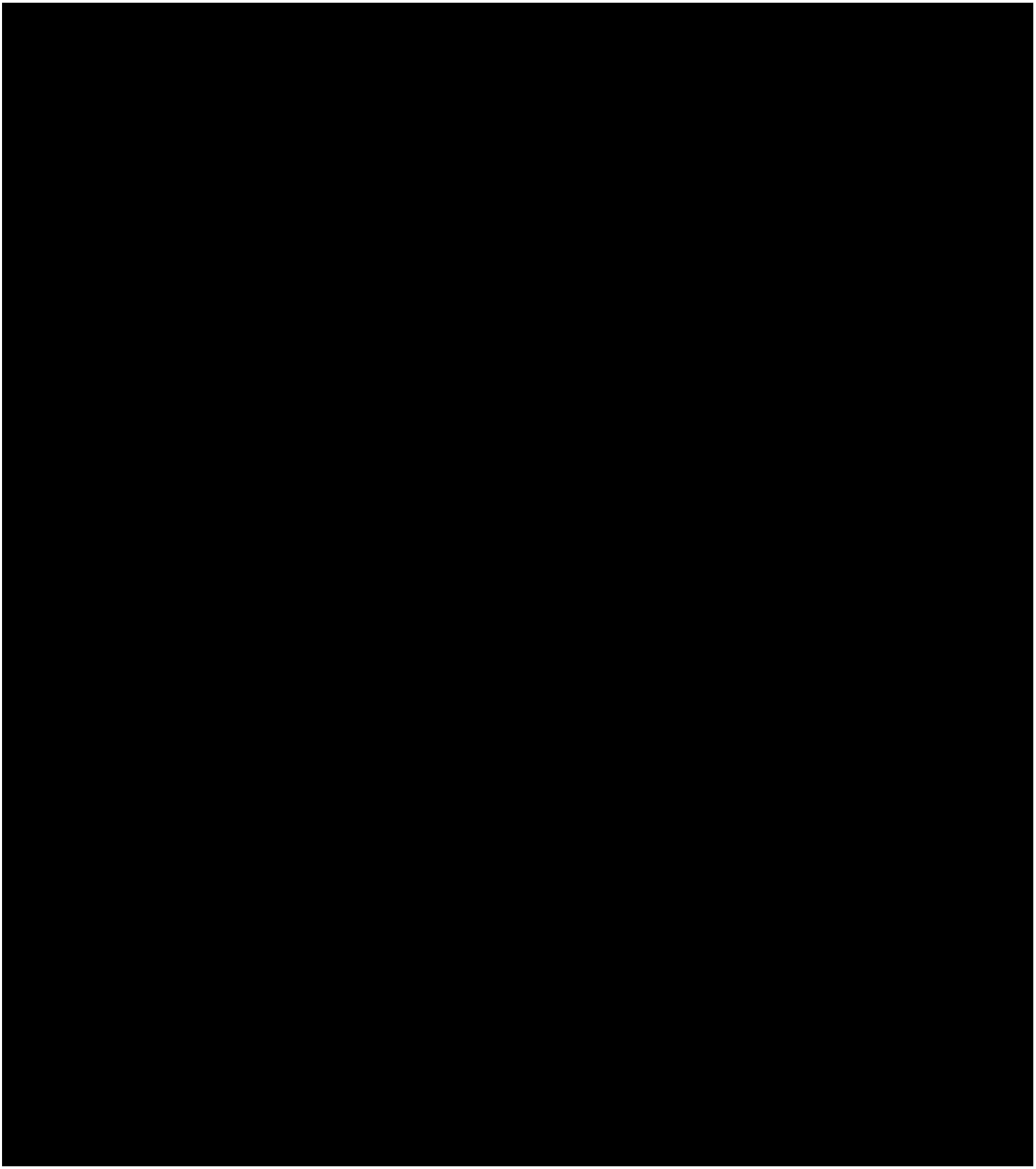


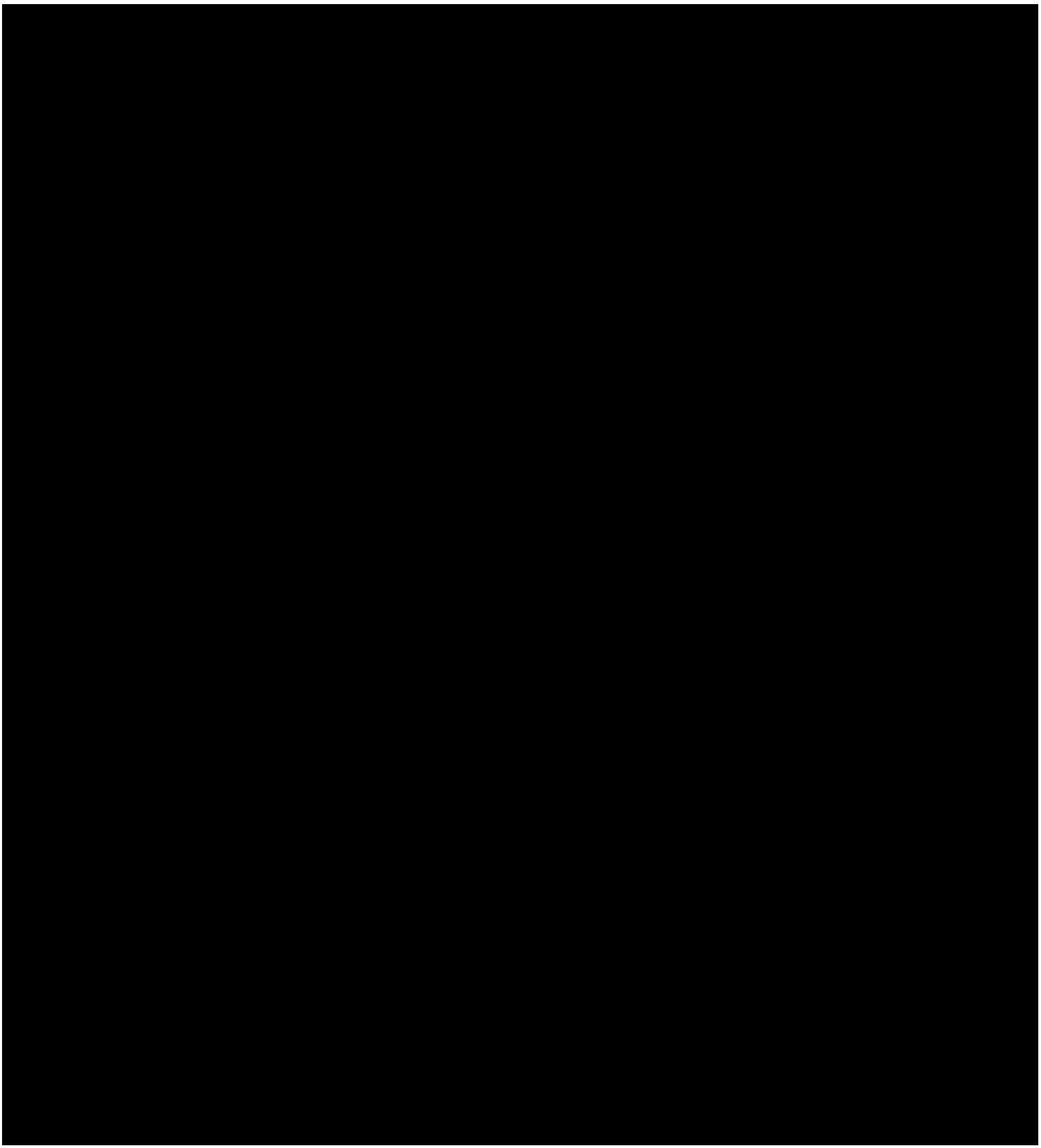
Bore Hole Information



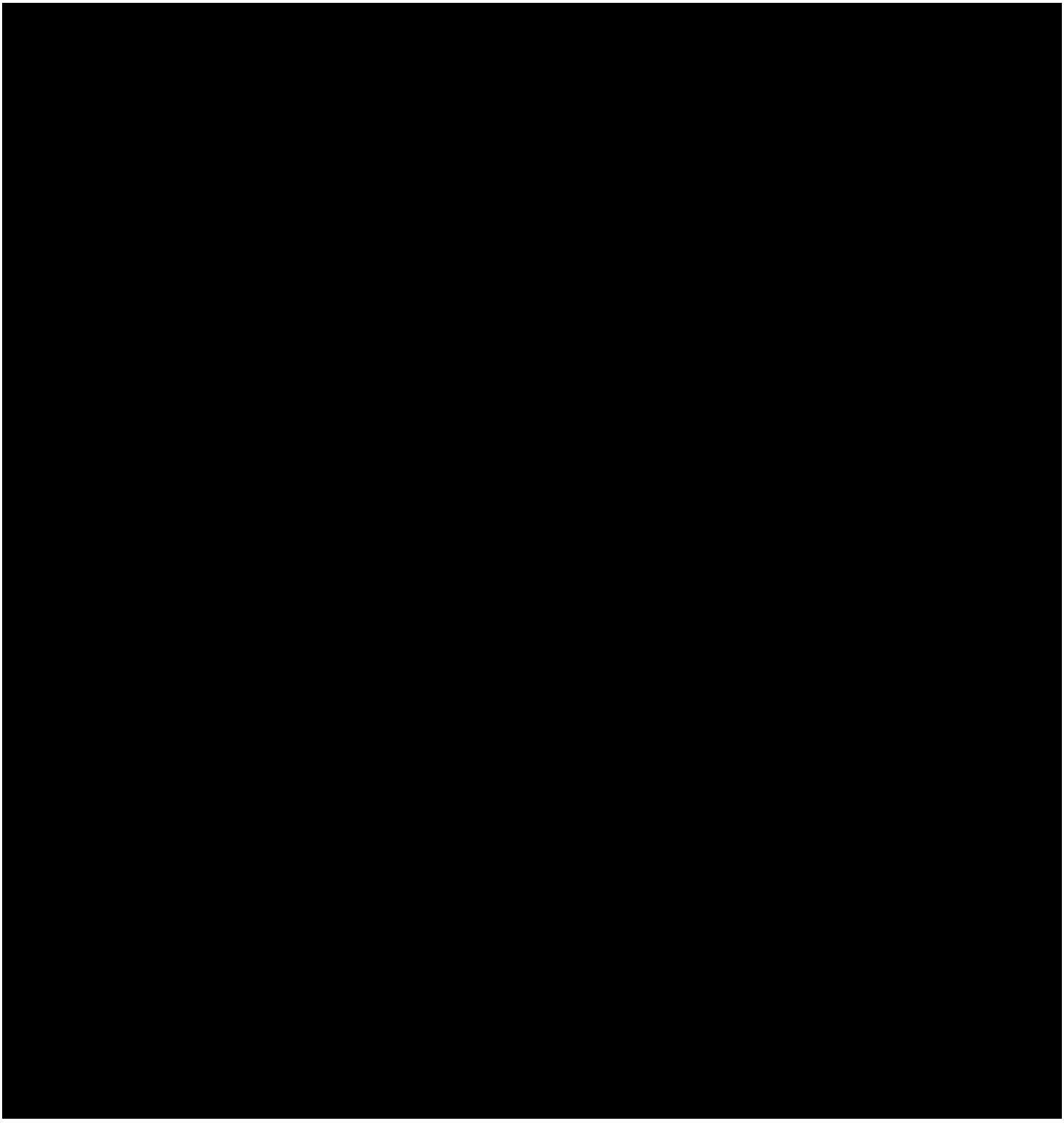


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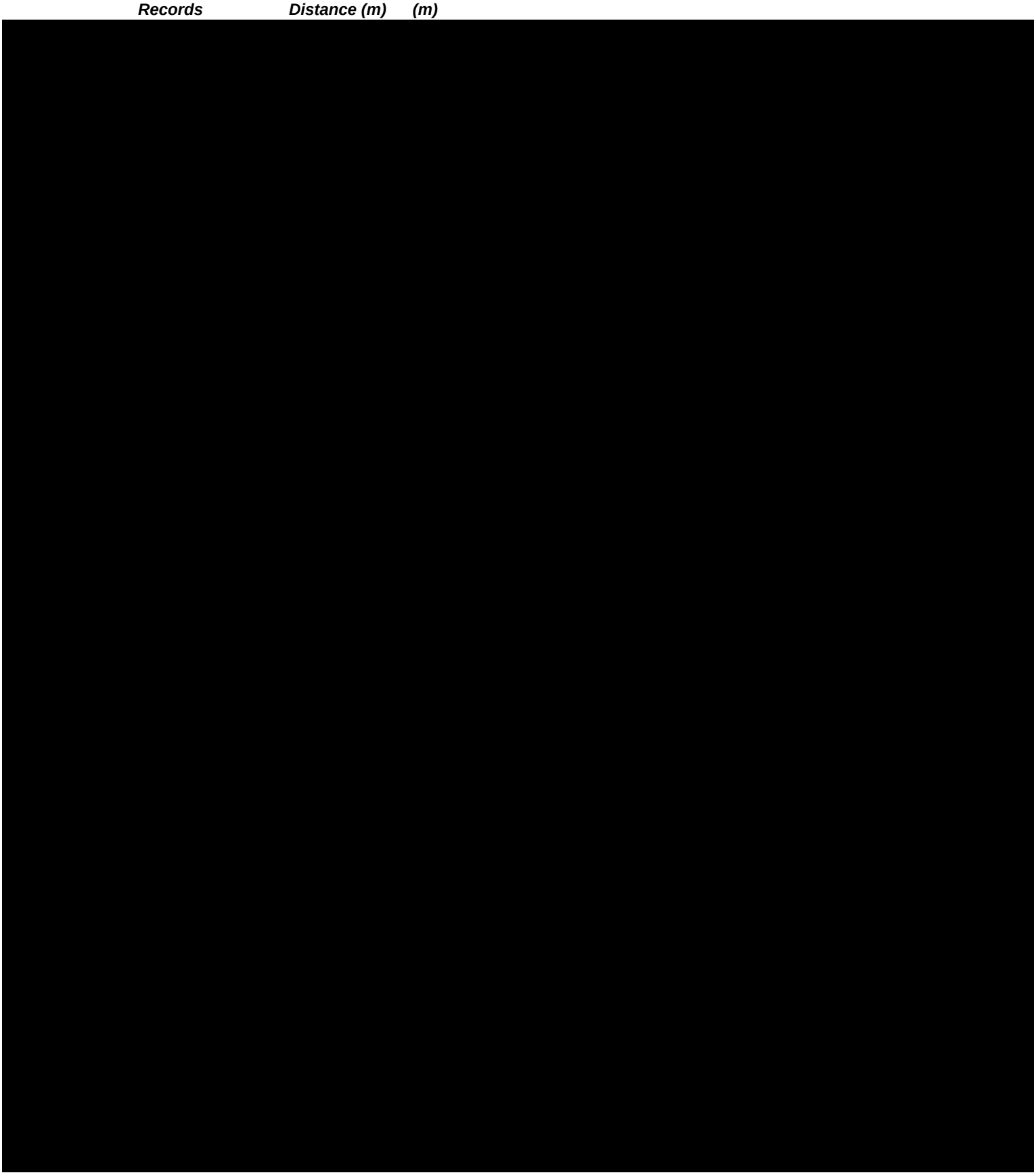




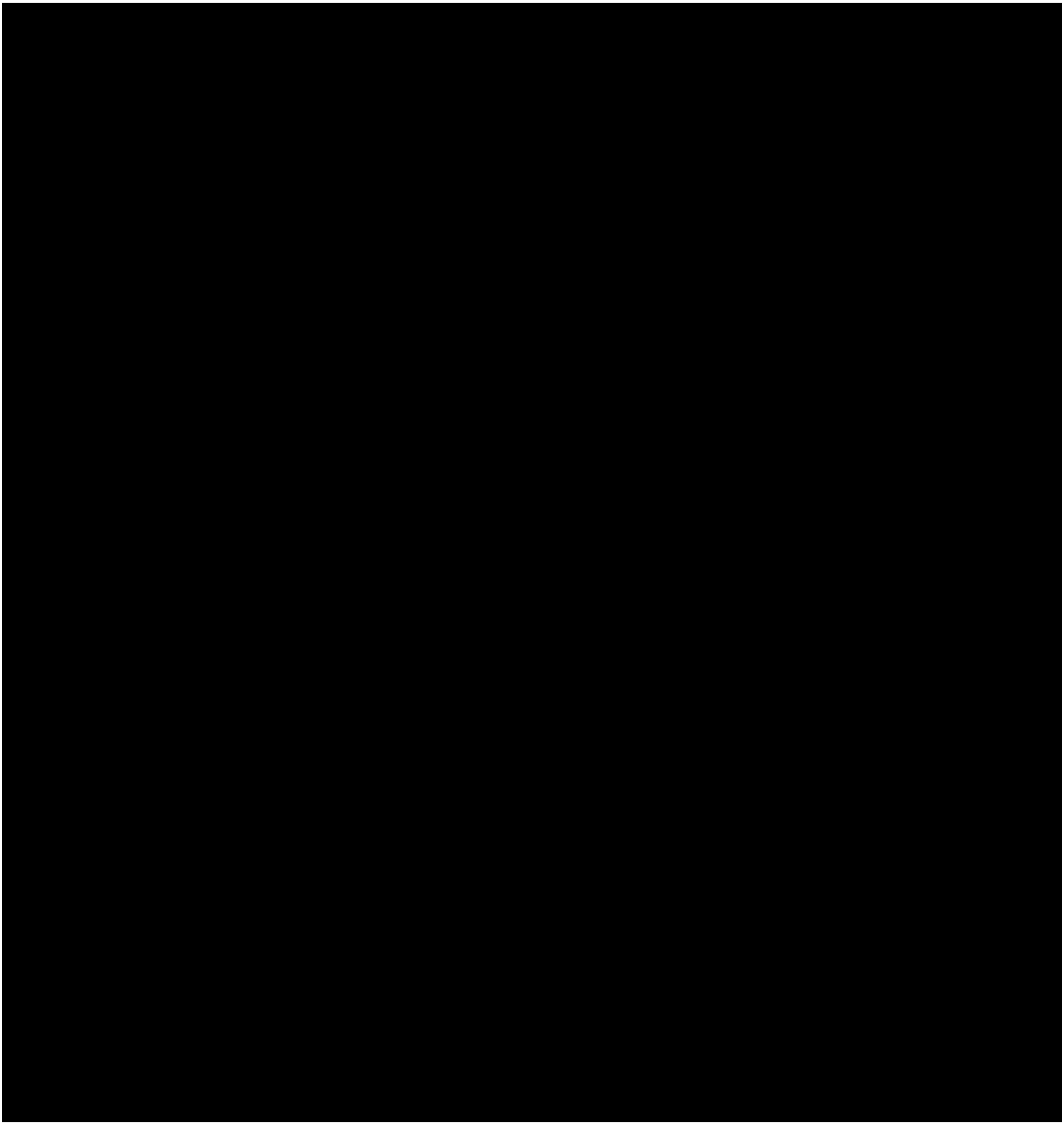
Method of Construction & Well Use



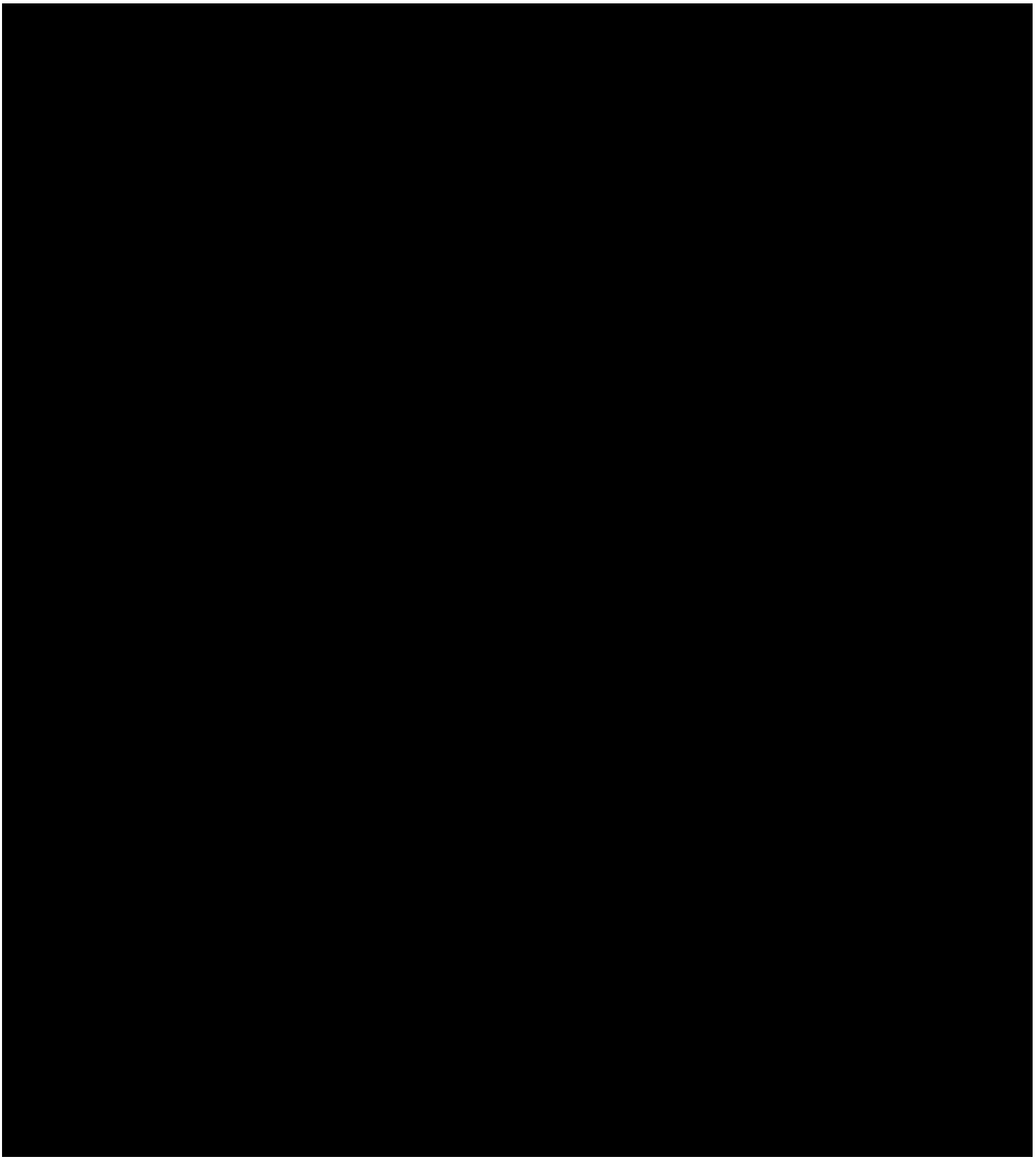
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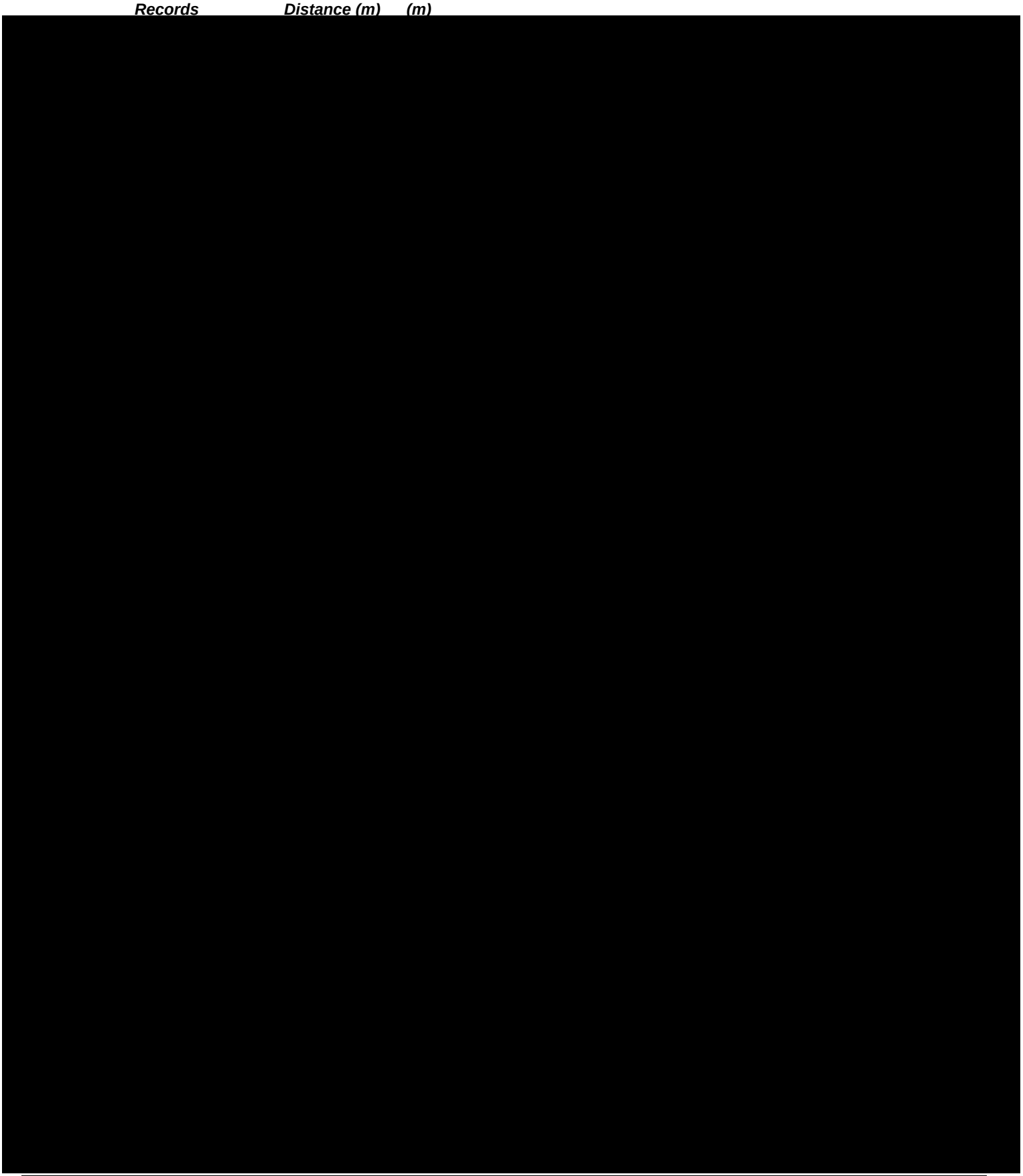
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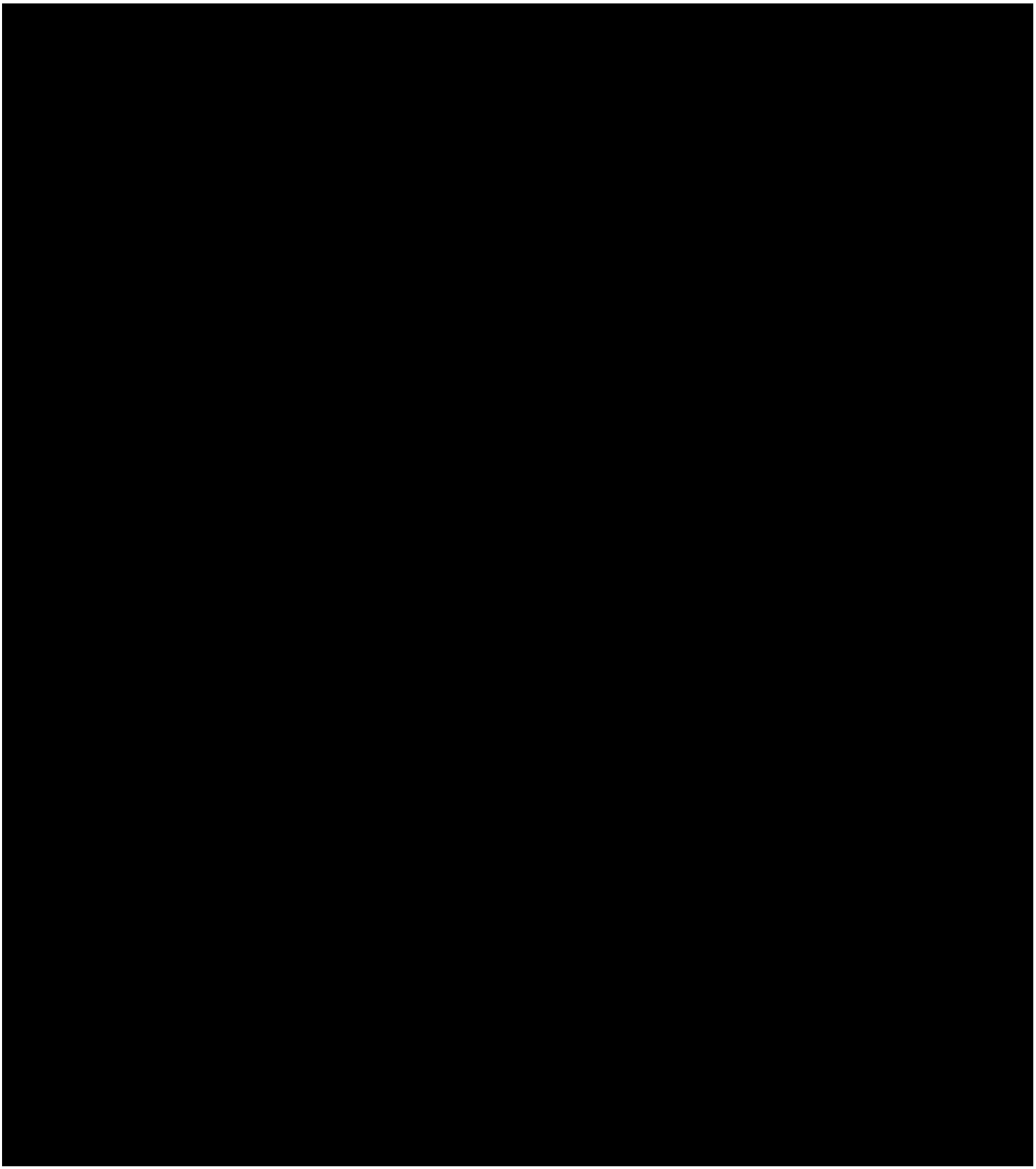
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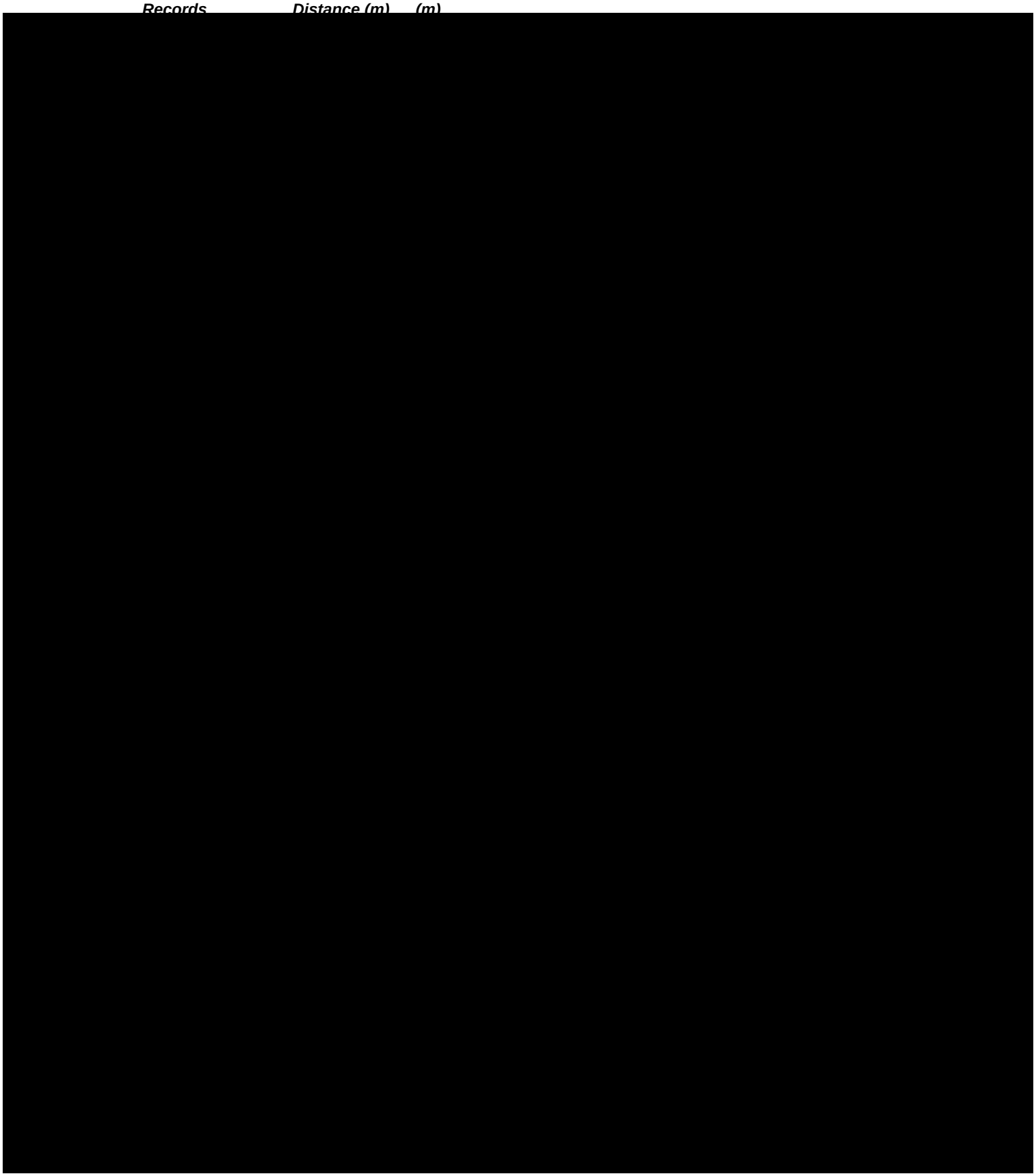
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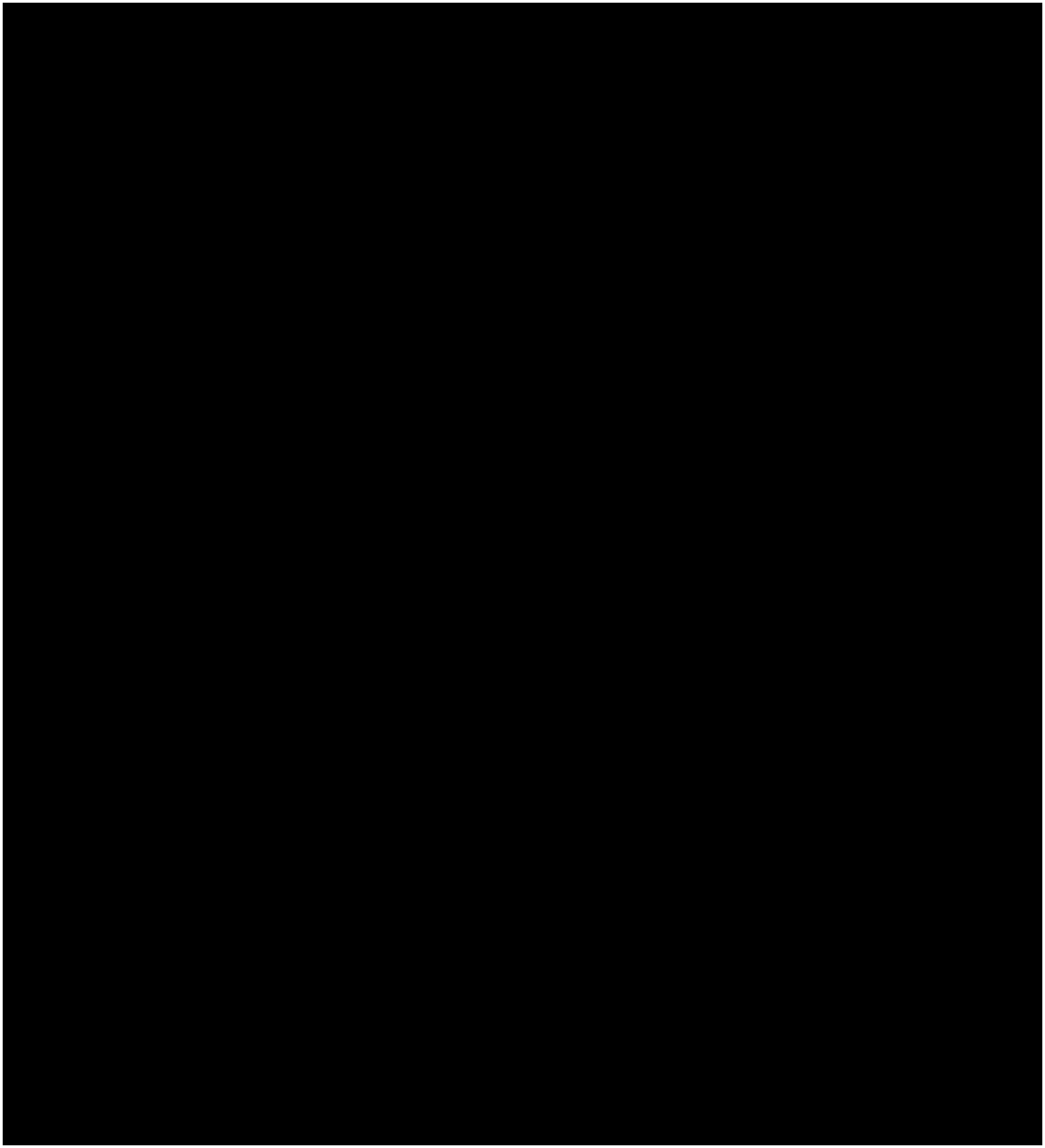


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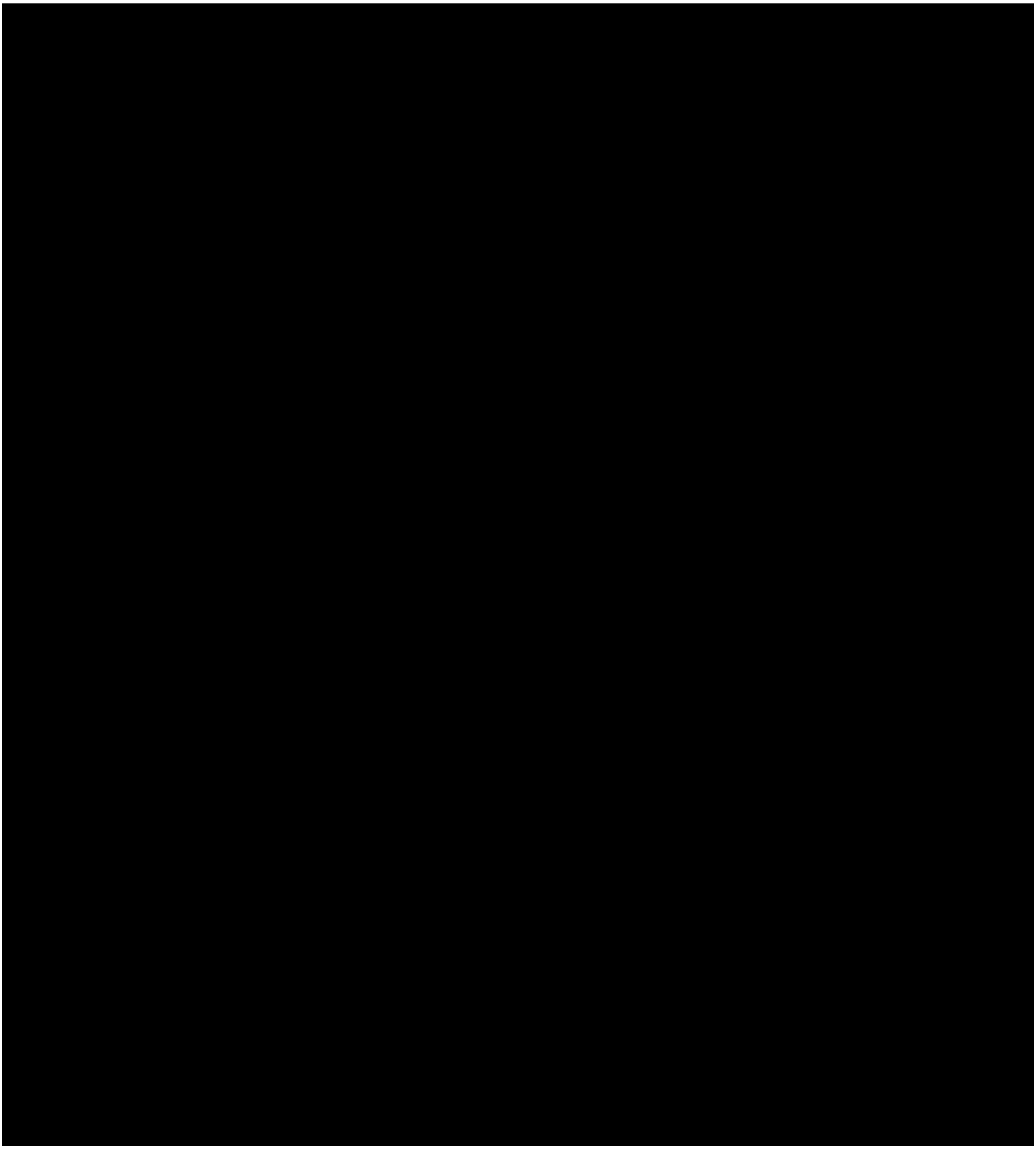


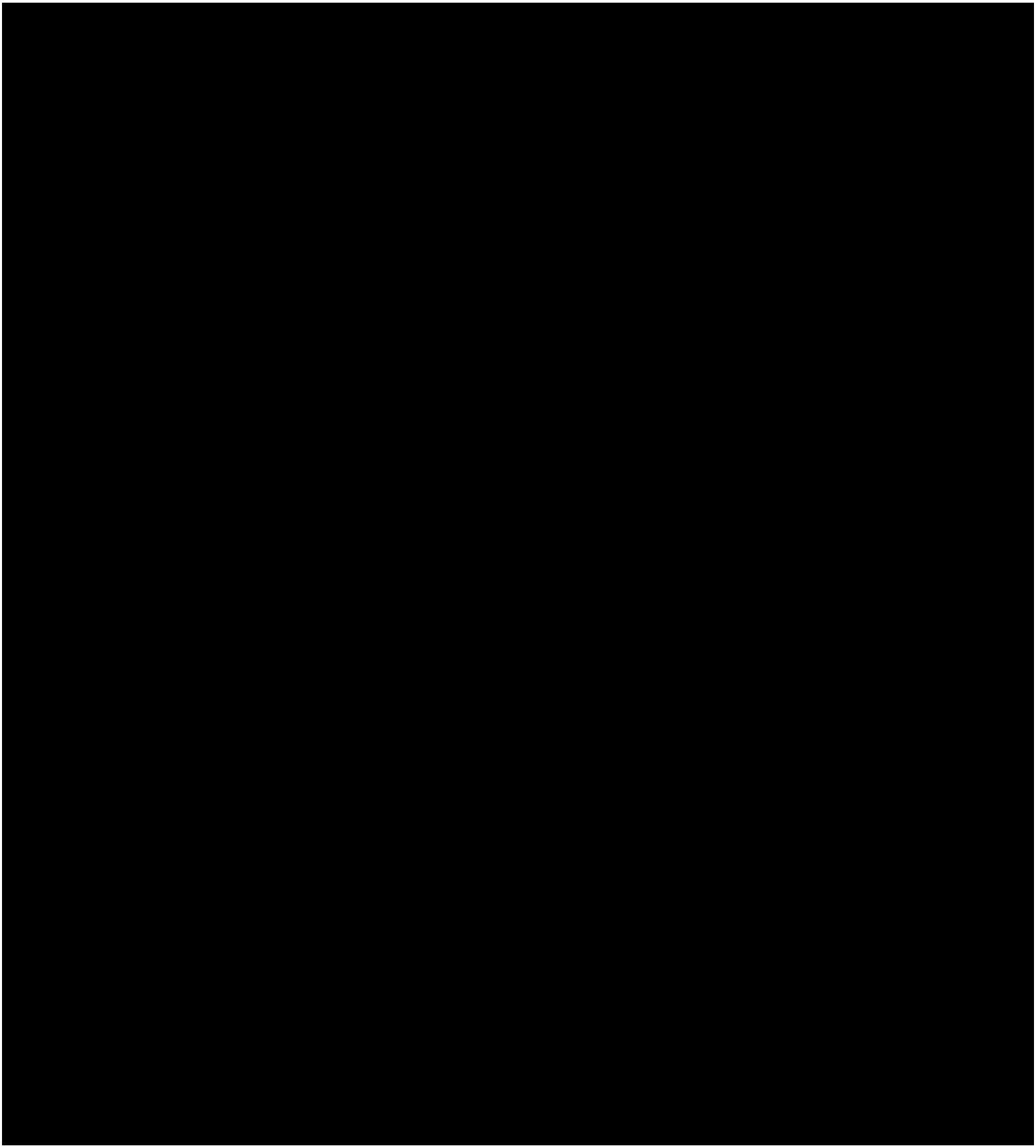
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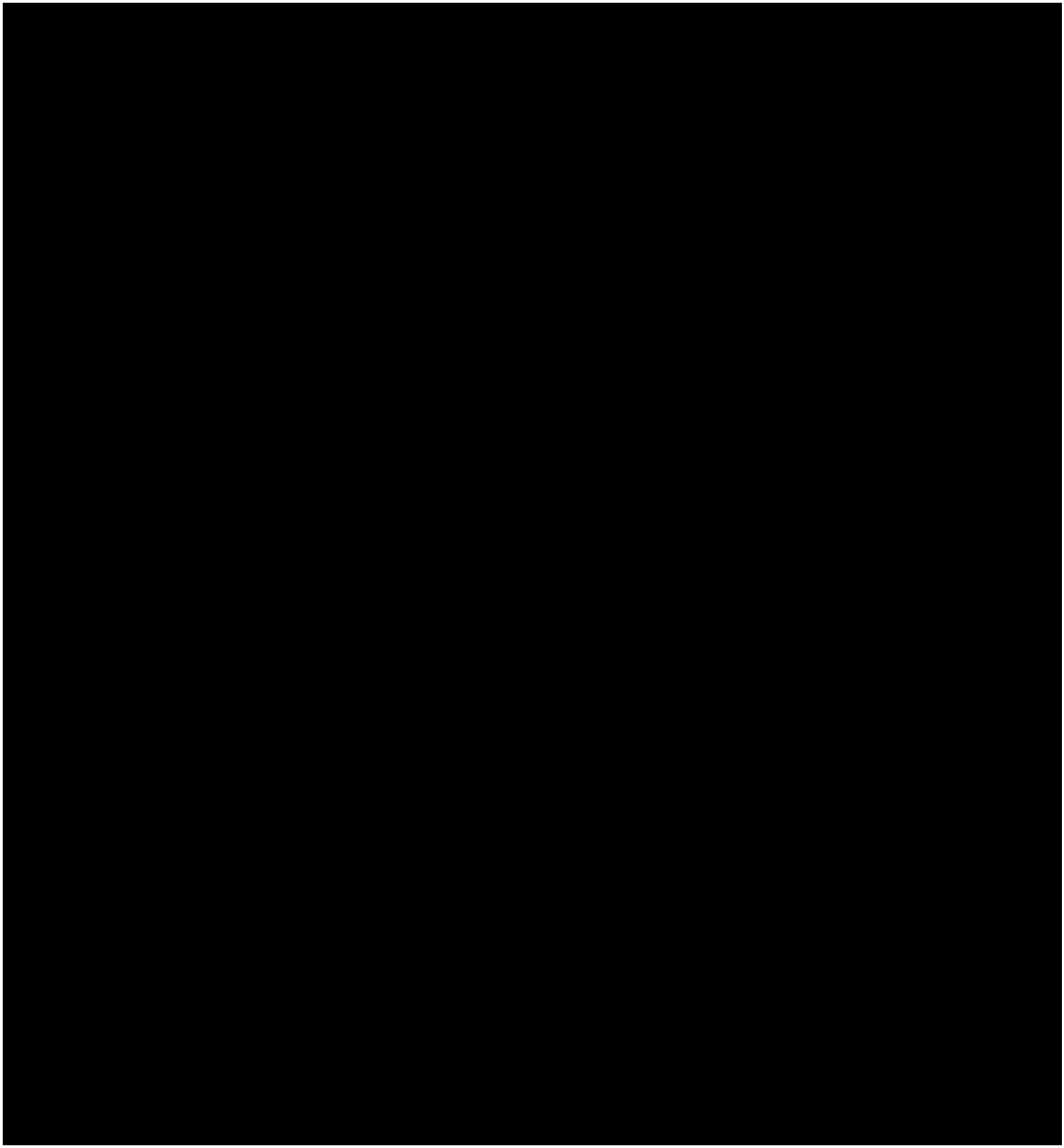


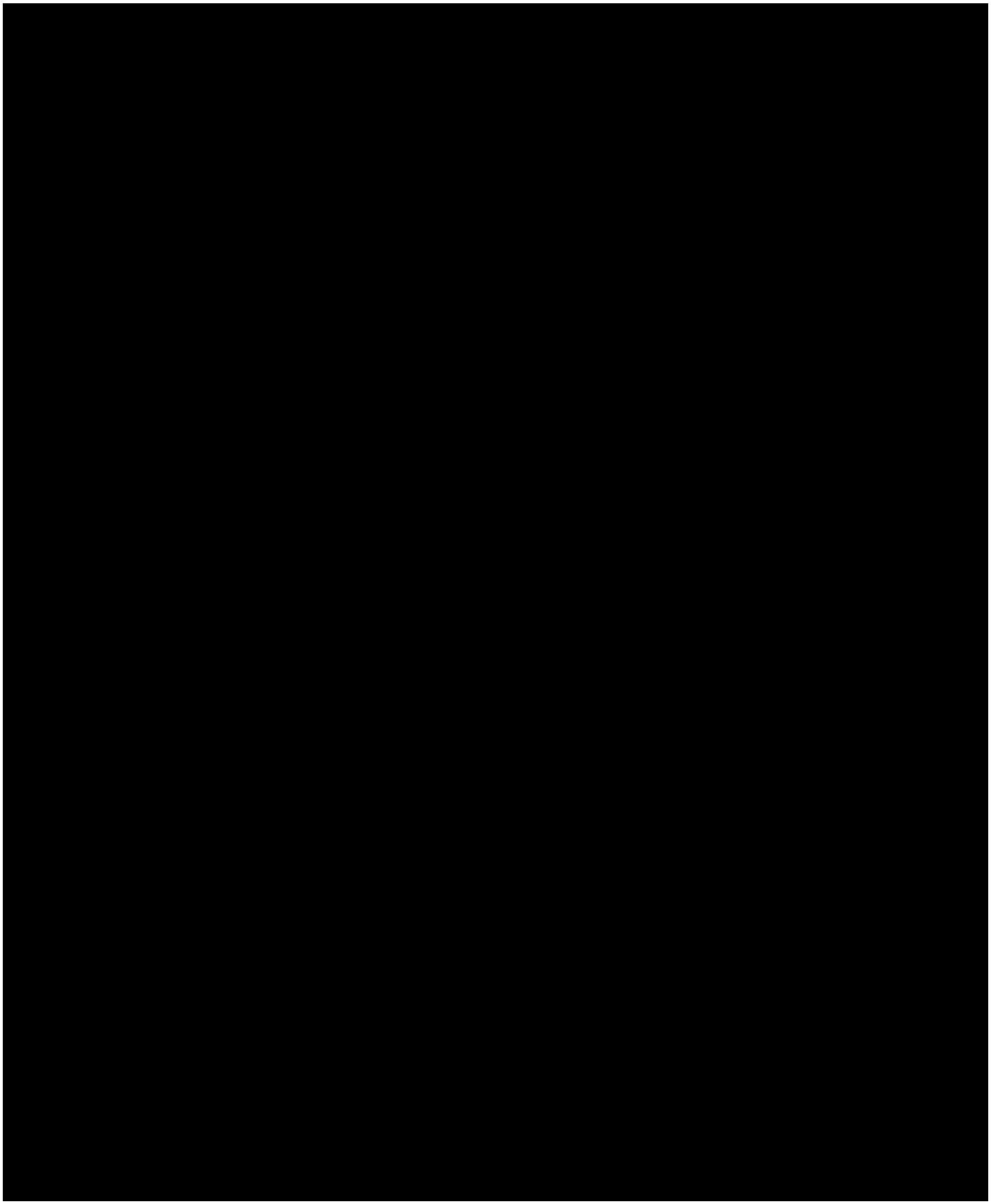
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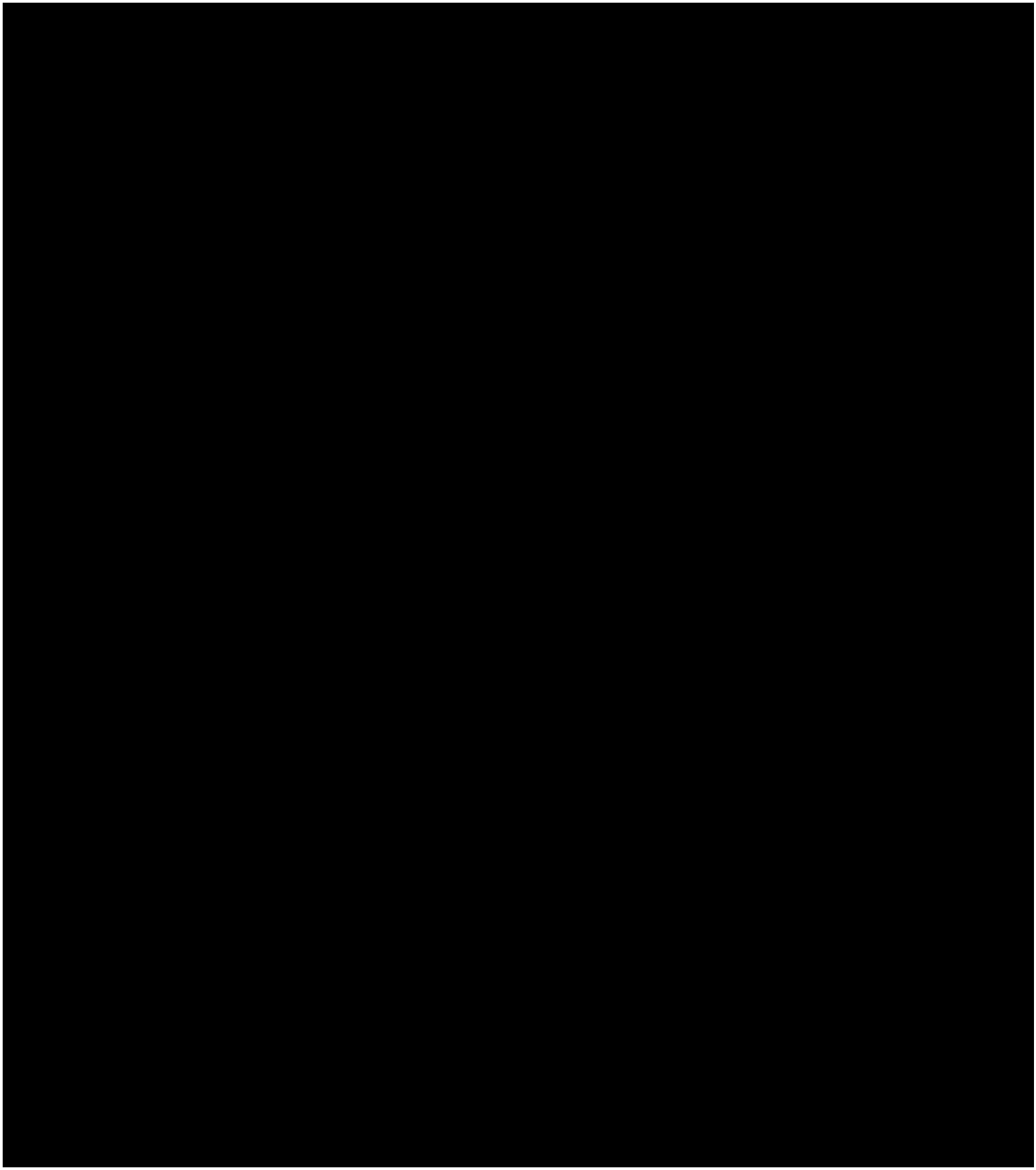




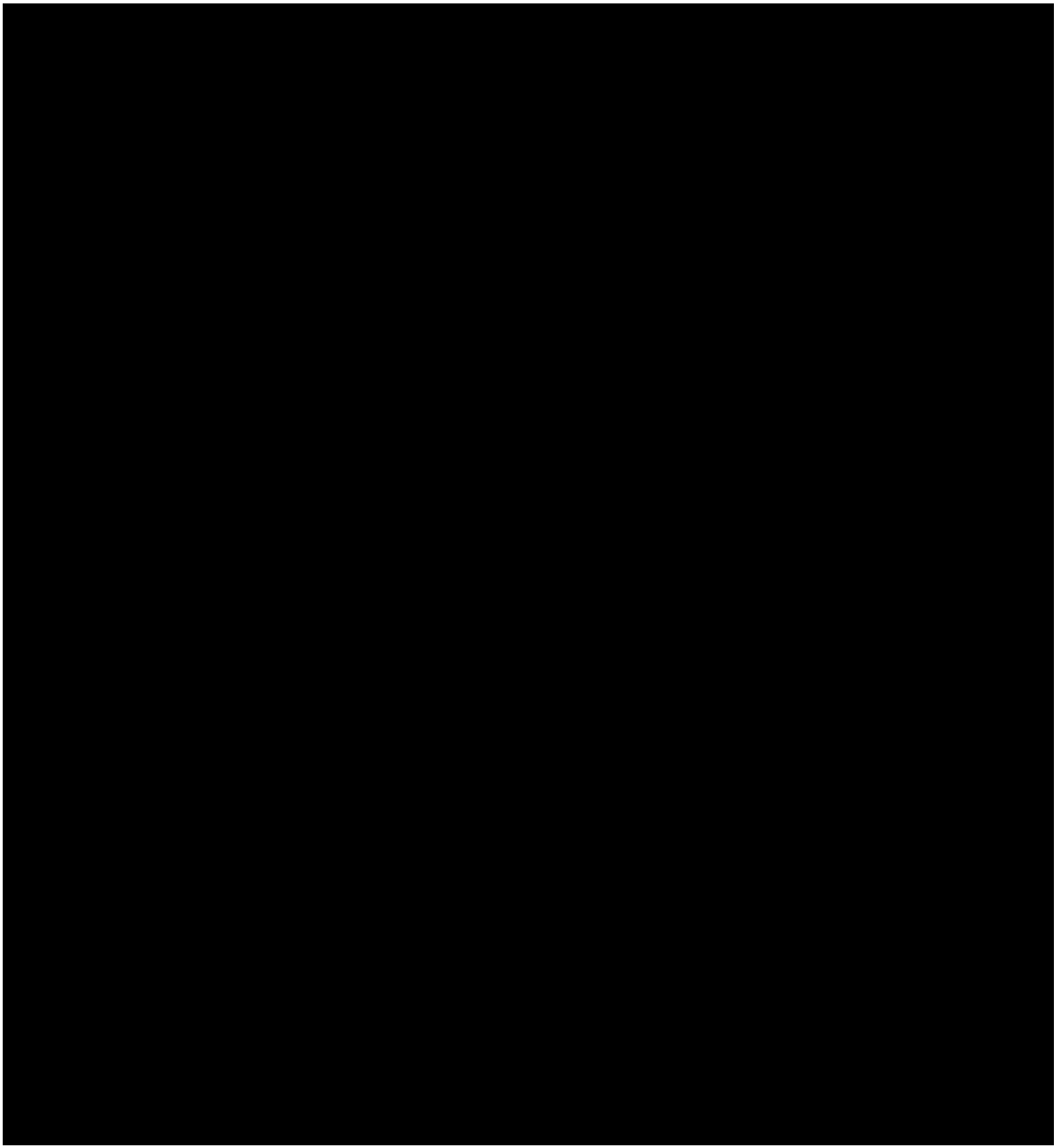
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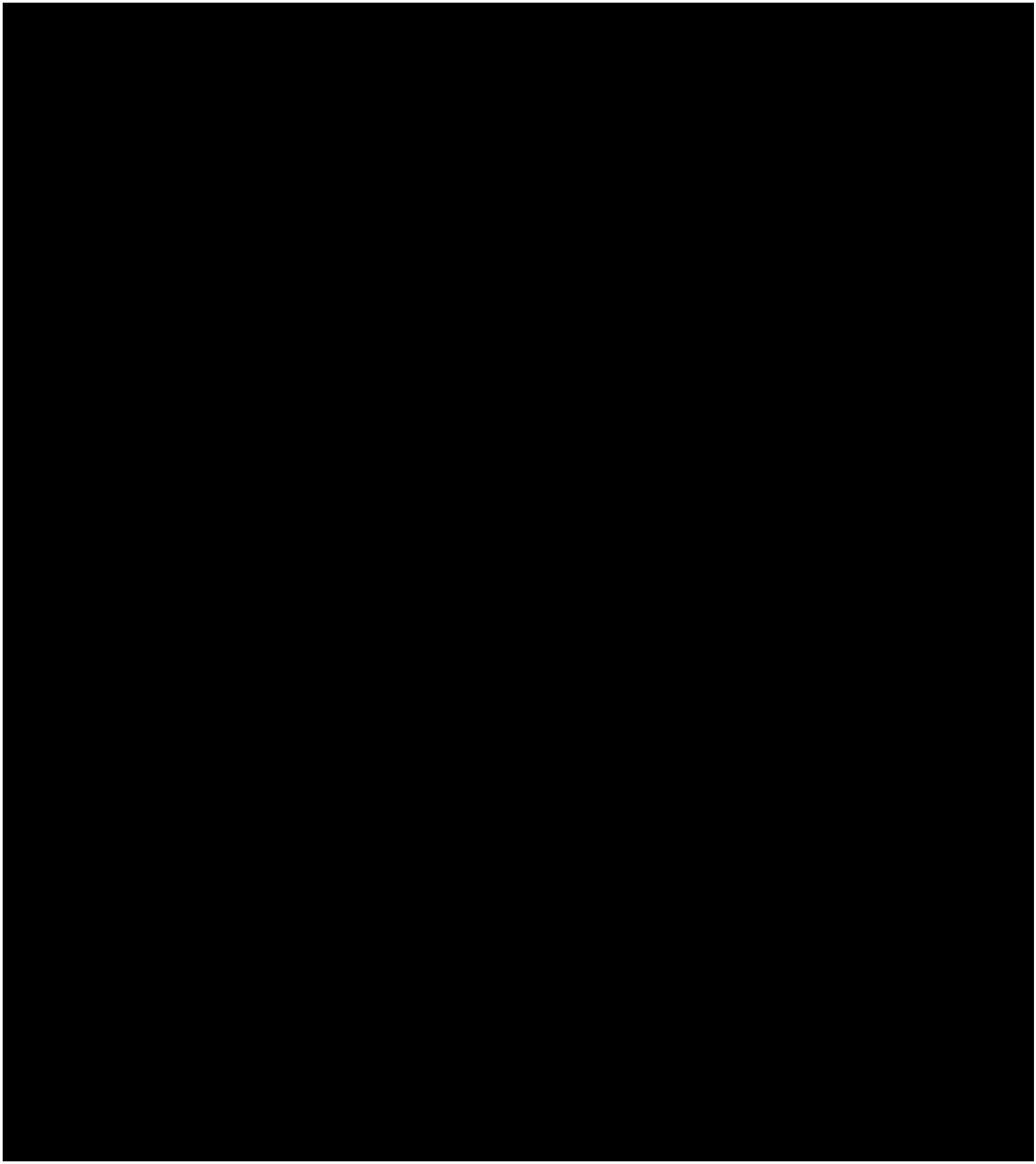




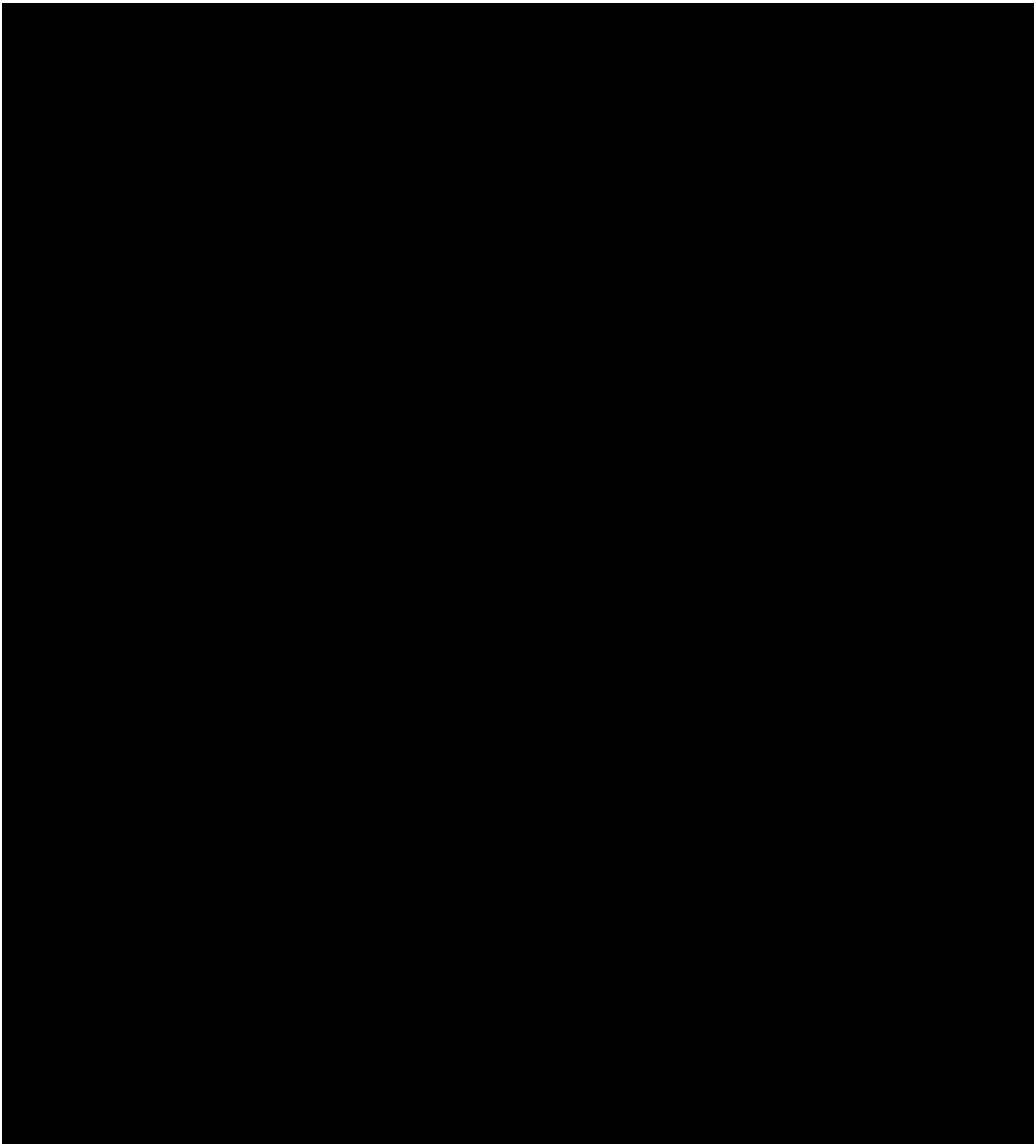


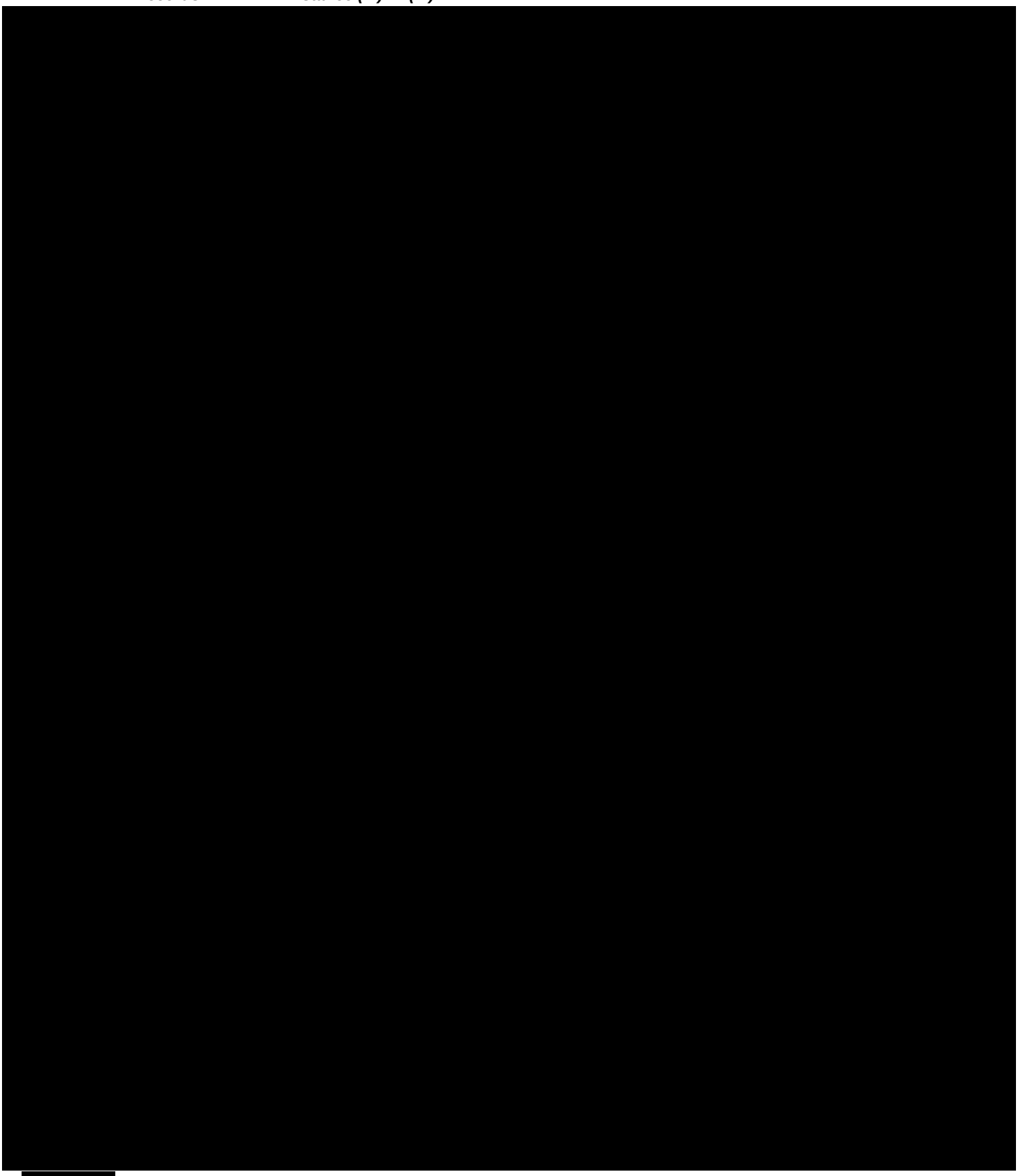
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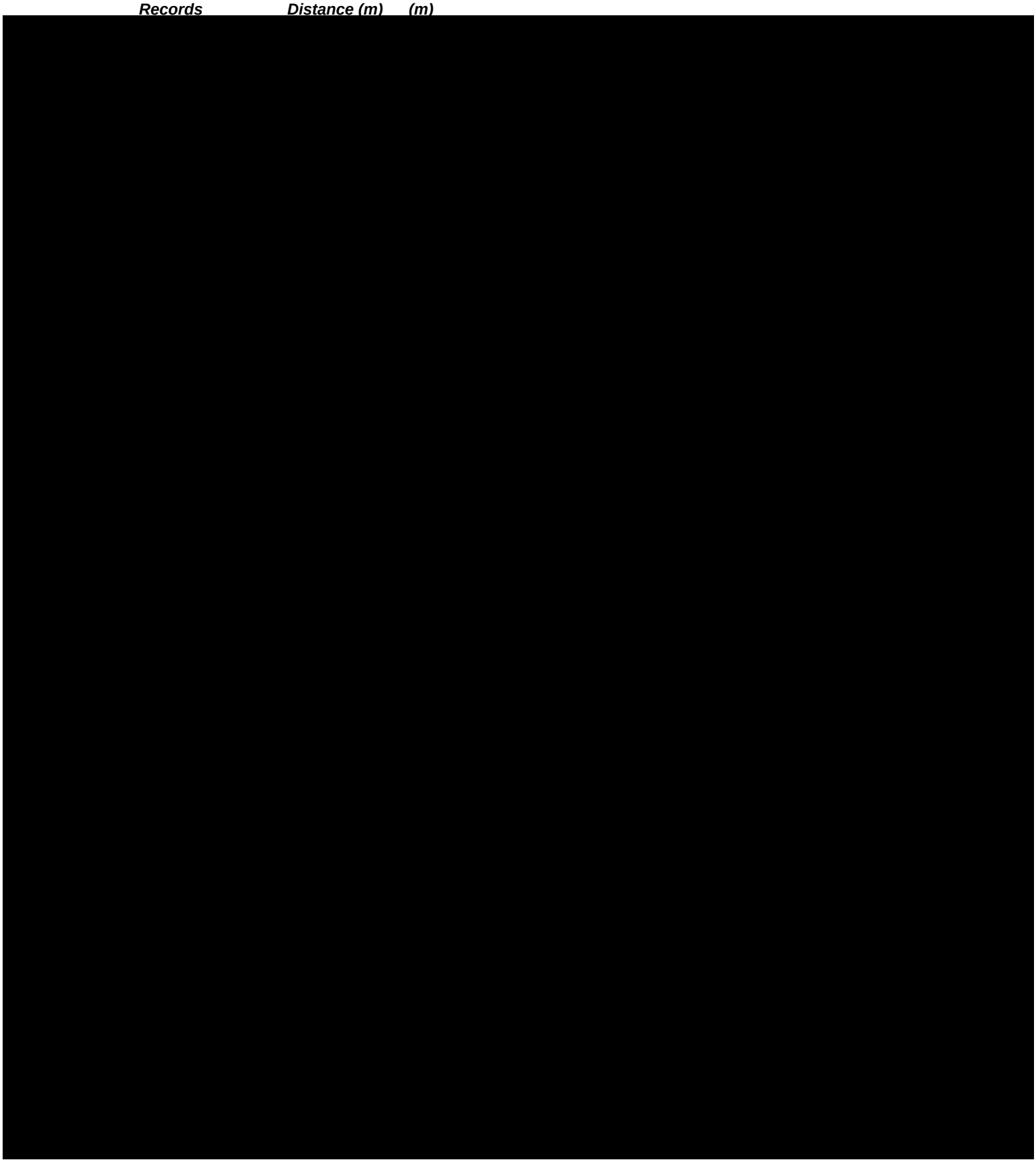


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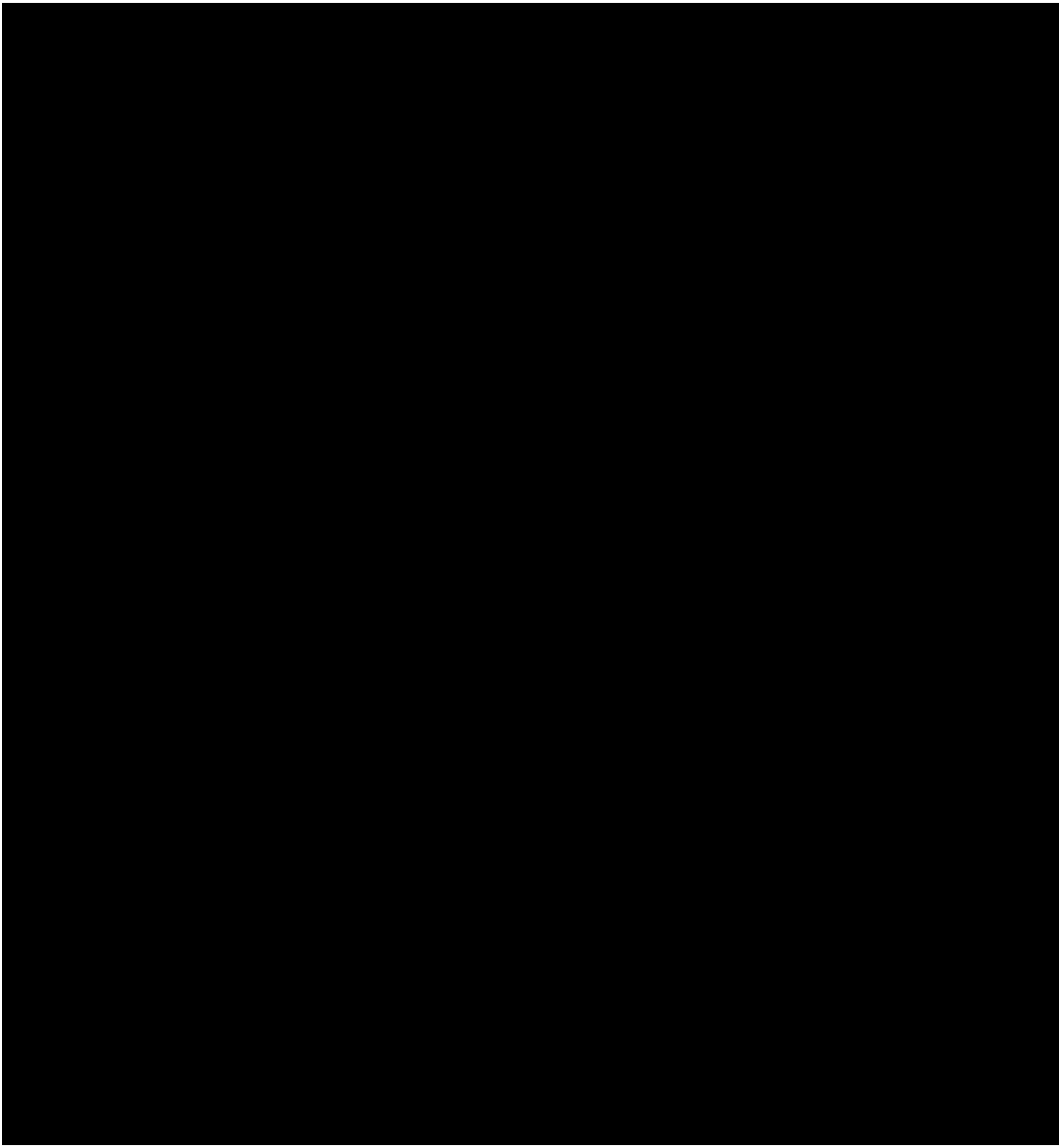




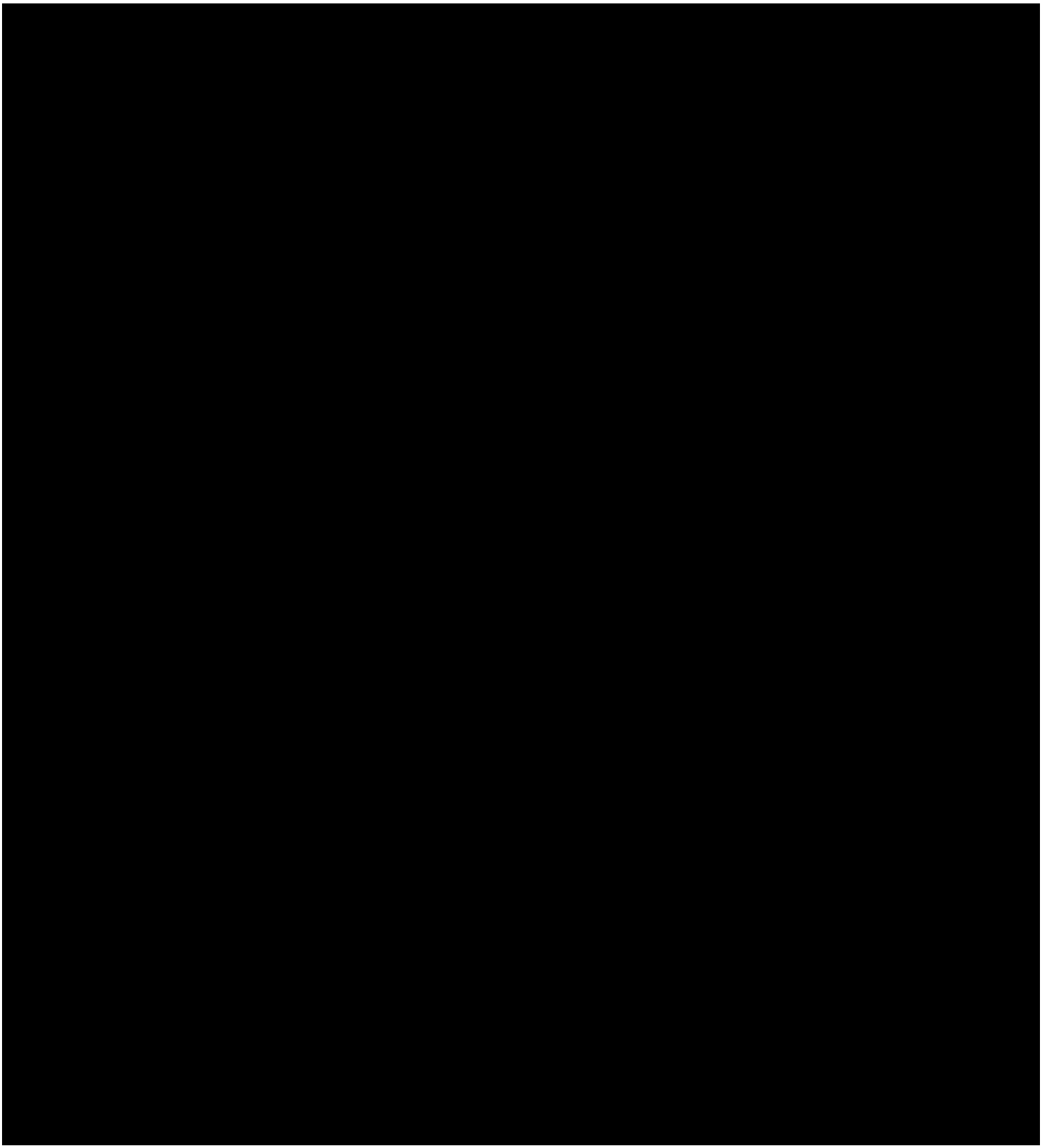
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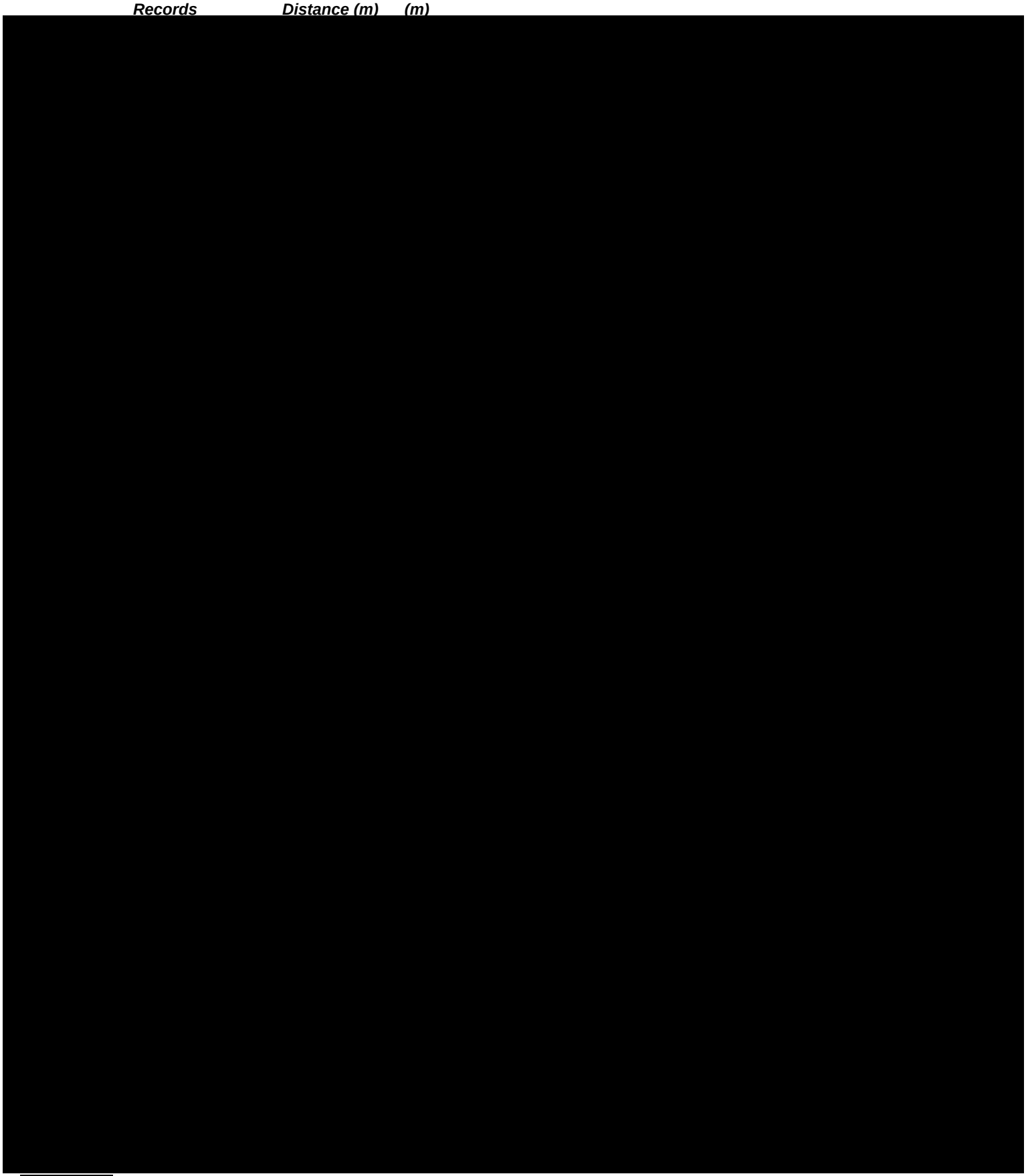
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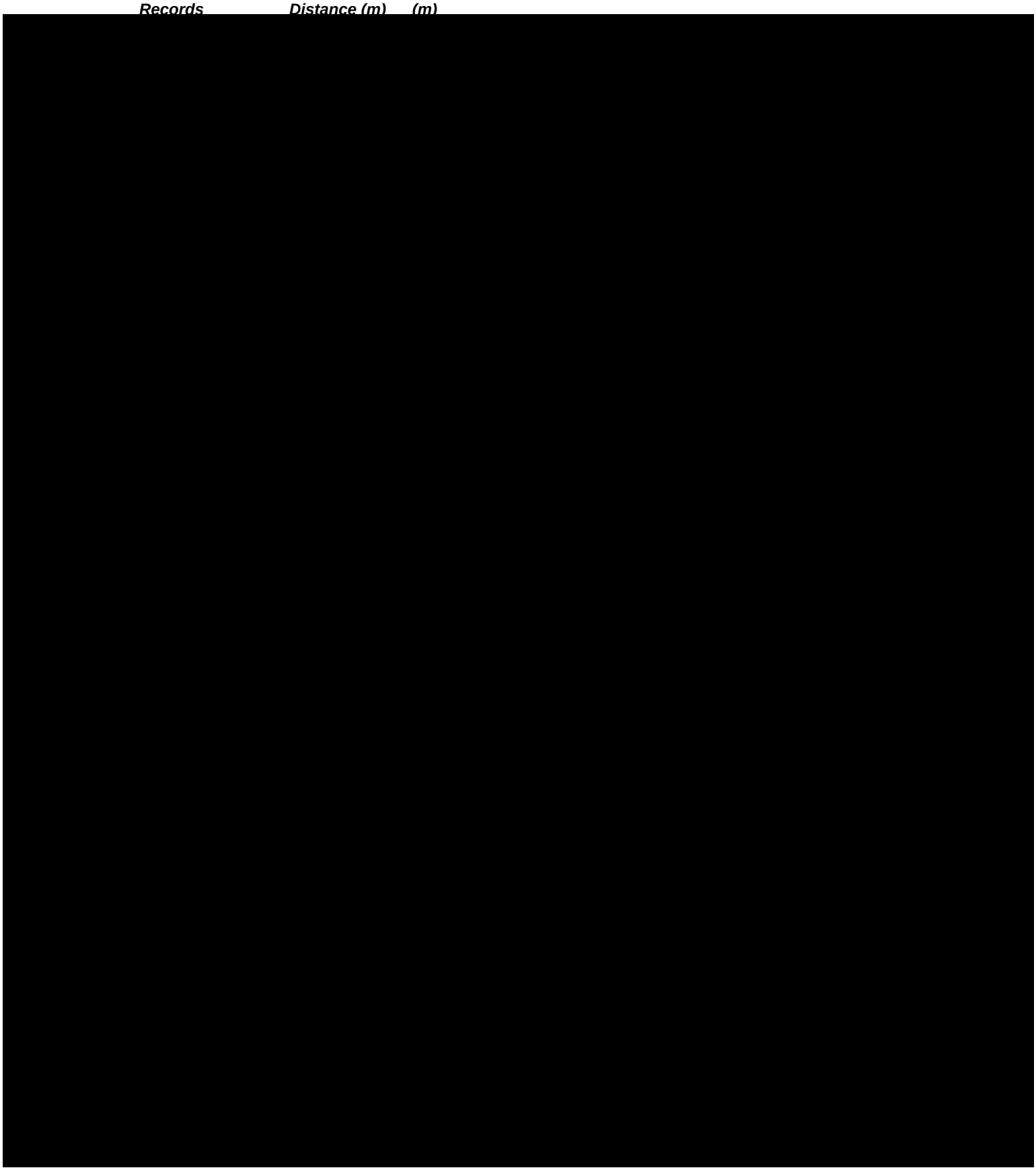
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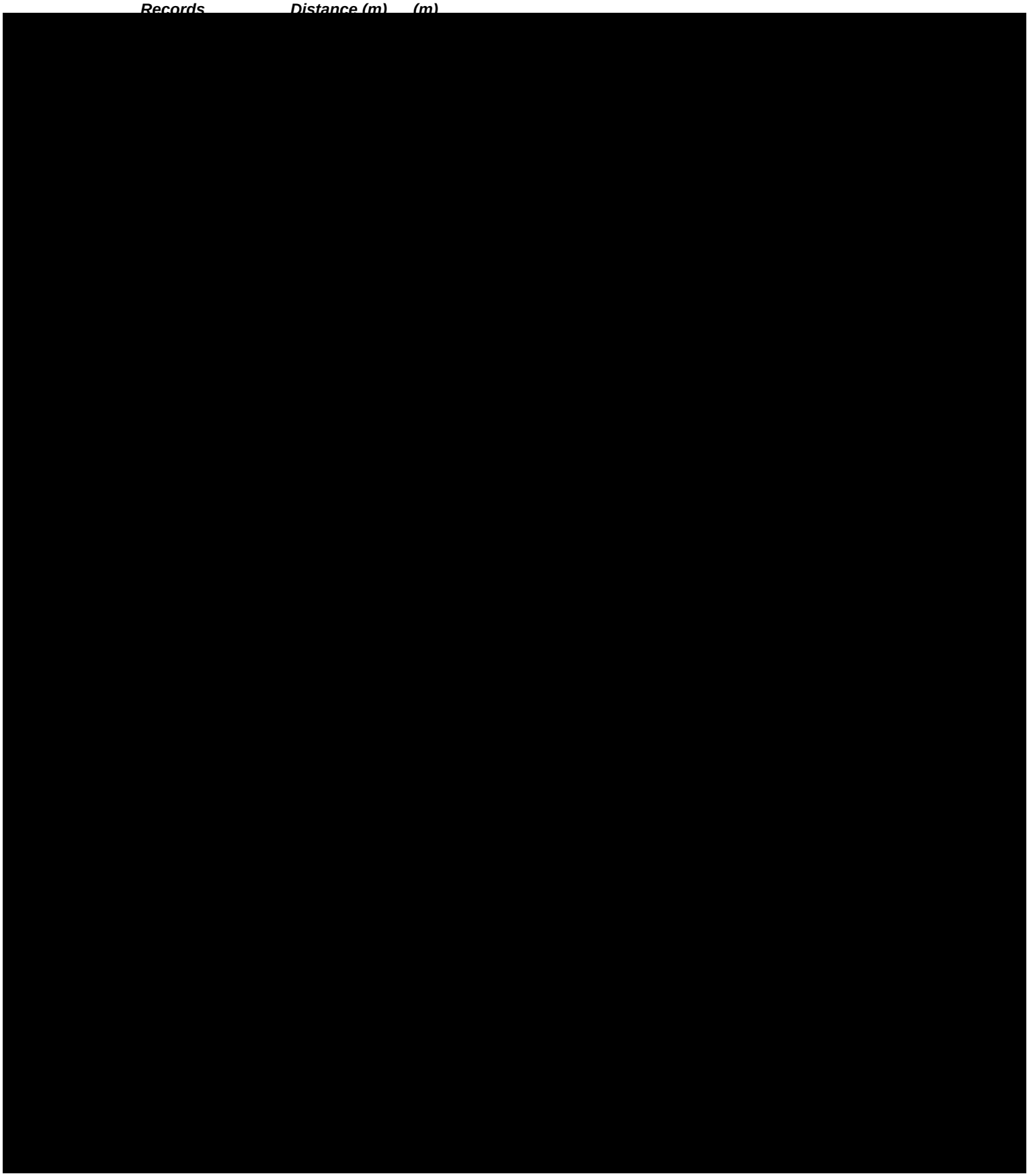
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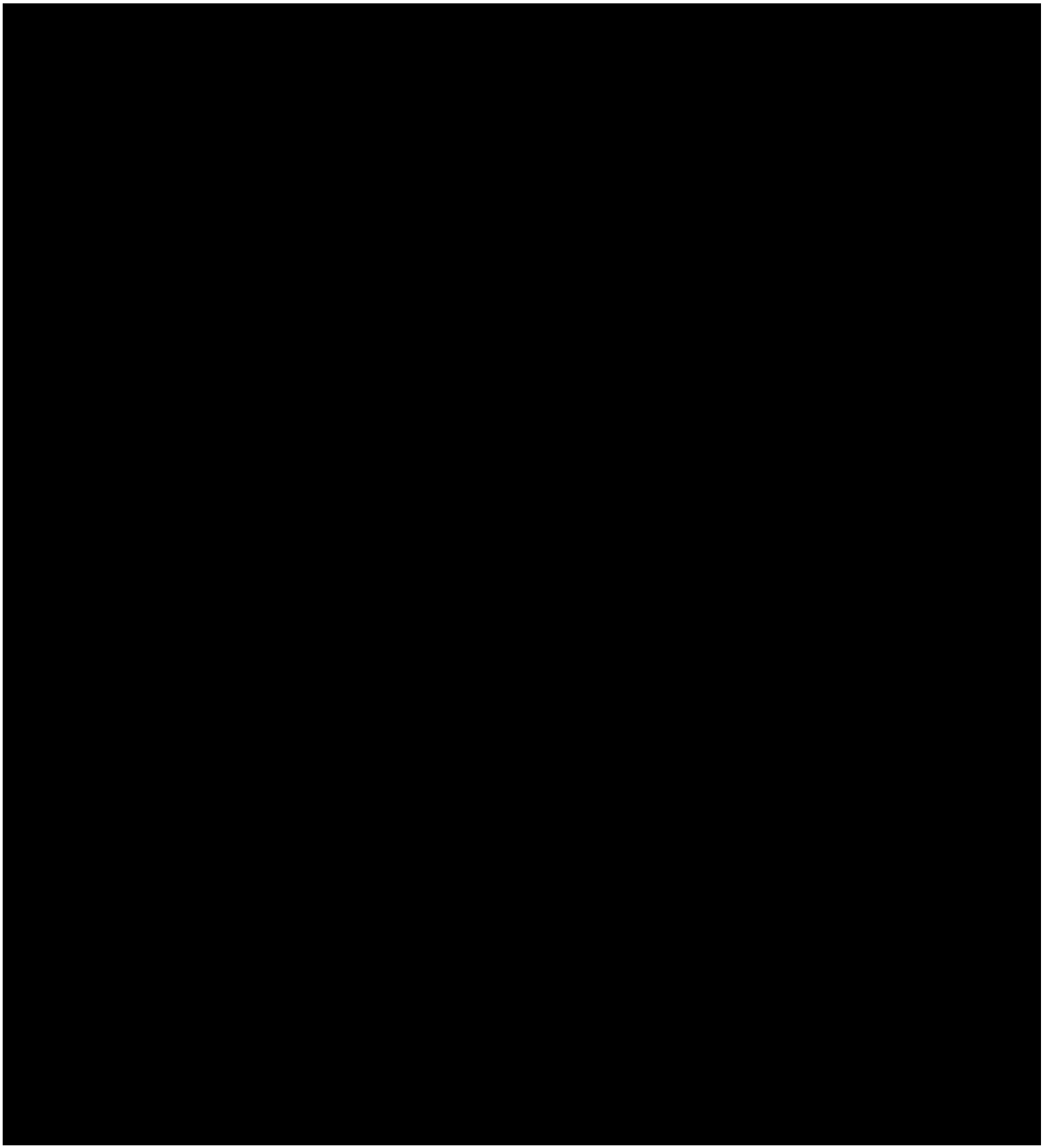


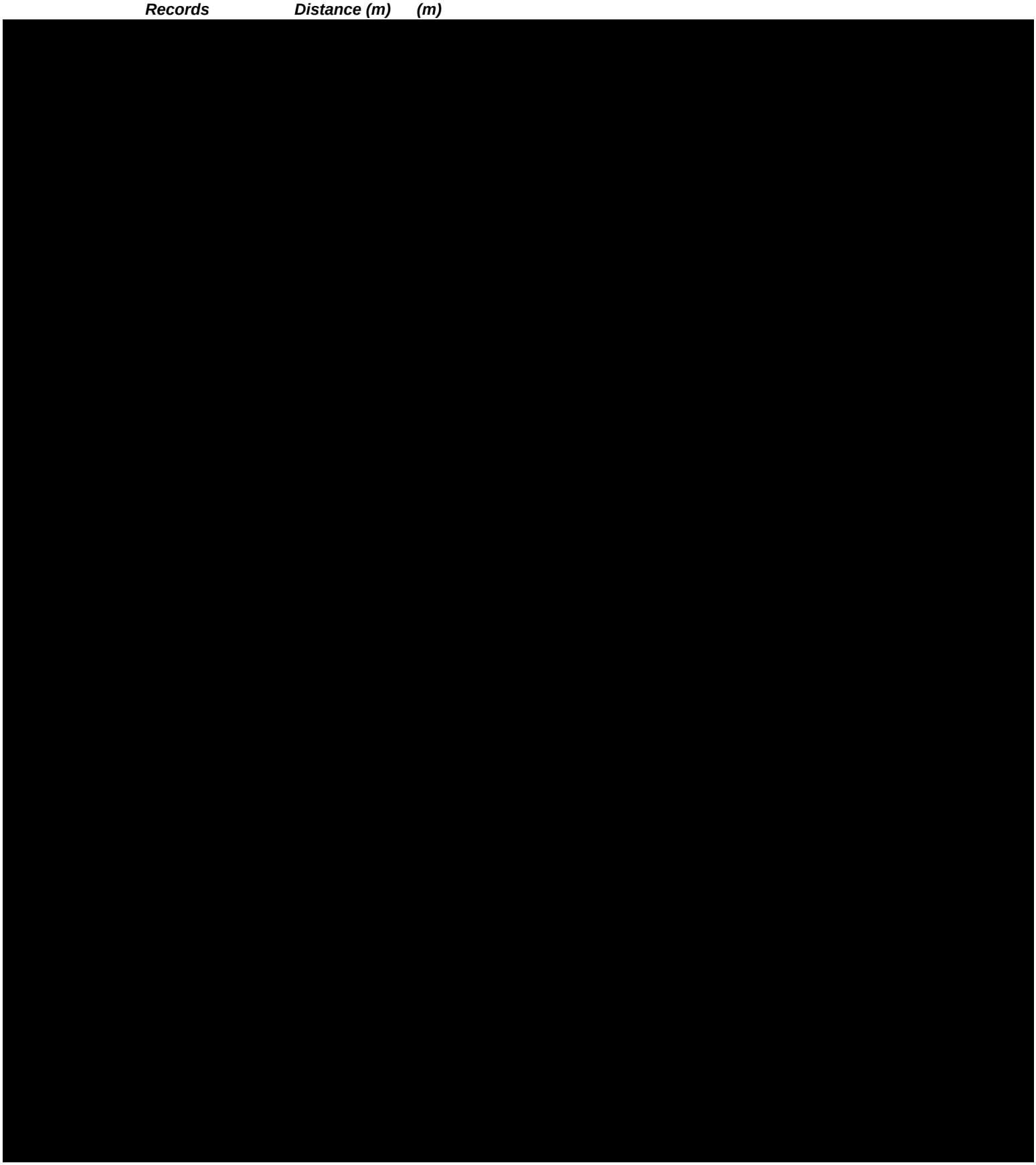
Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB



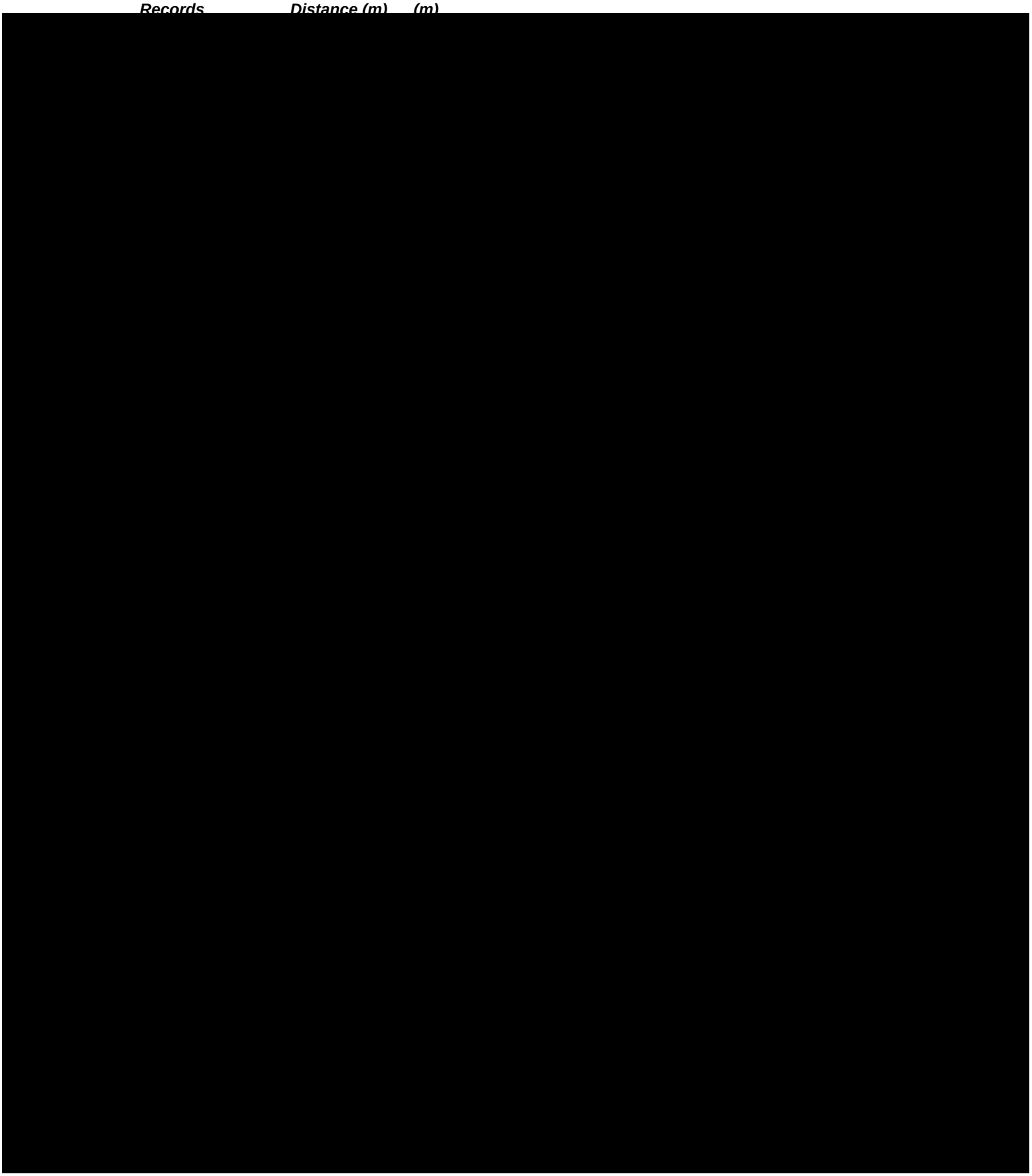
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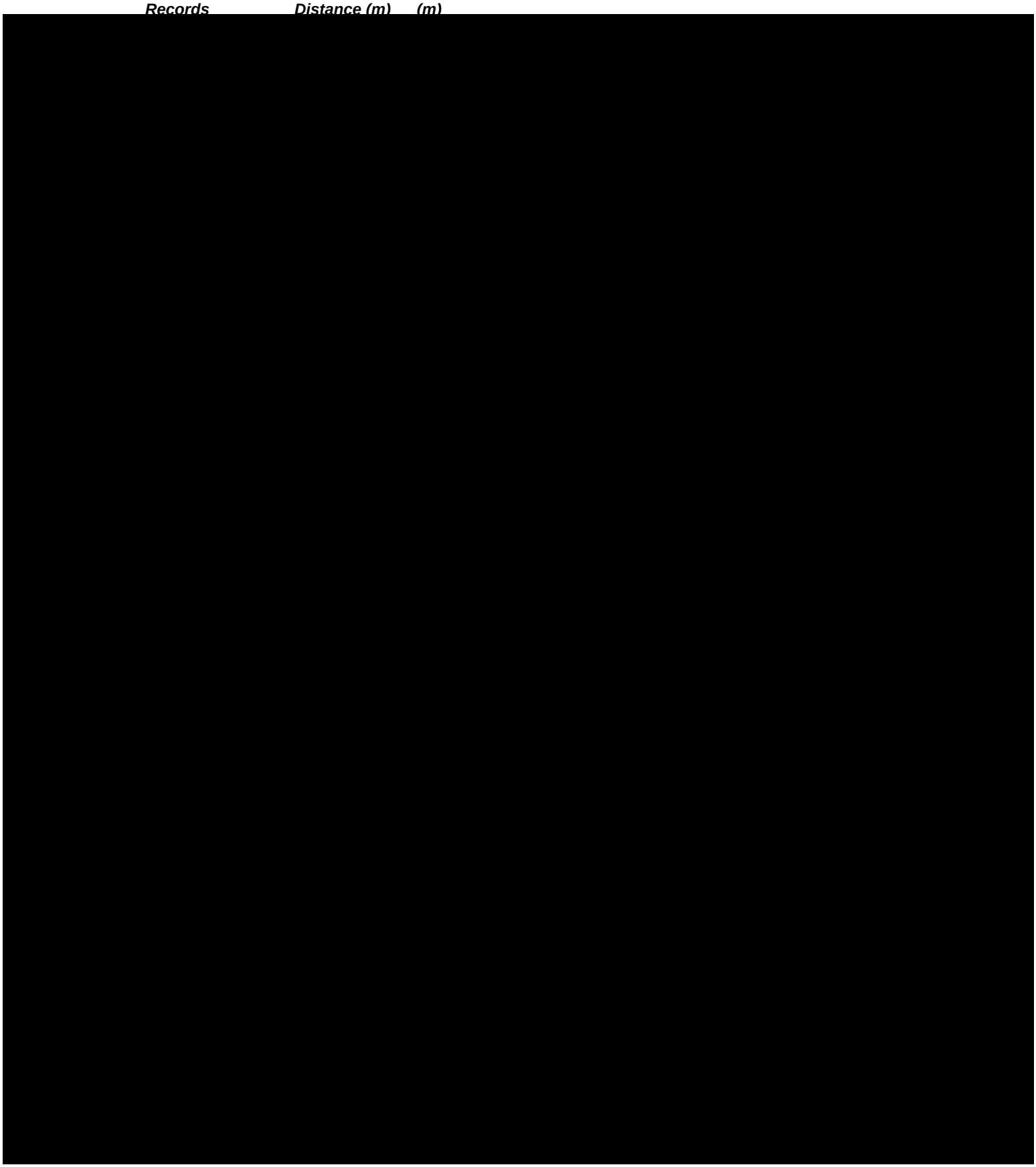


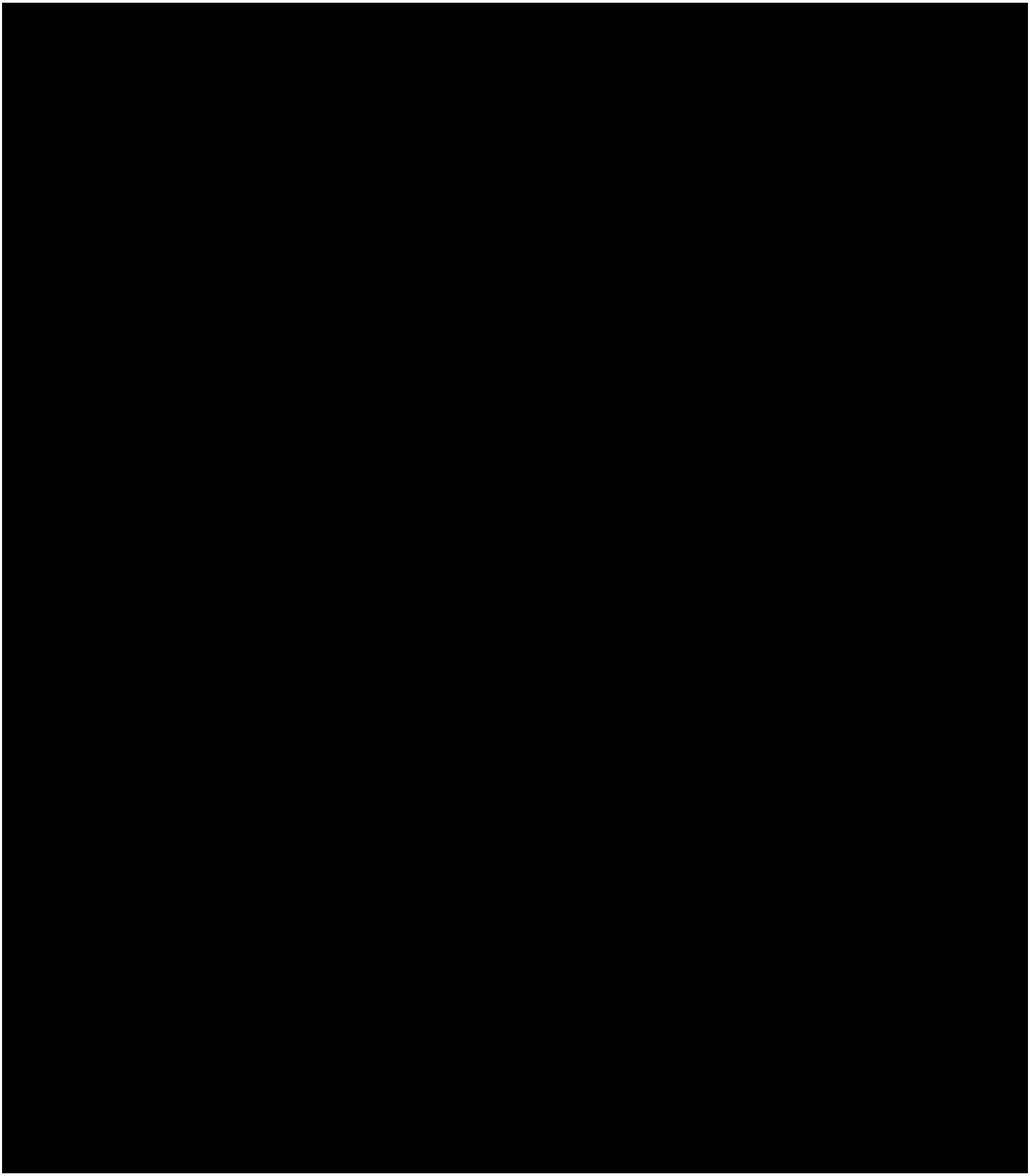


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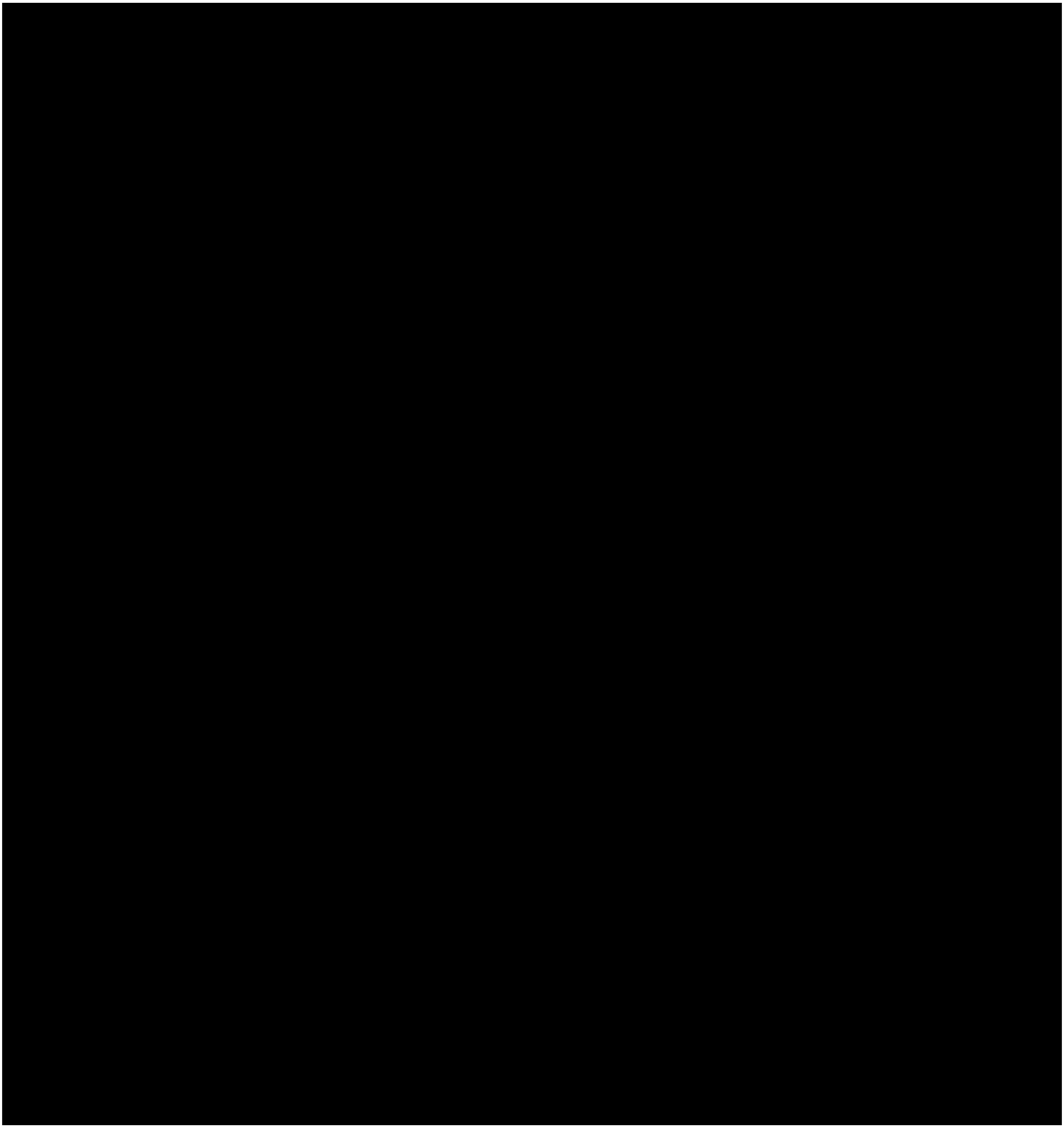


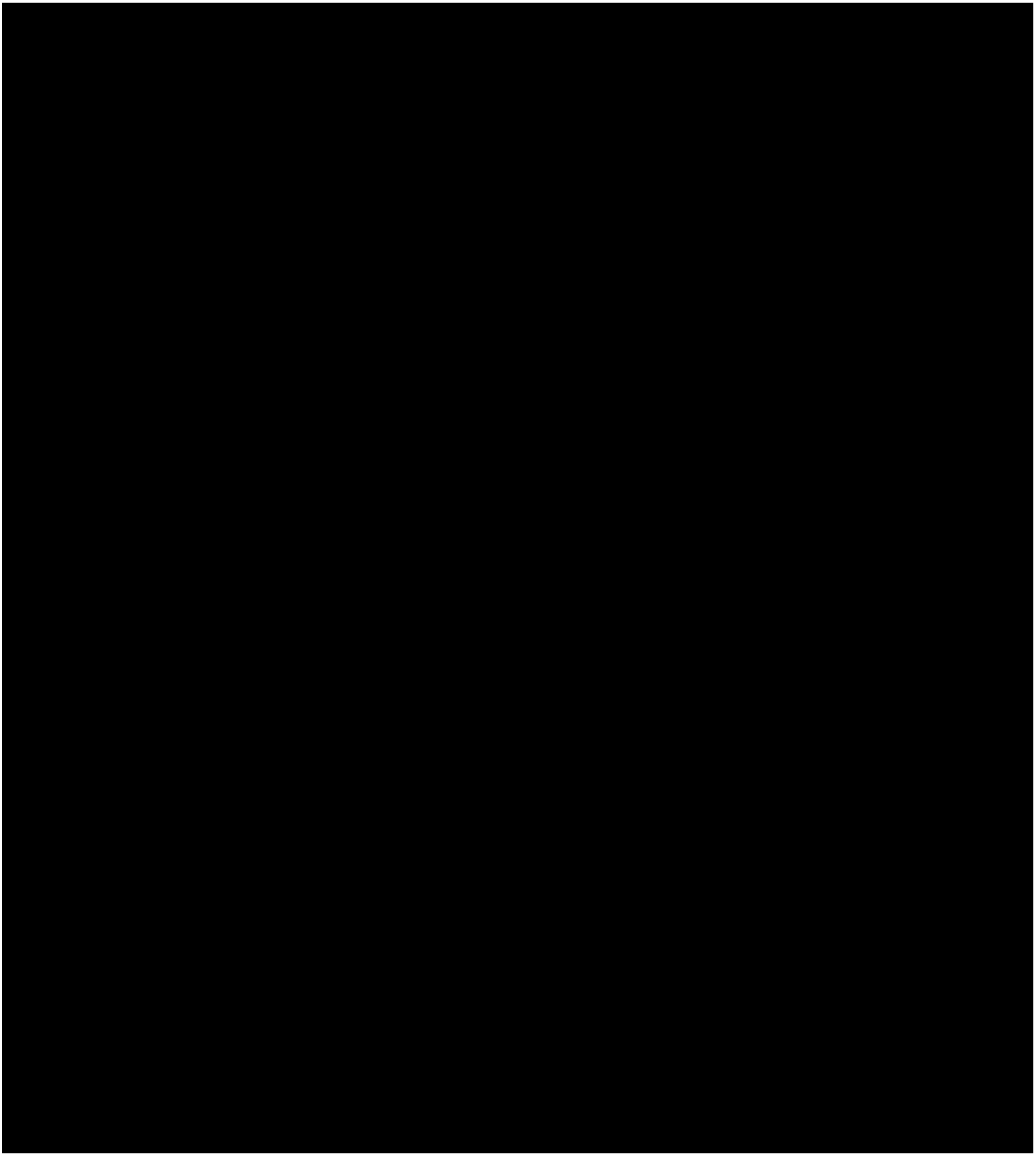
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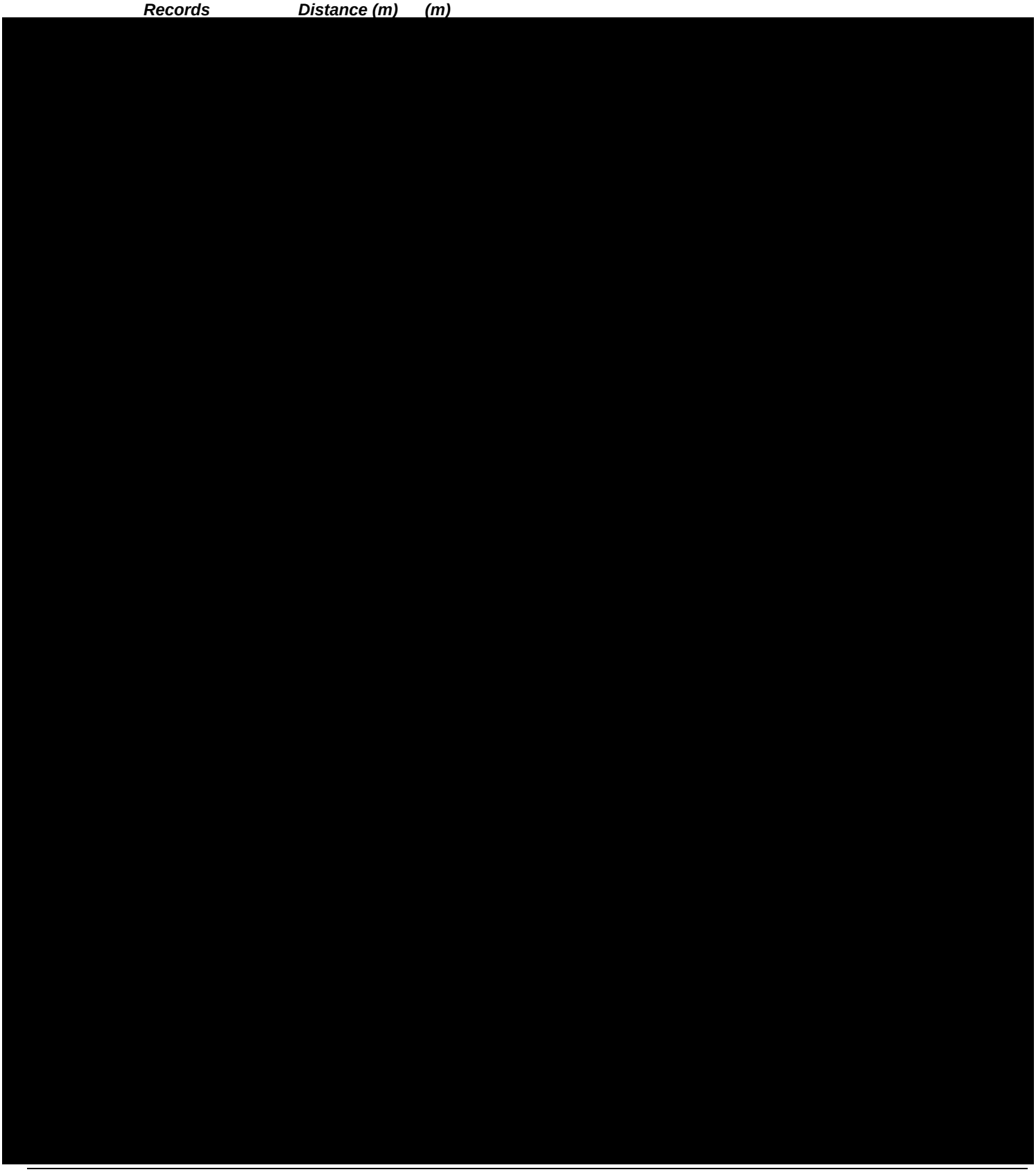


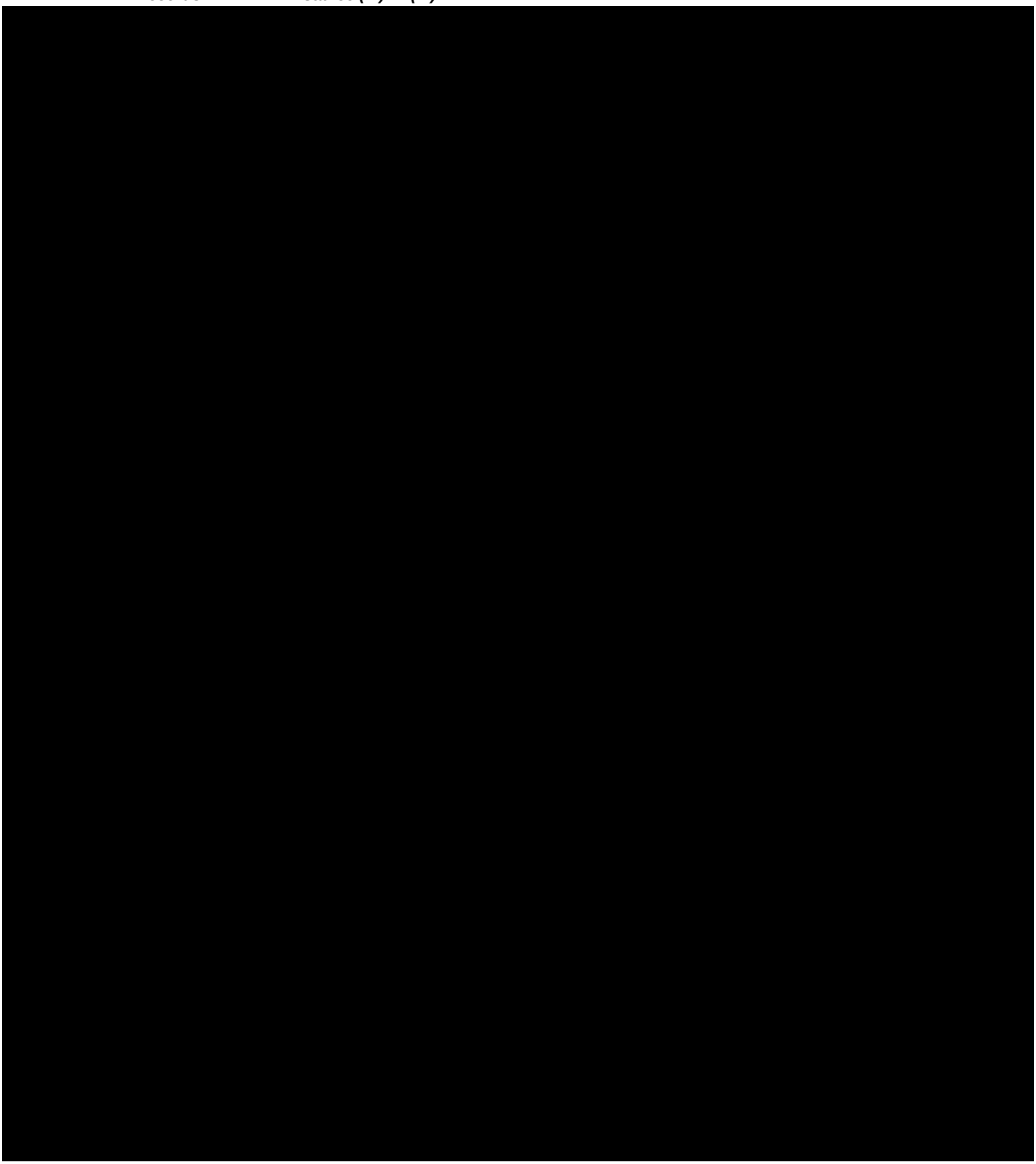
Waste Class Name: ORGANIC LABORATORY CHEMICALS

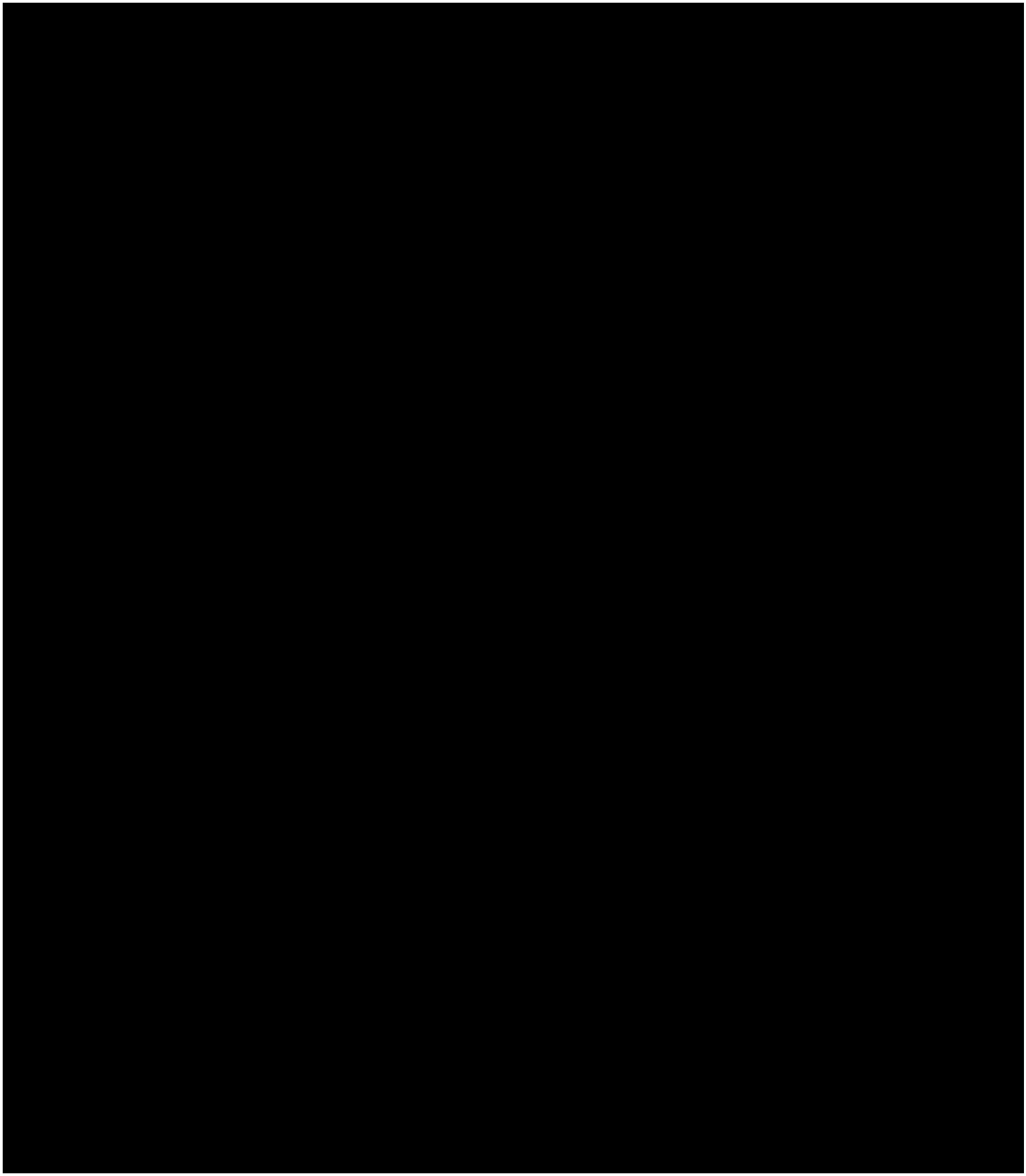




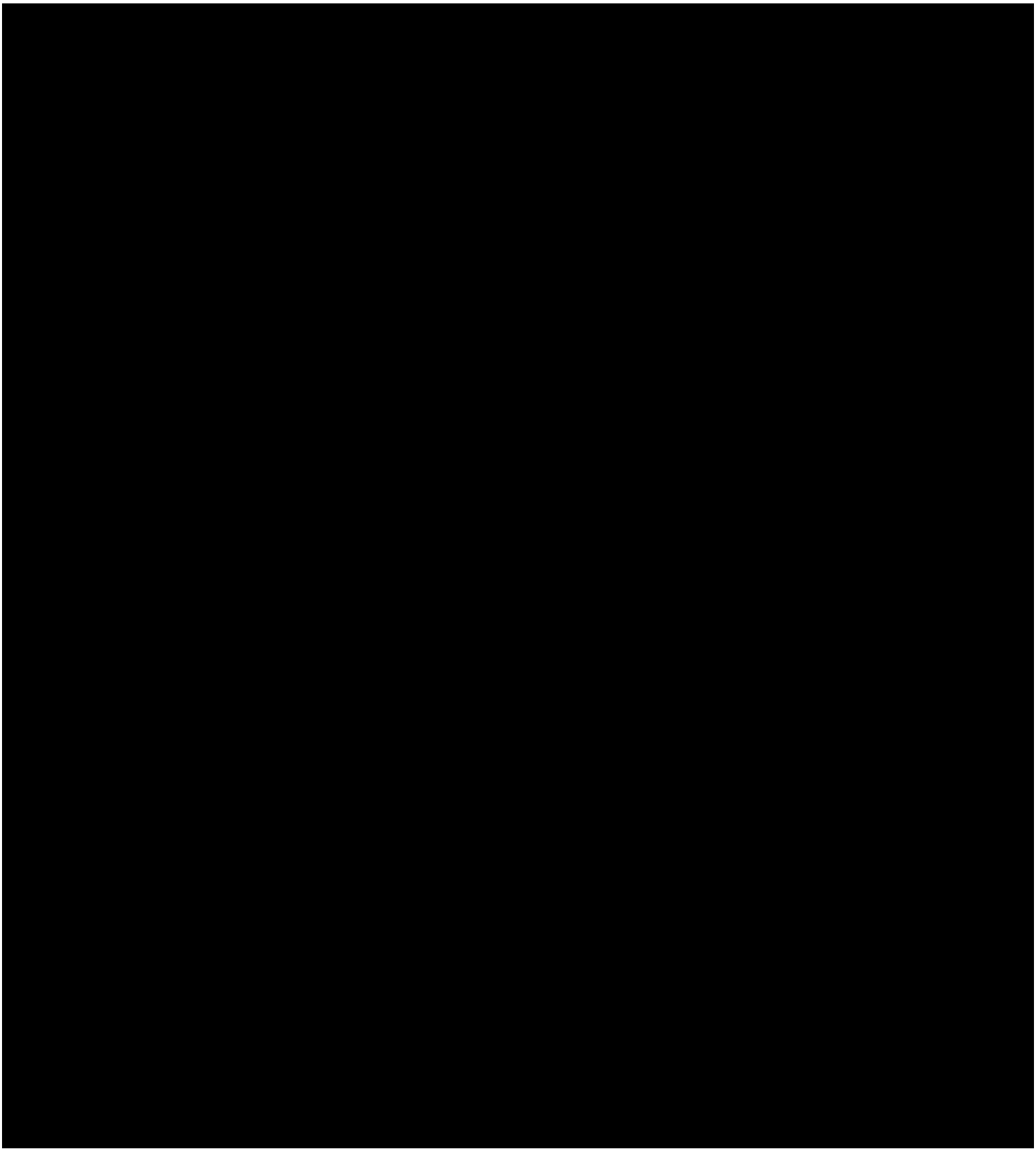
Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB



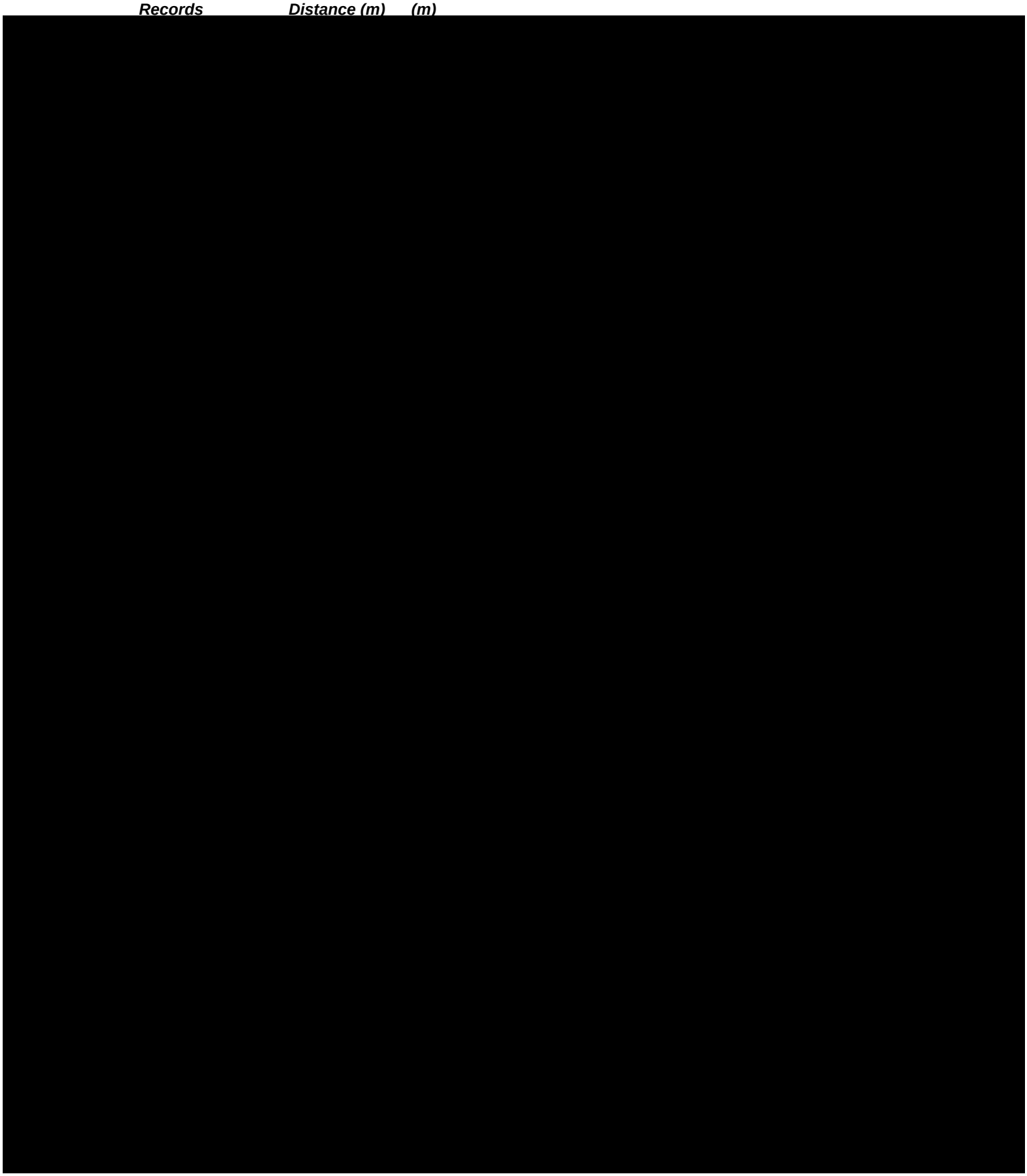


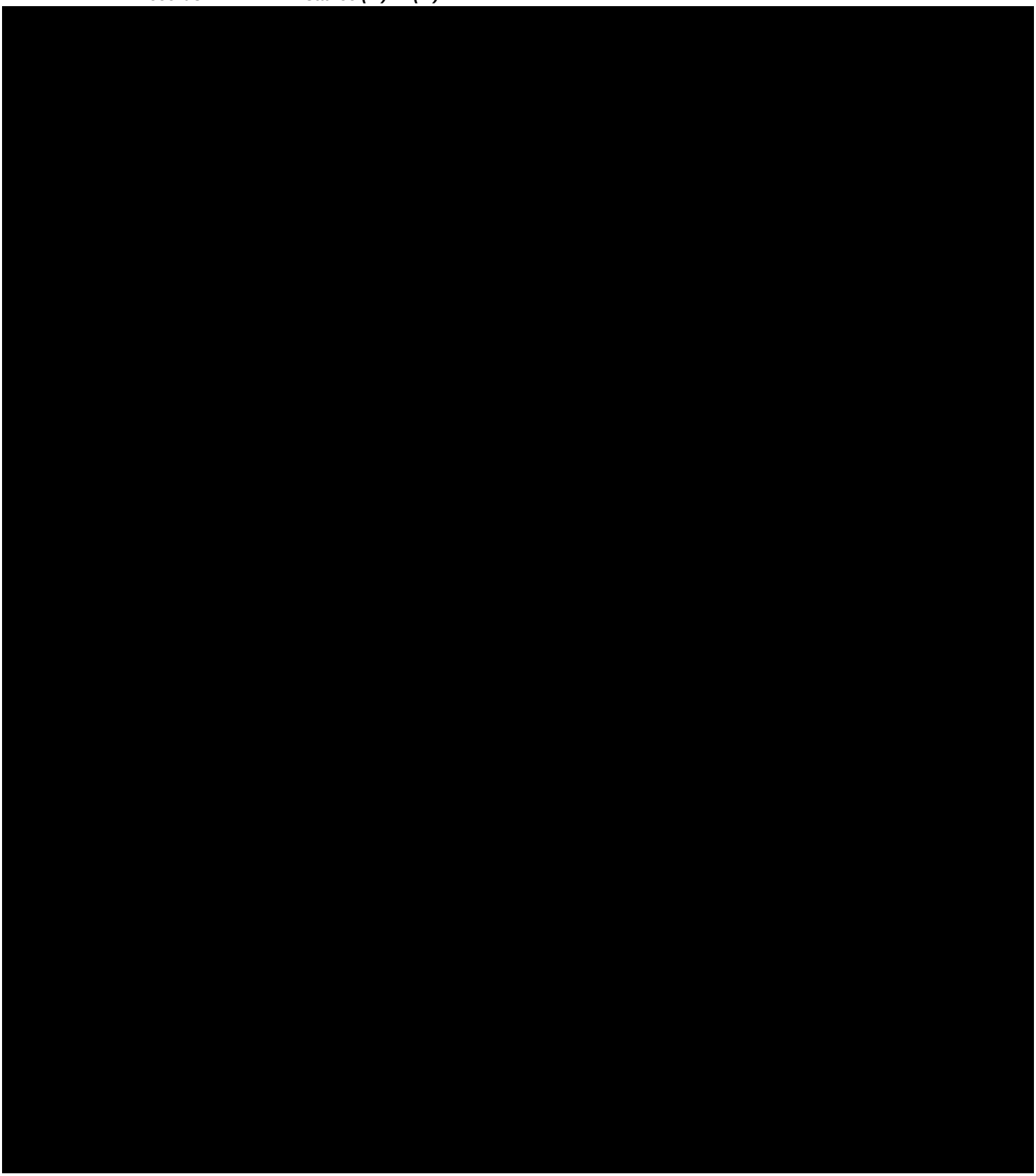


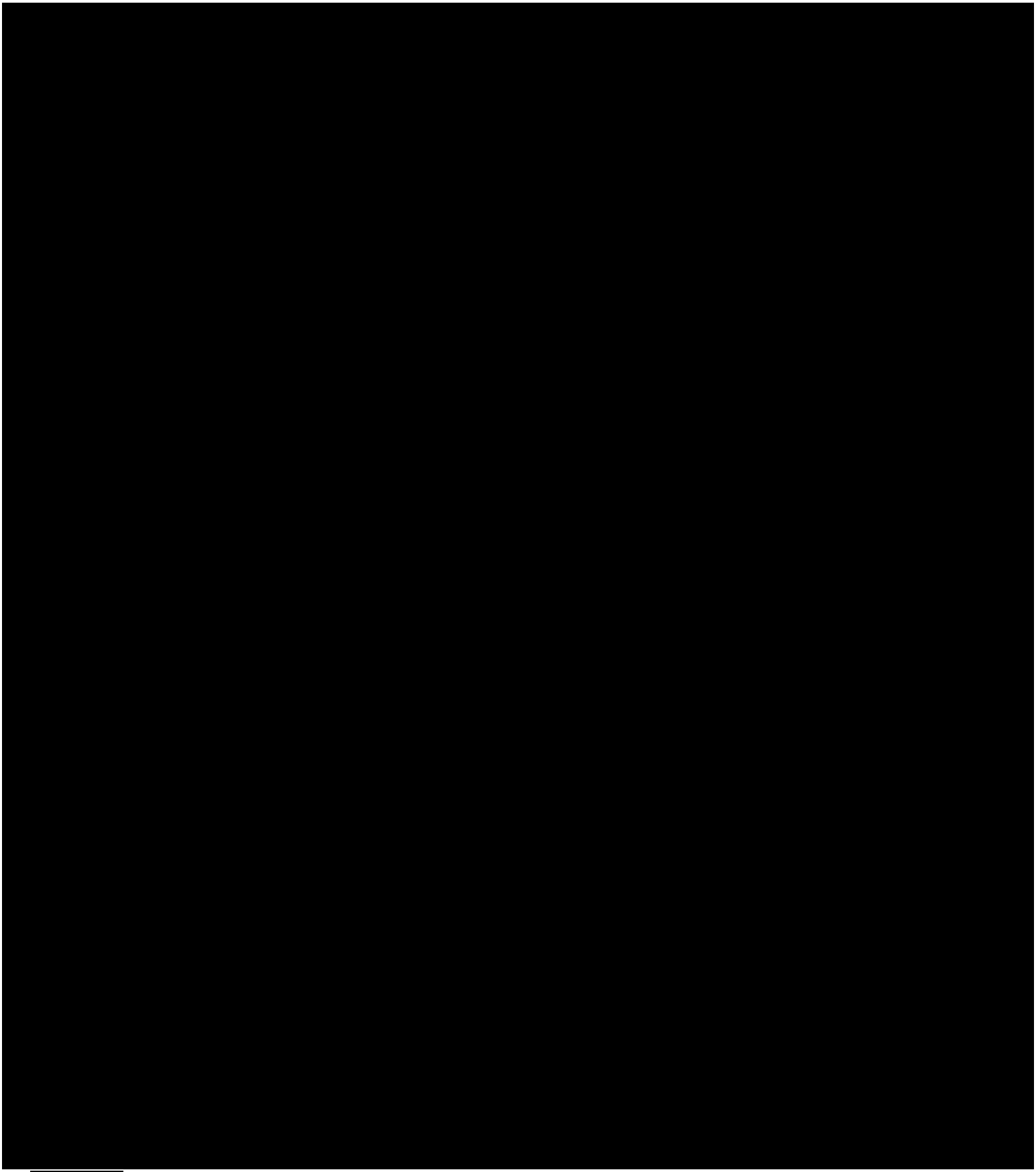
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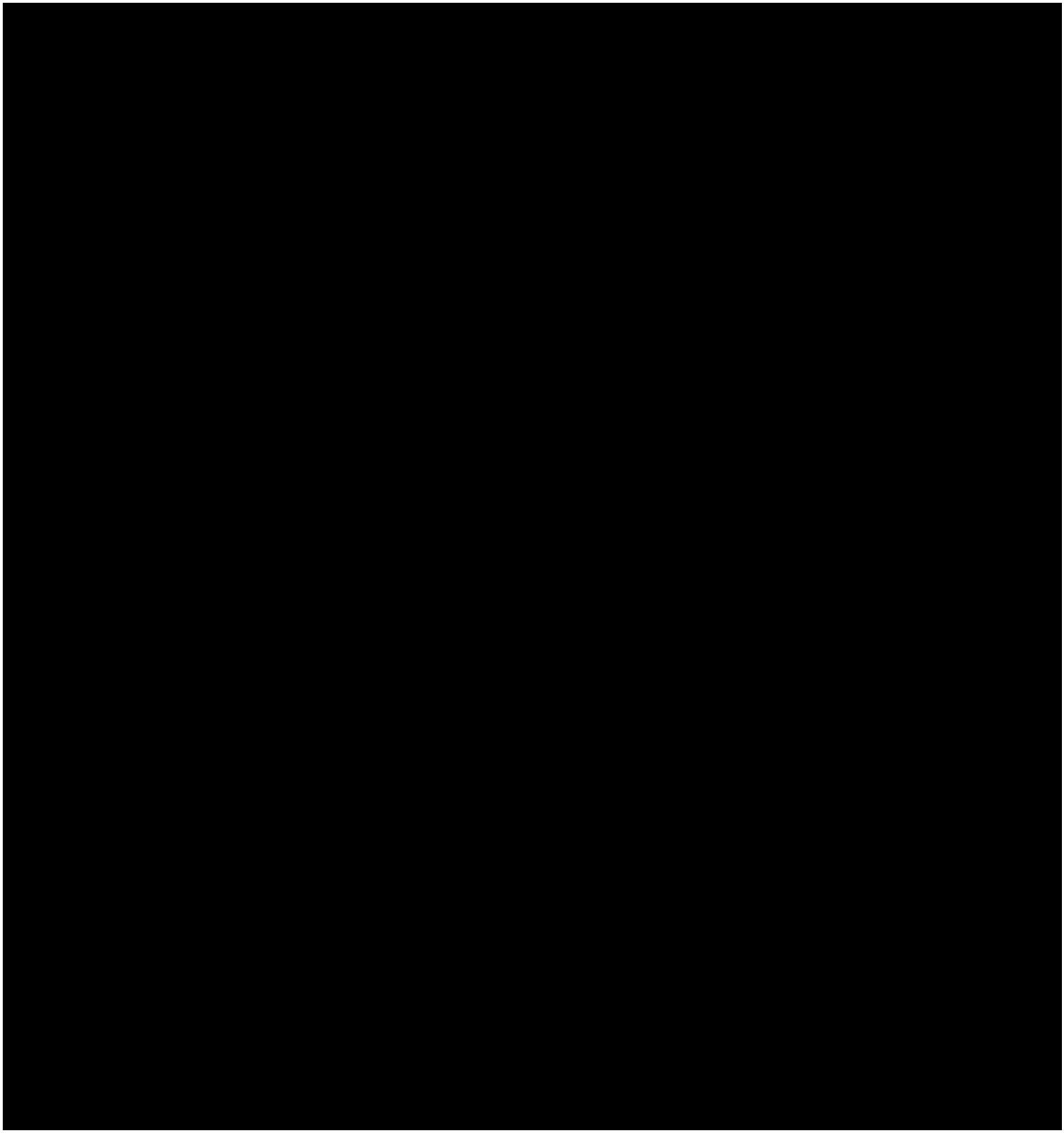
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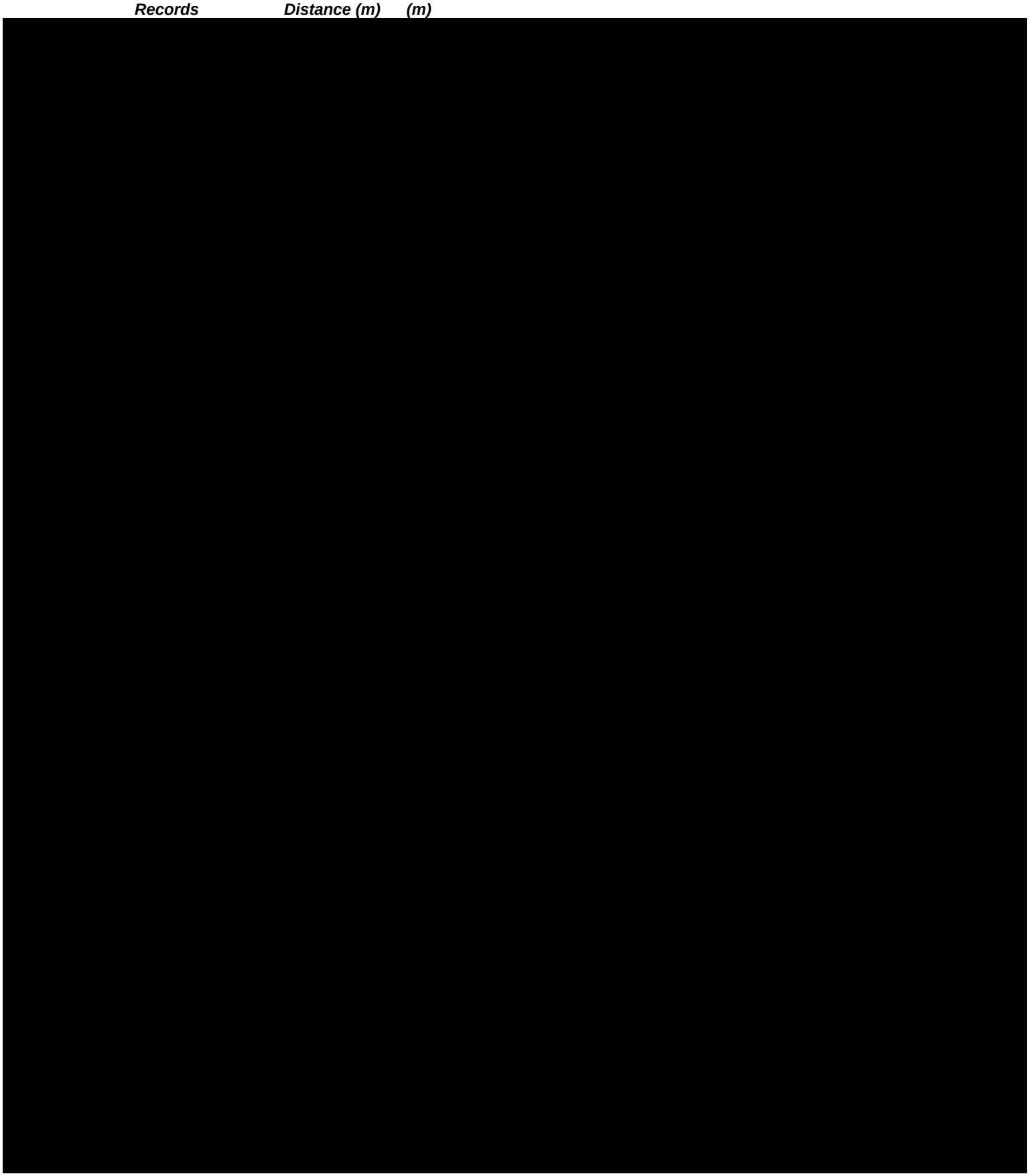


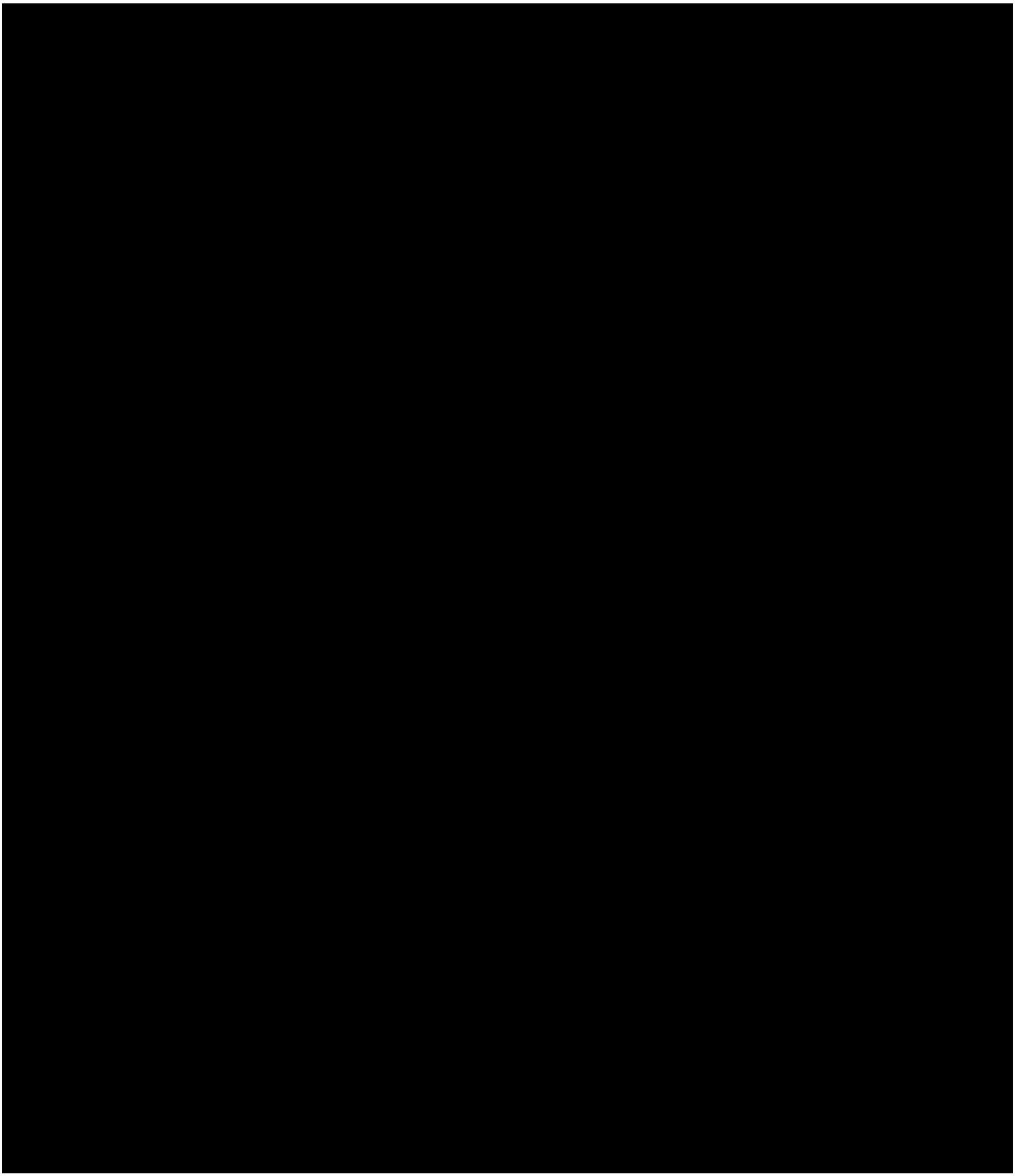


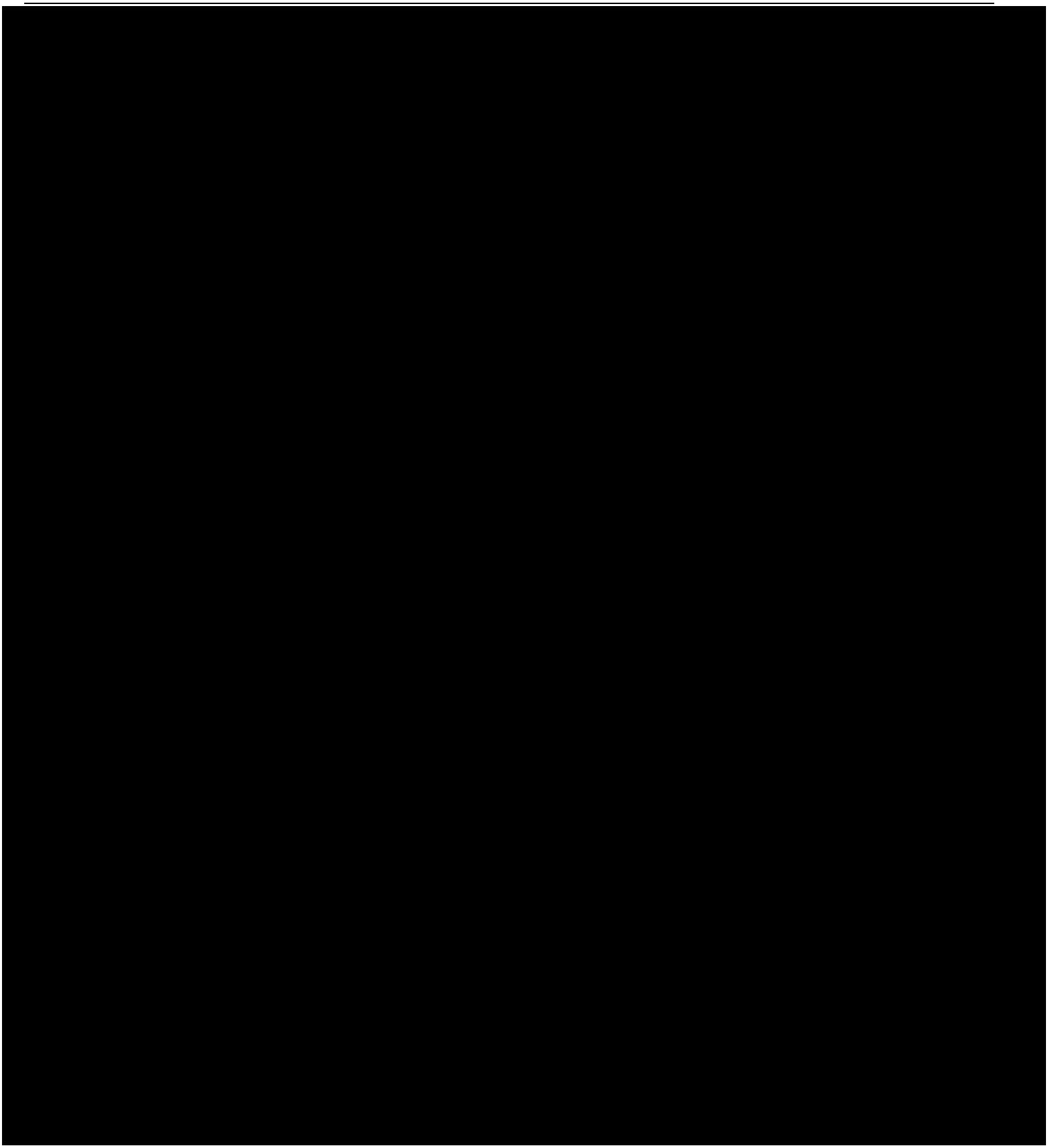


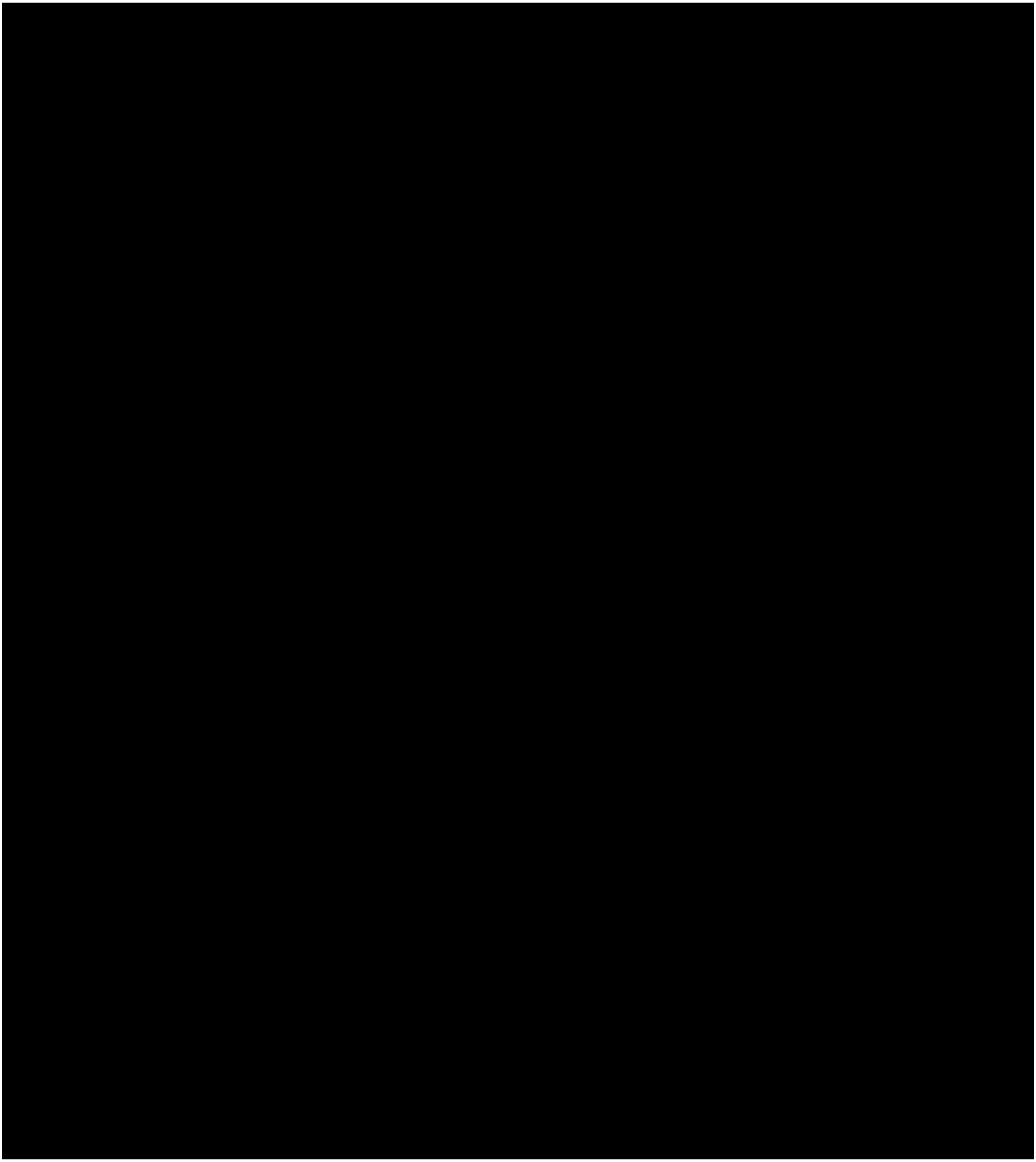
Waste Class Name:	WASTE OILS & LUBRICANTS



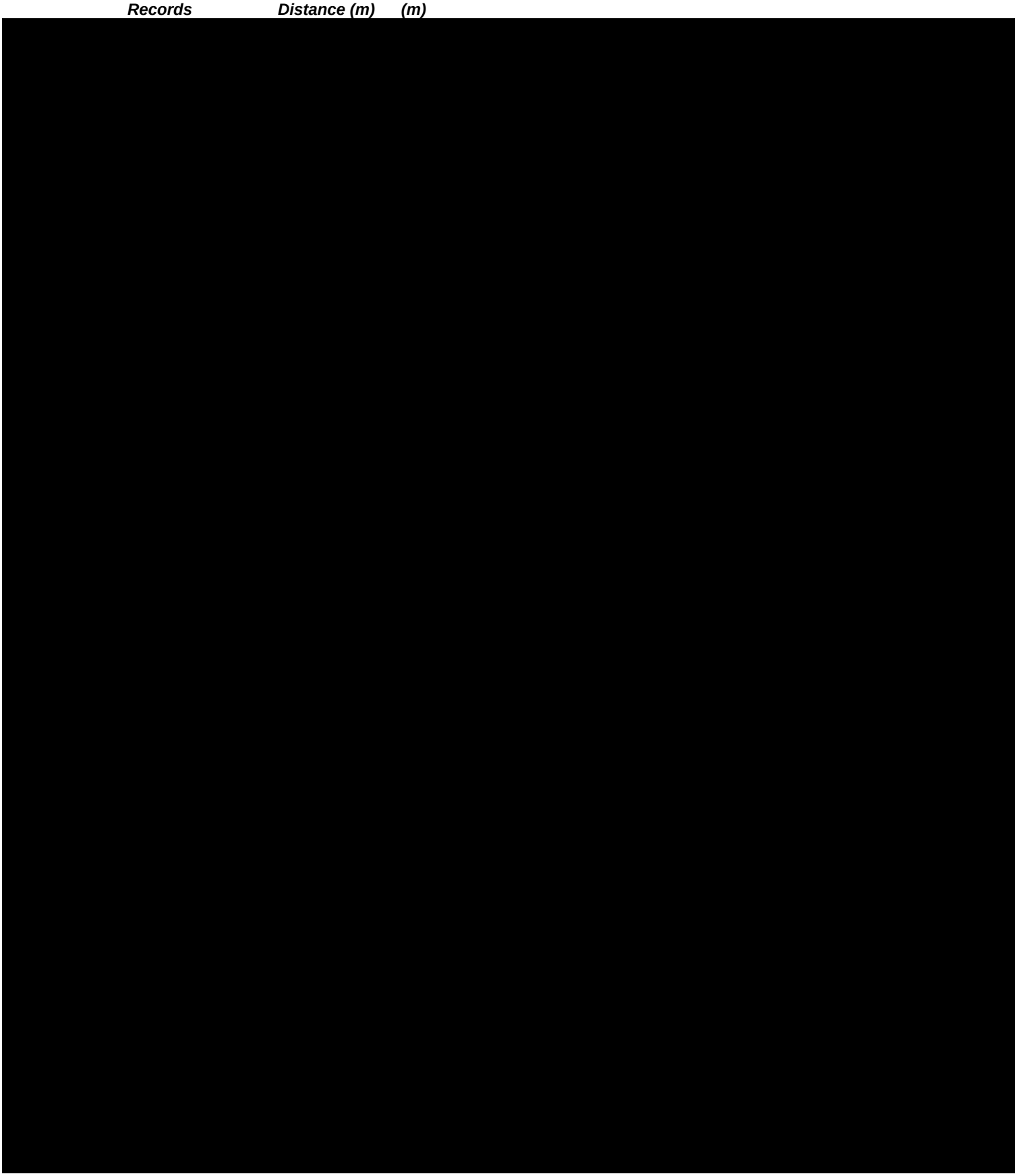








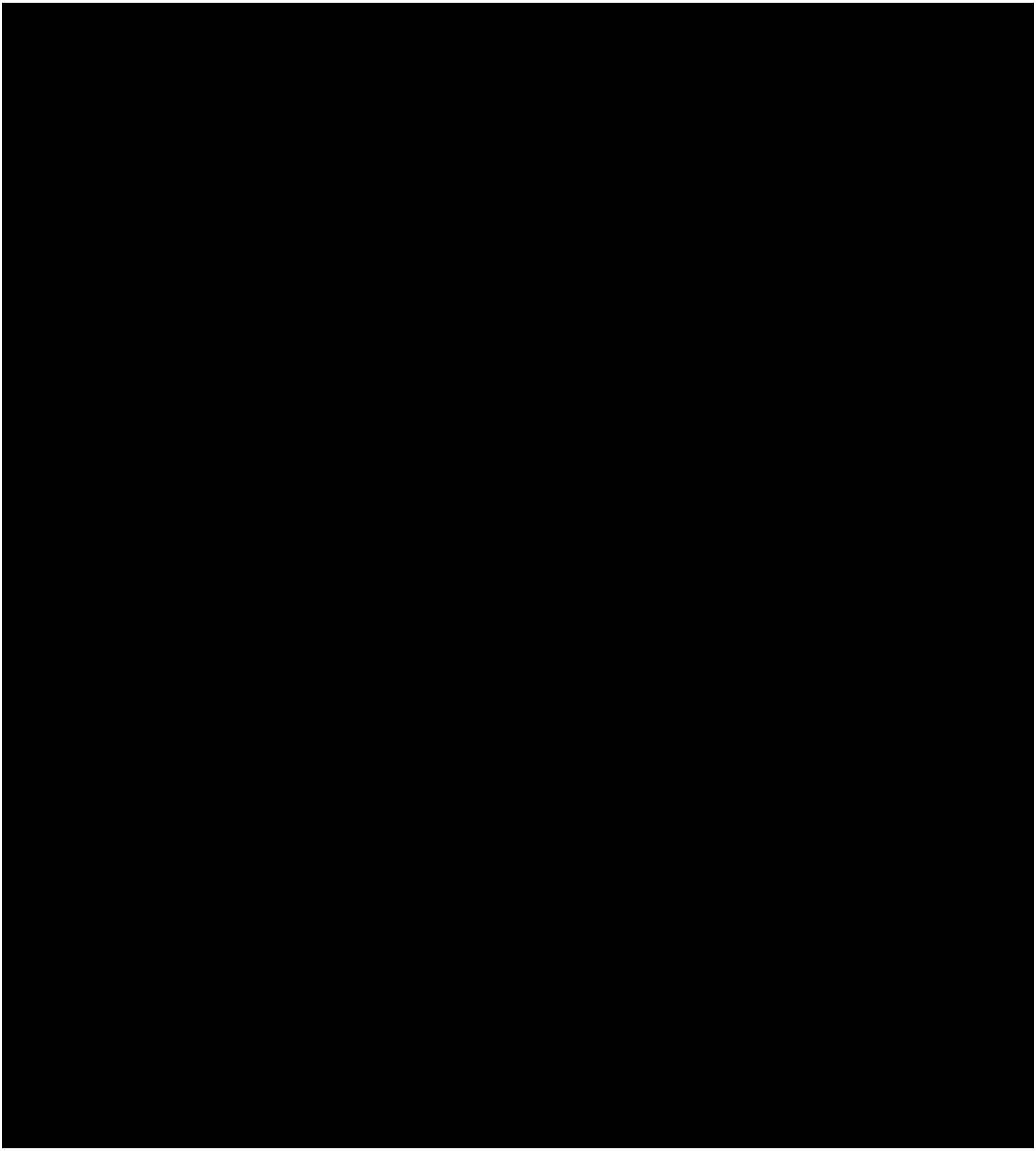
Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB

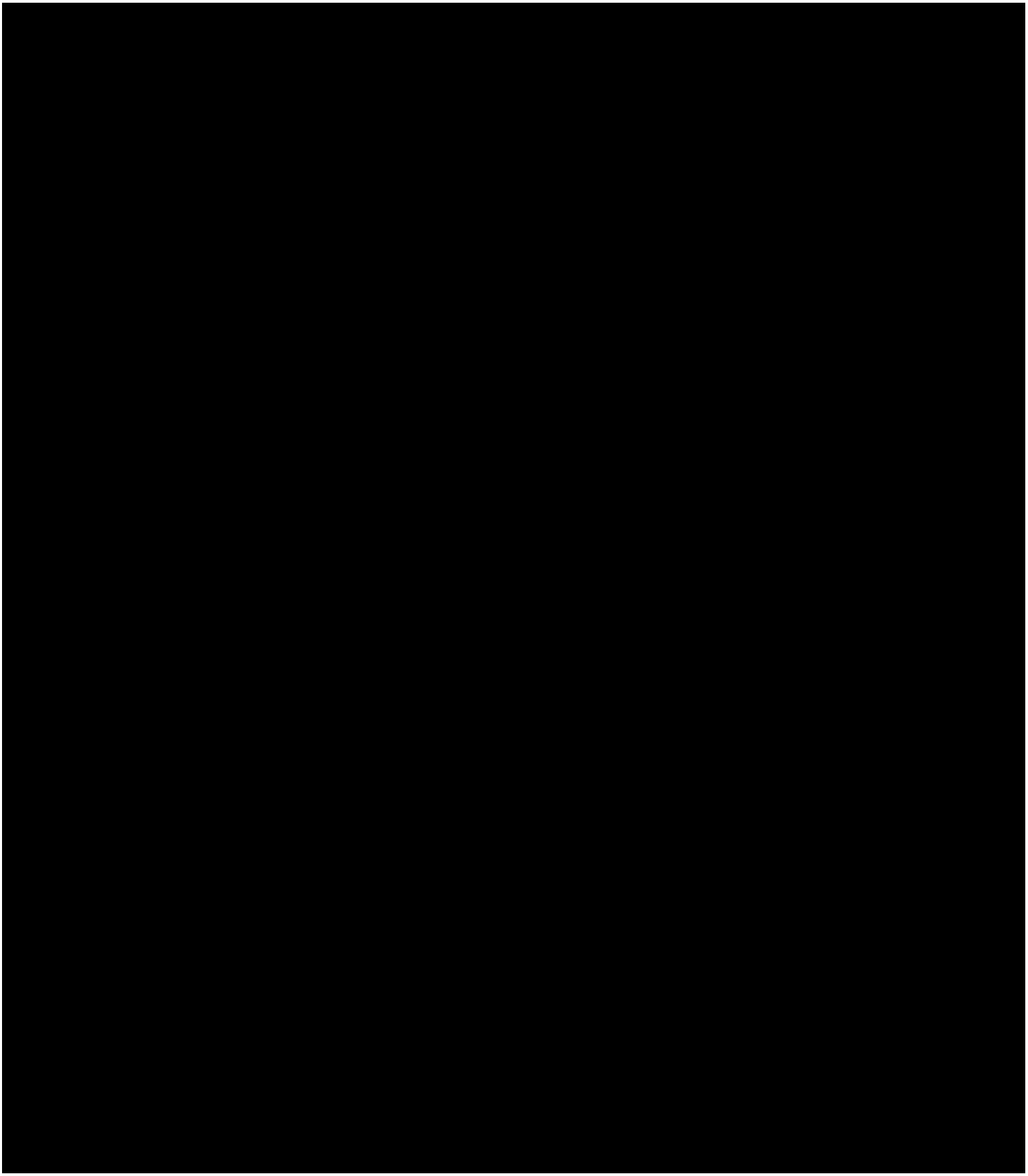


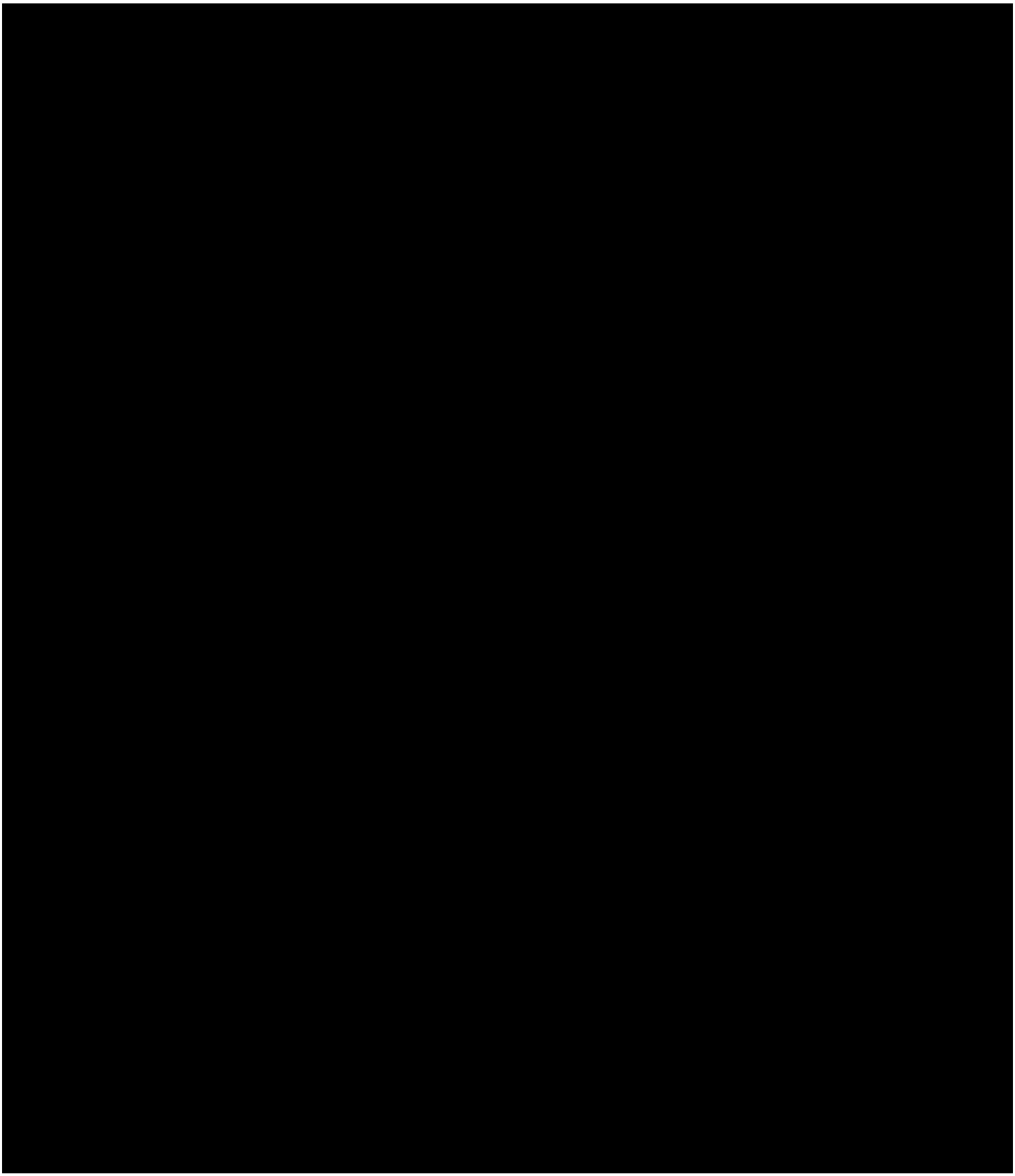
Waste Class: 213
Waste Class Name: PETROLEUM DISTILLATES

Waste Class: 252
Waste Class Name: WASTE OILS & LUBRICANTS

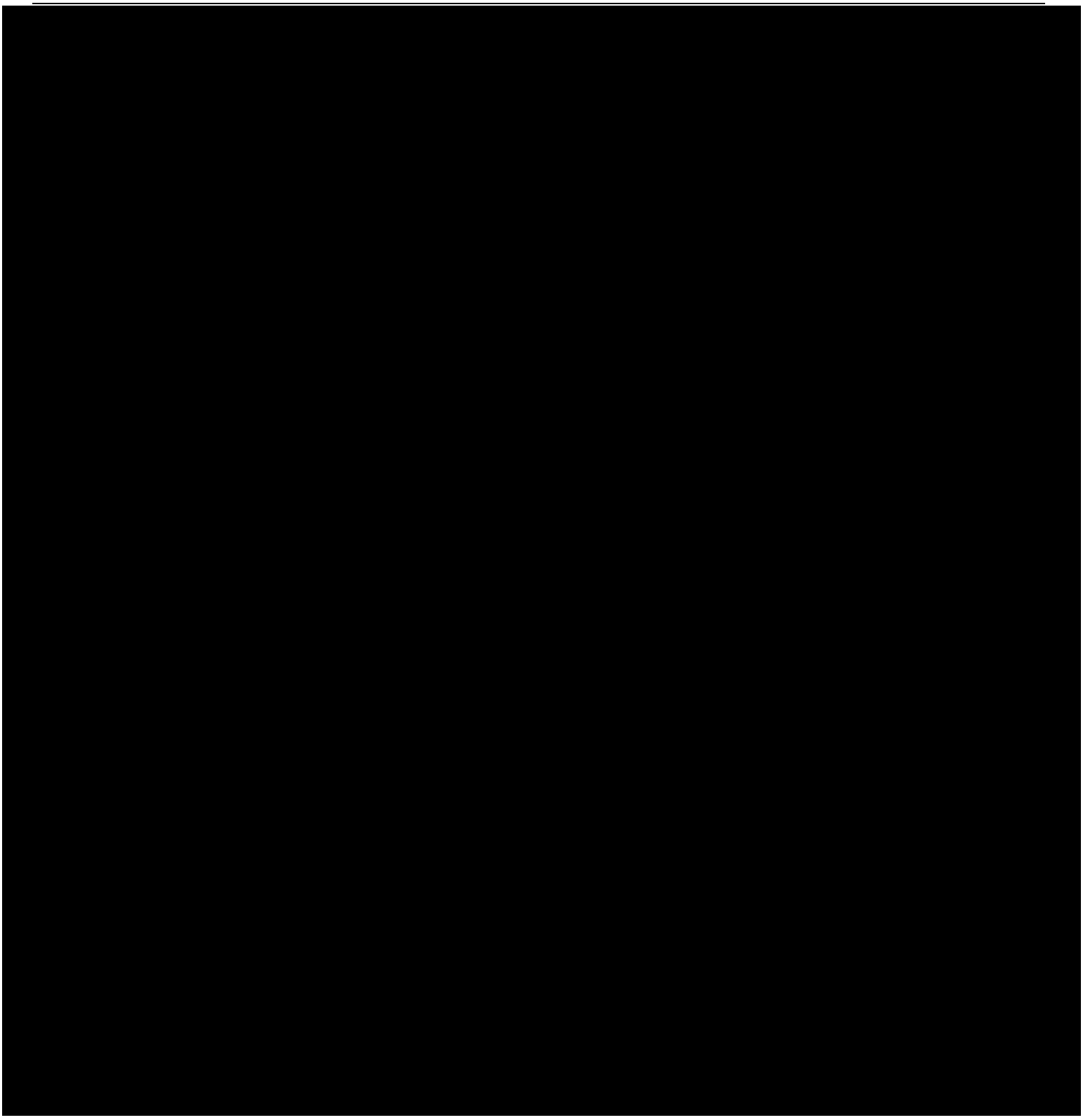
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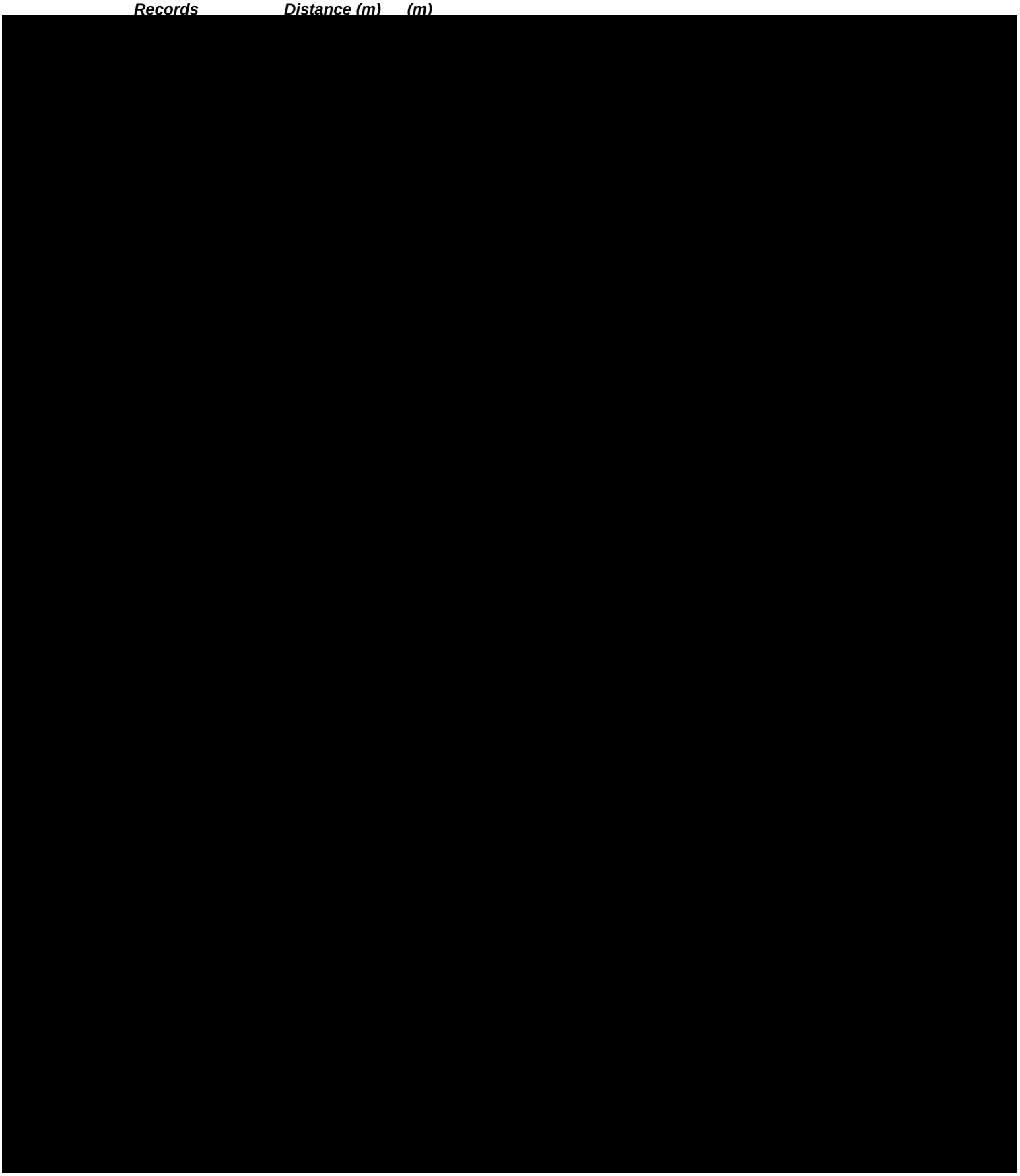




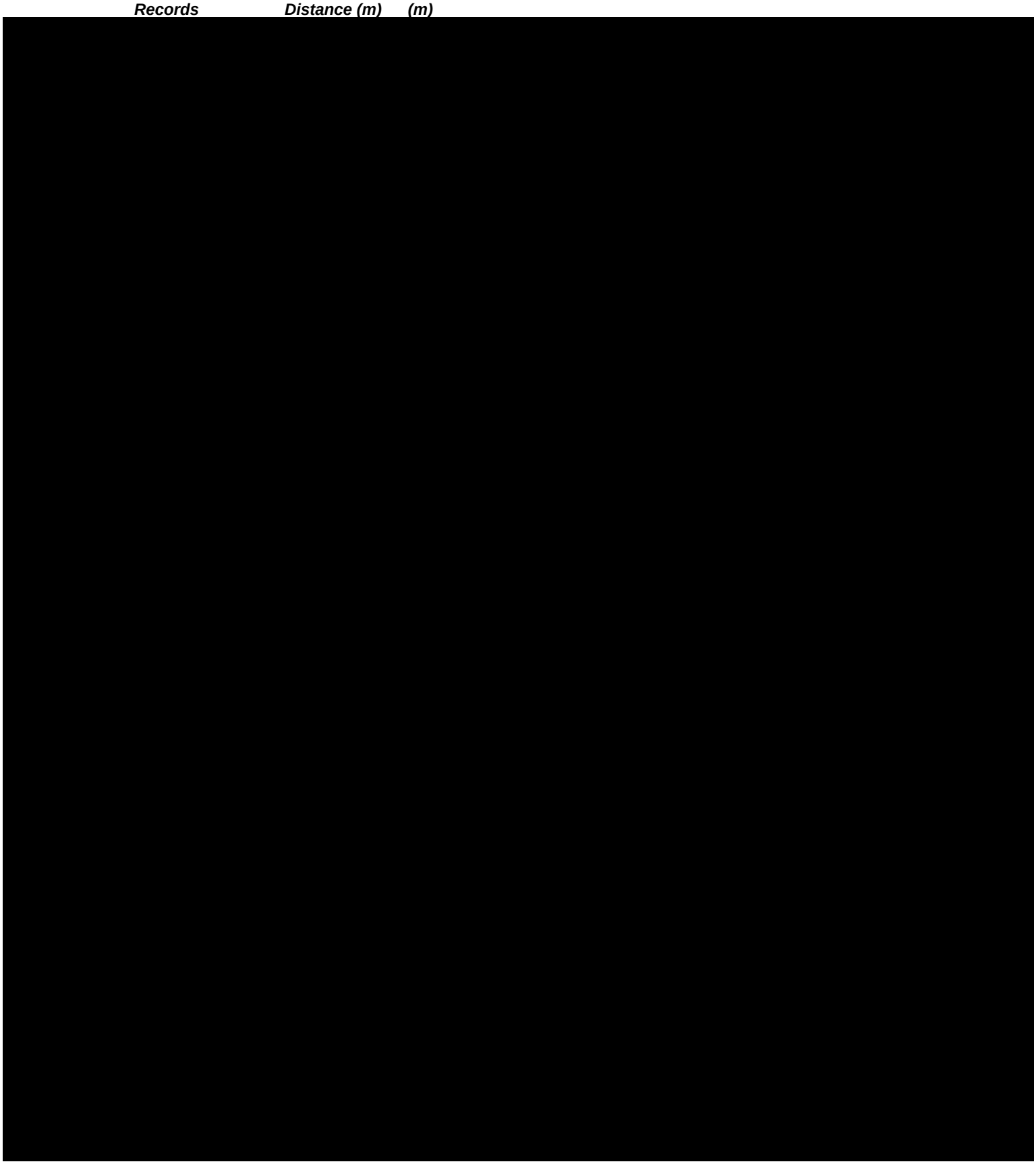


Waste Class: 148
Waste Class Name: INORGANIC LABORATORY CHEMICALS

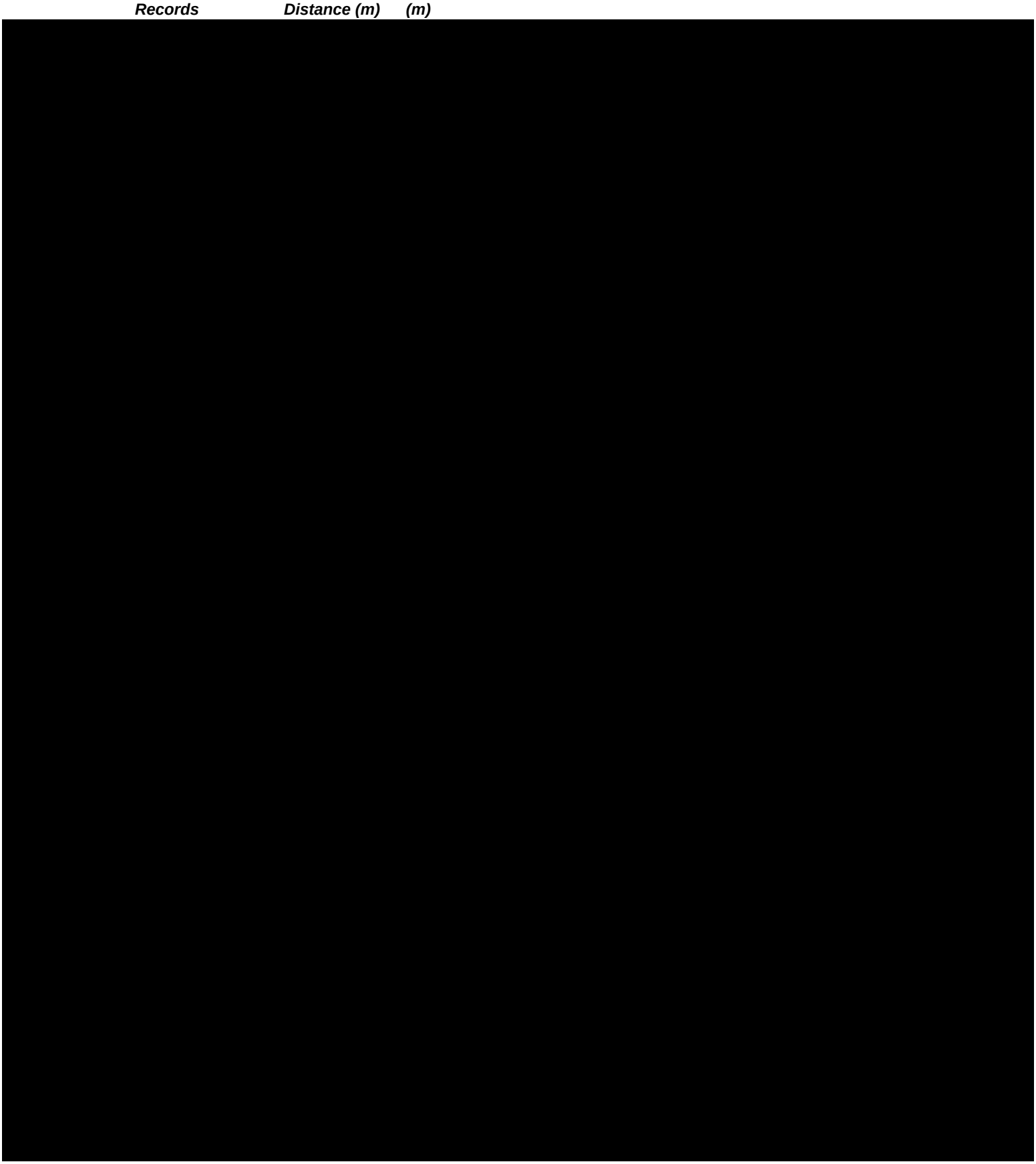


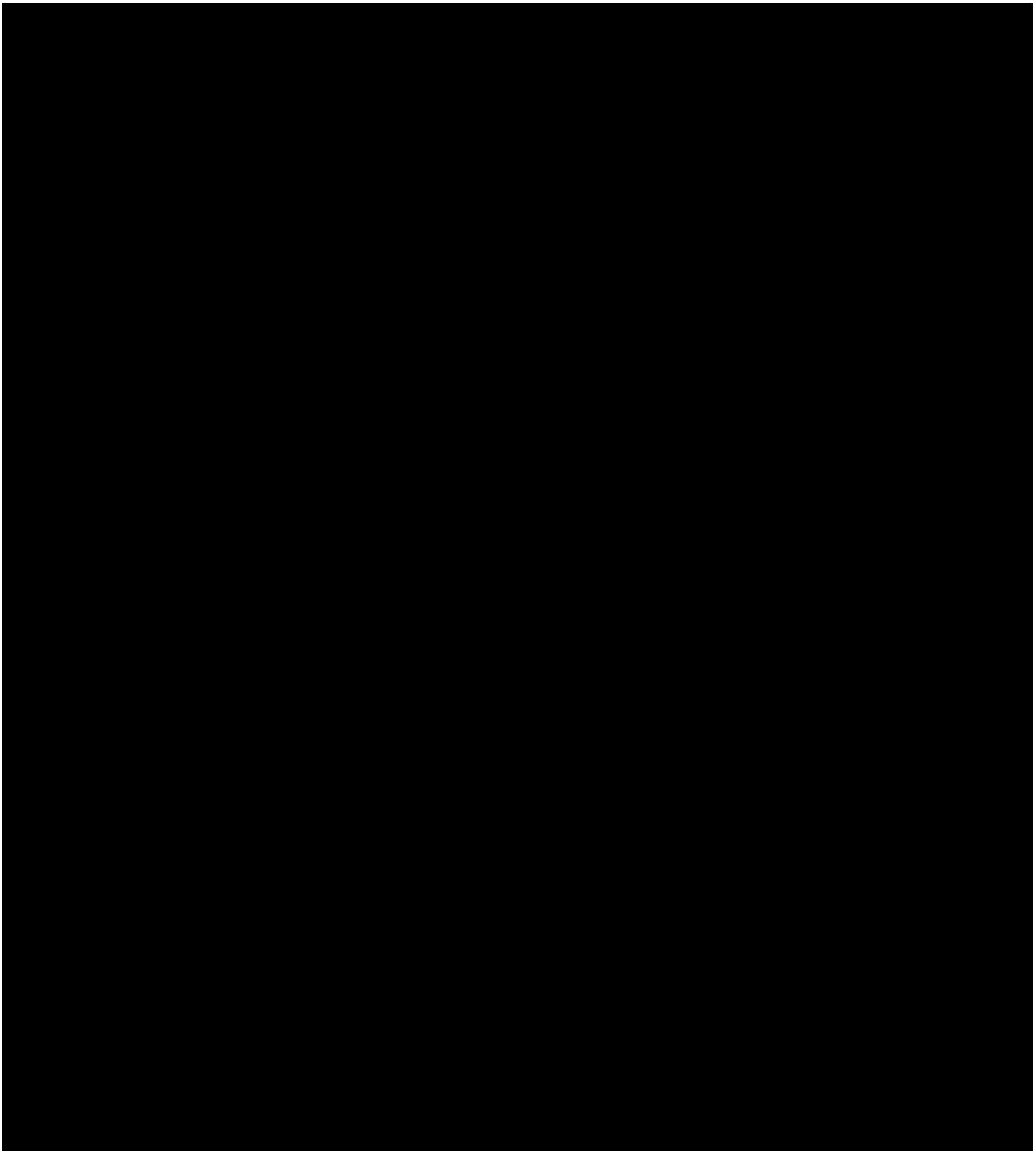


Map Key	Number of Records	Direction/ Distance (m)	Elev/Diff (m)	Site	DB

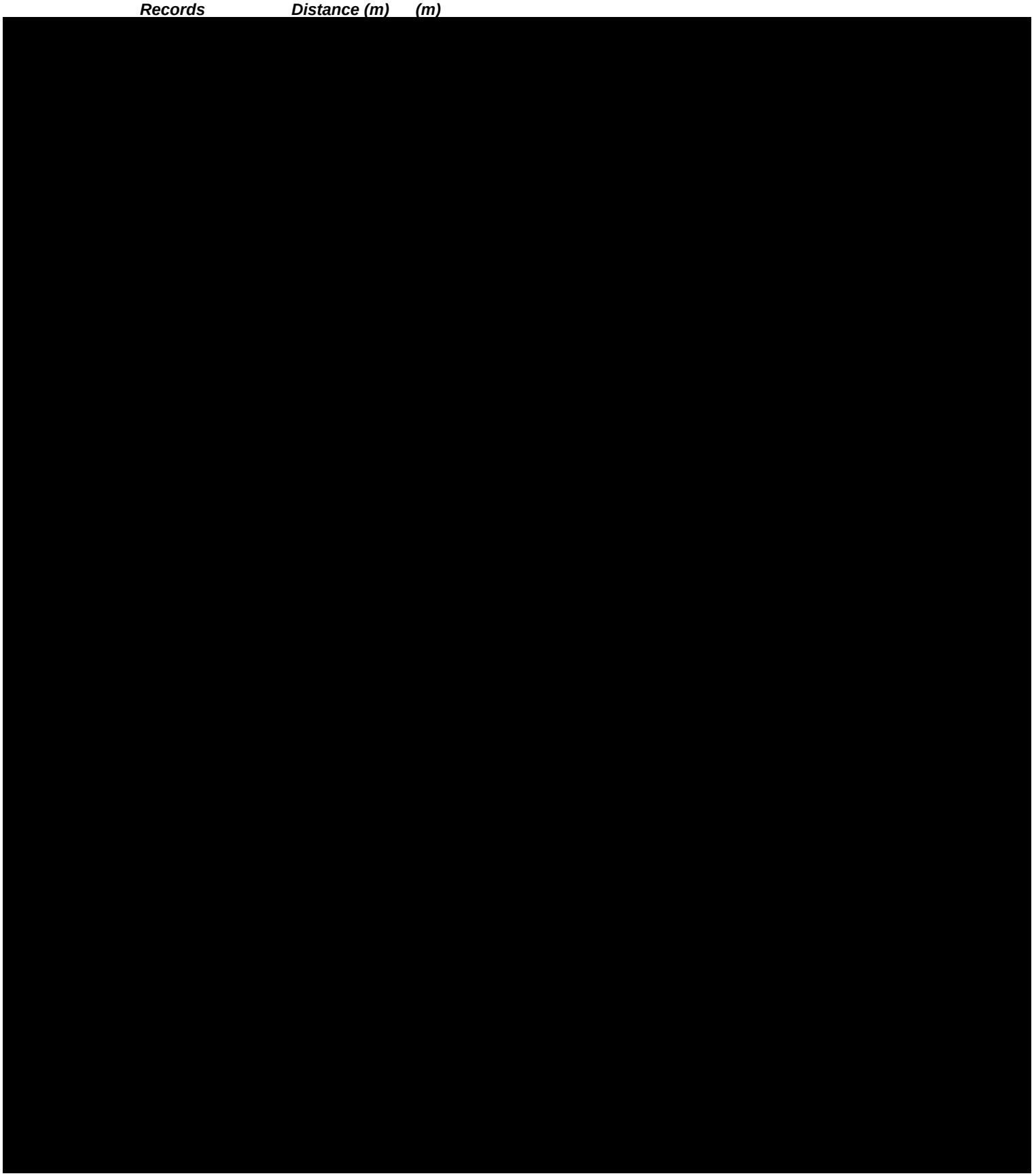


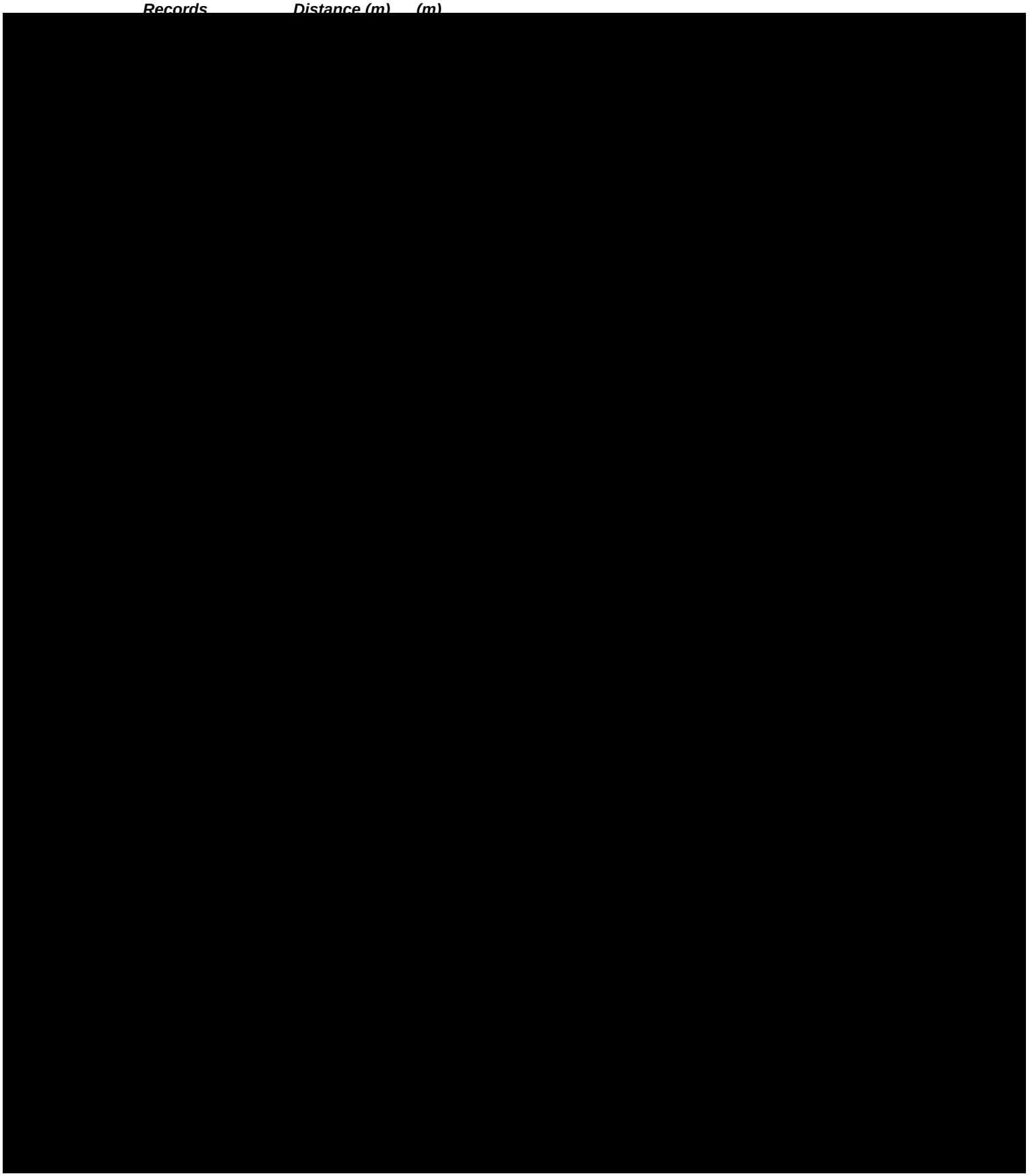
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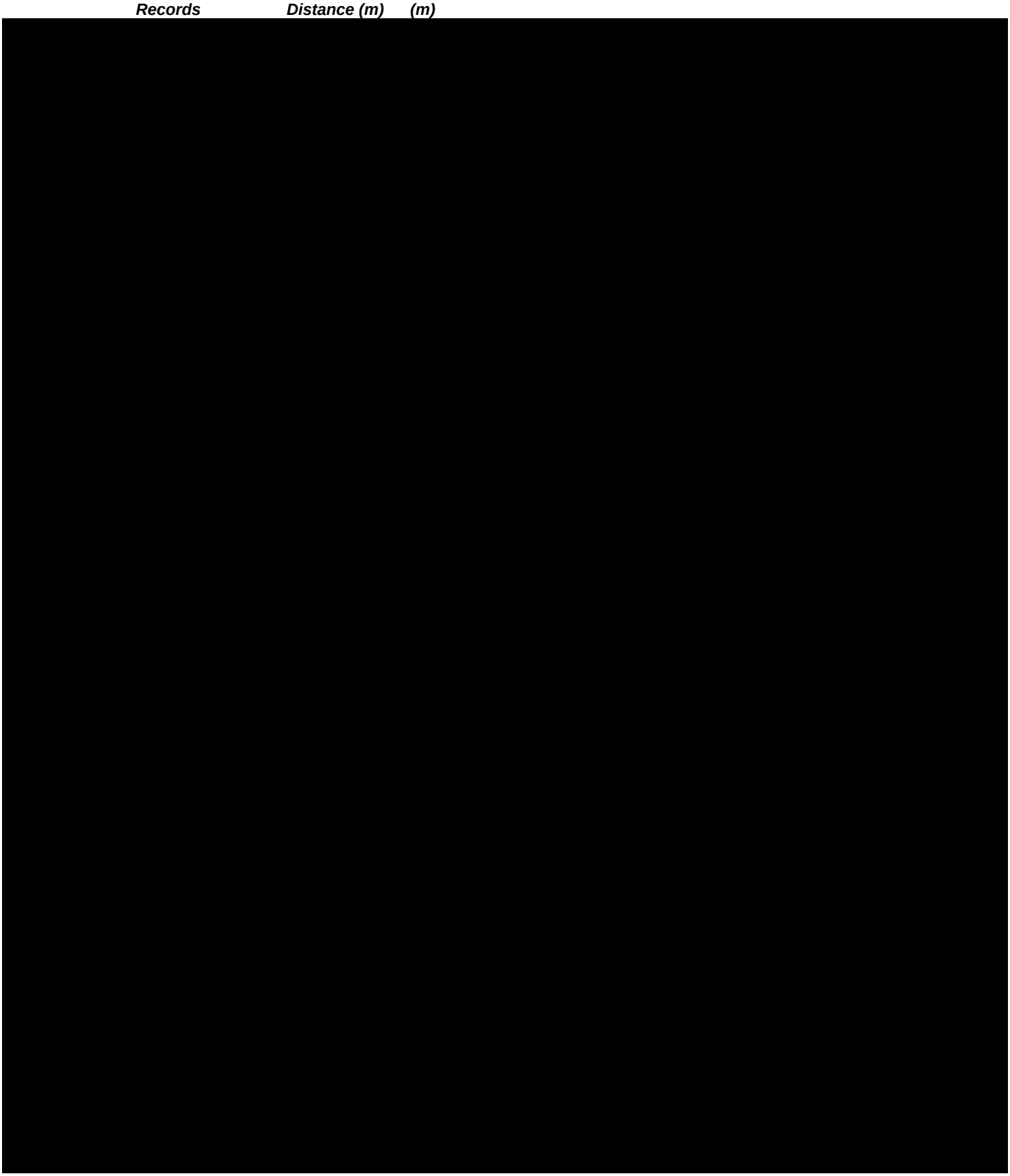


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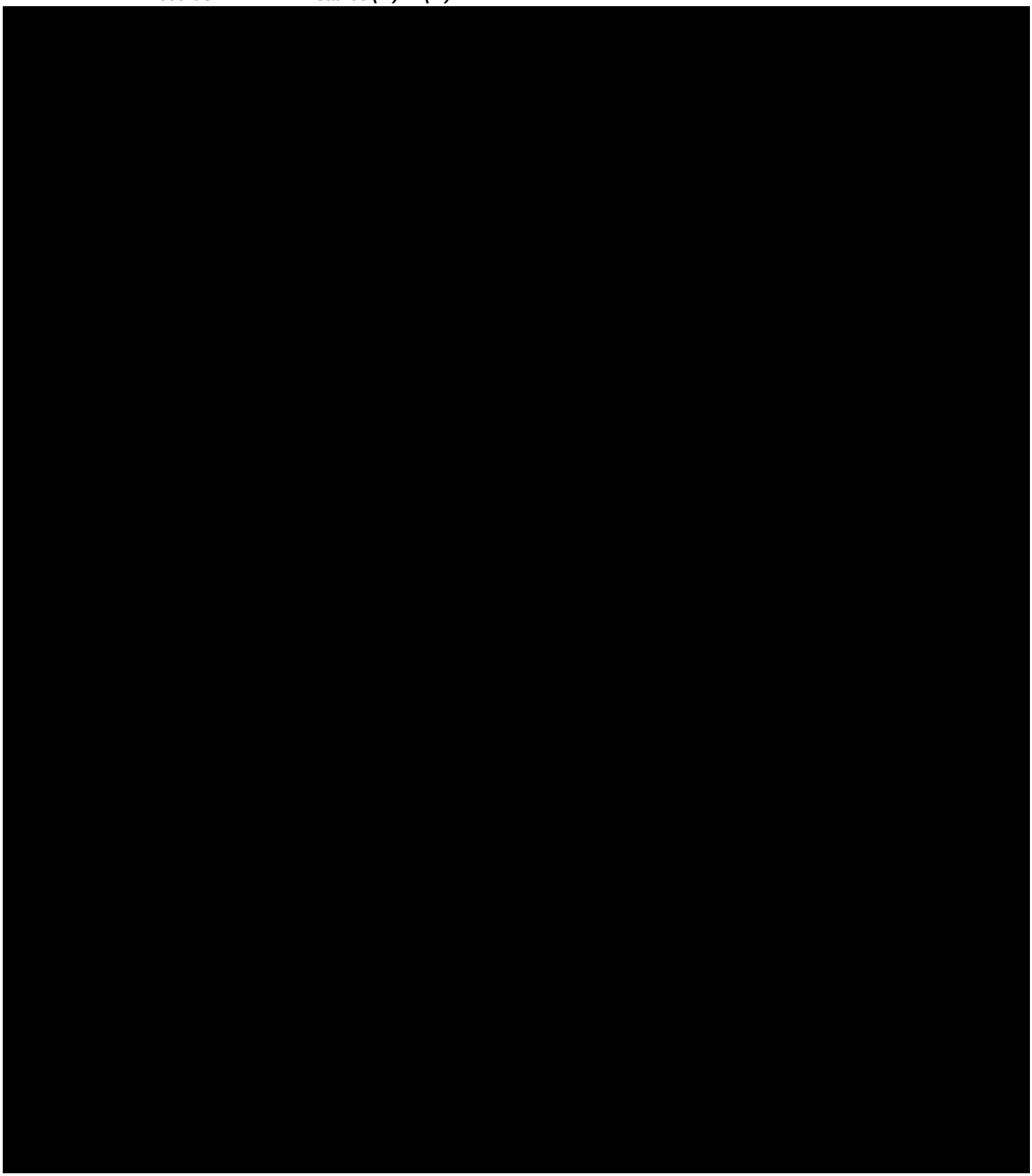


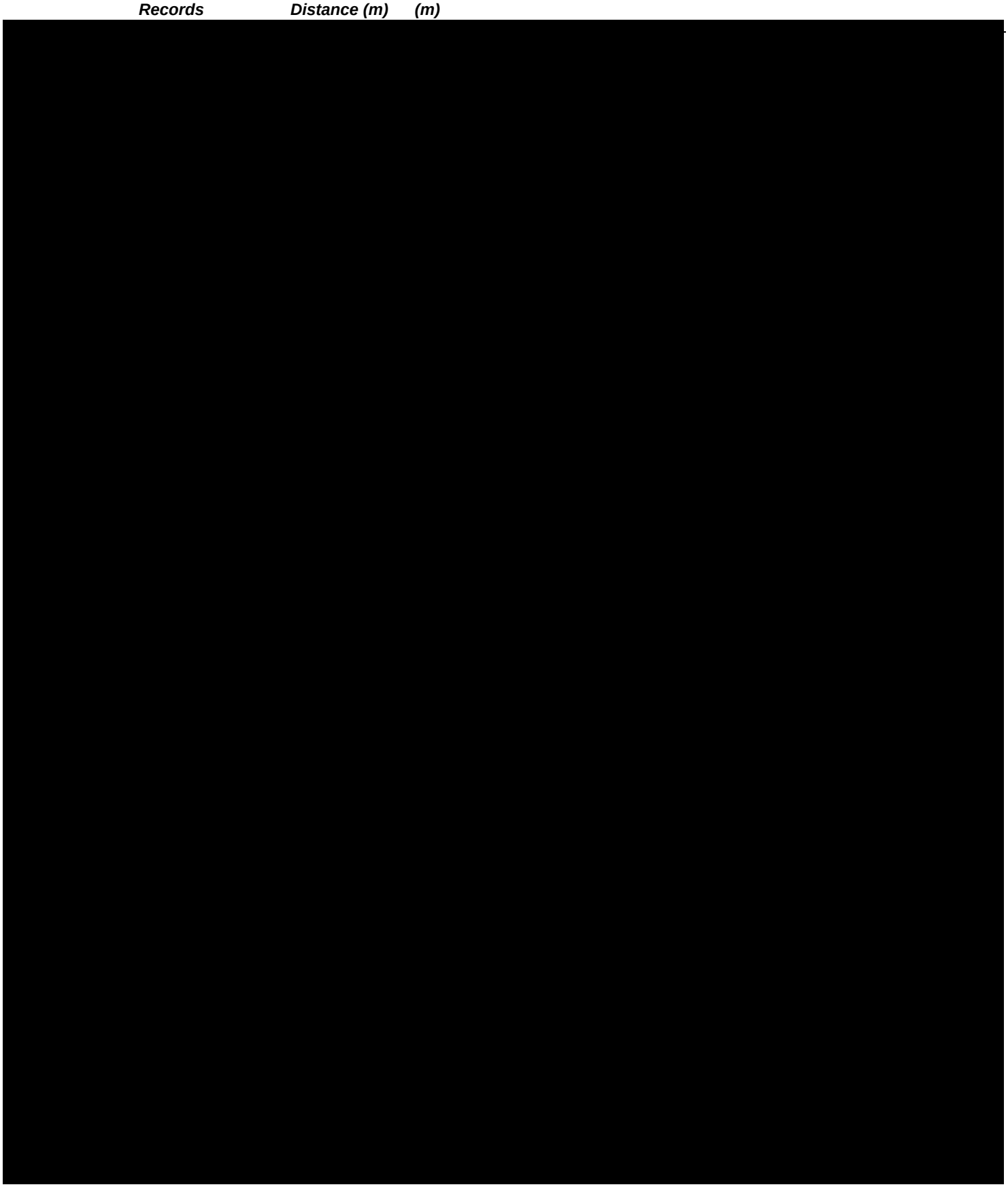


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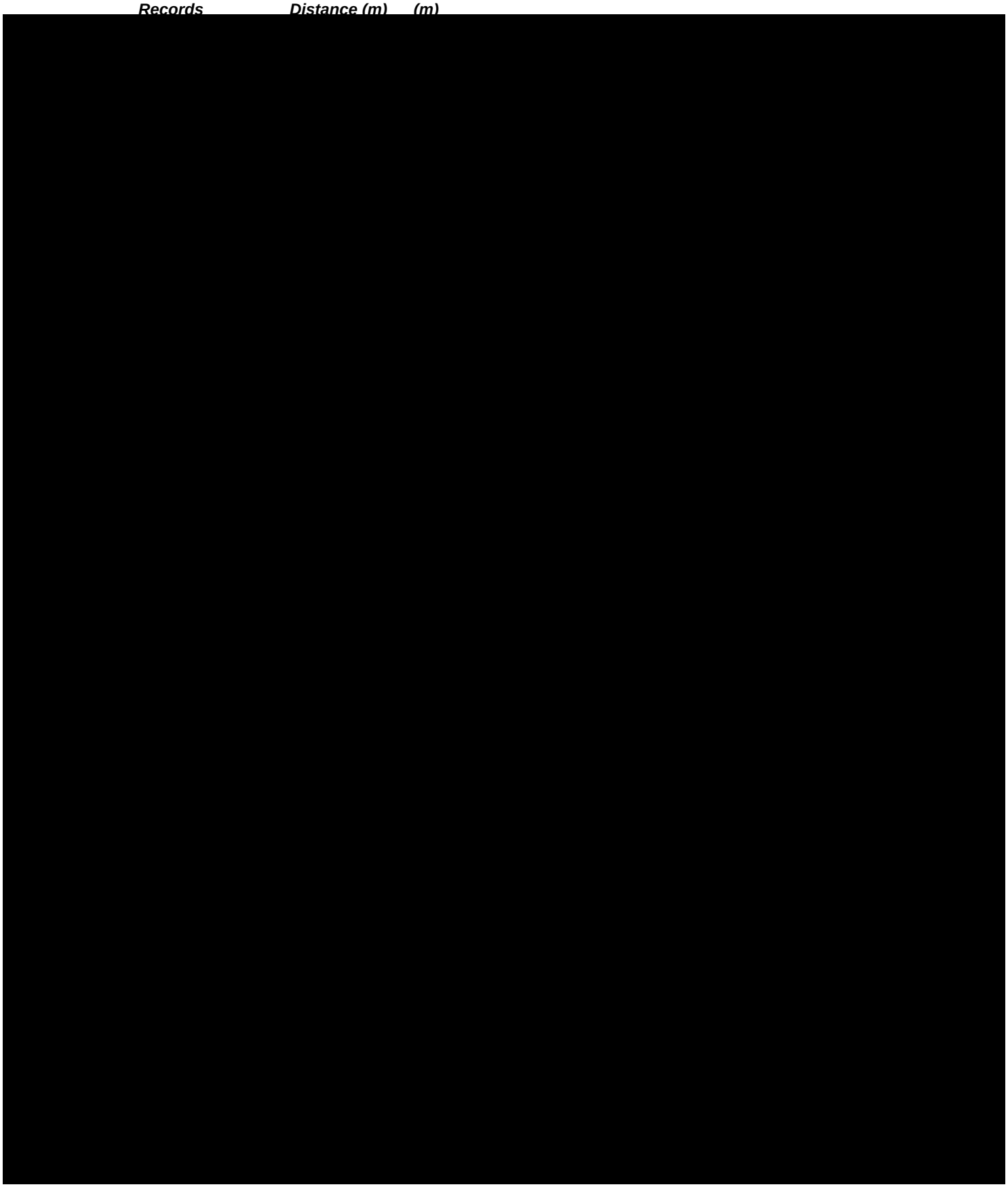


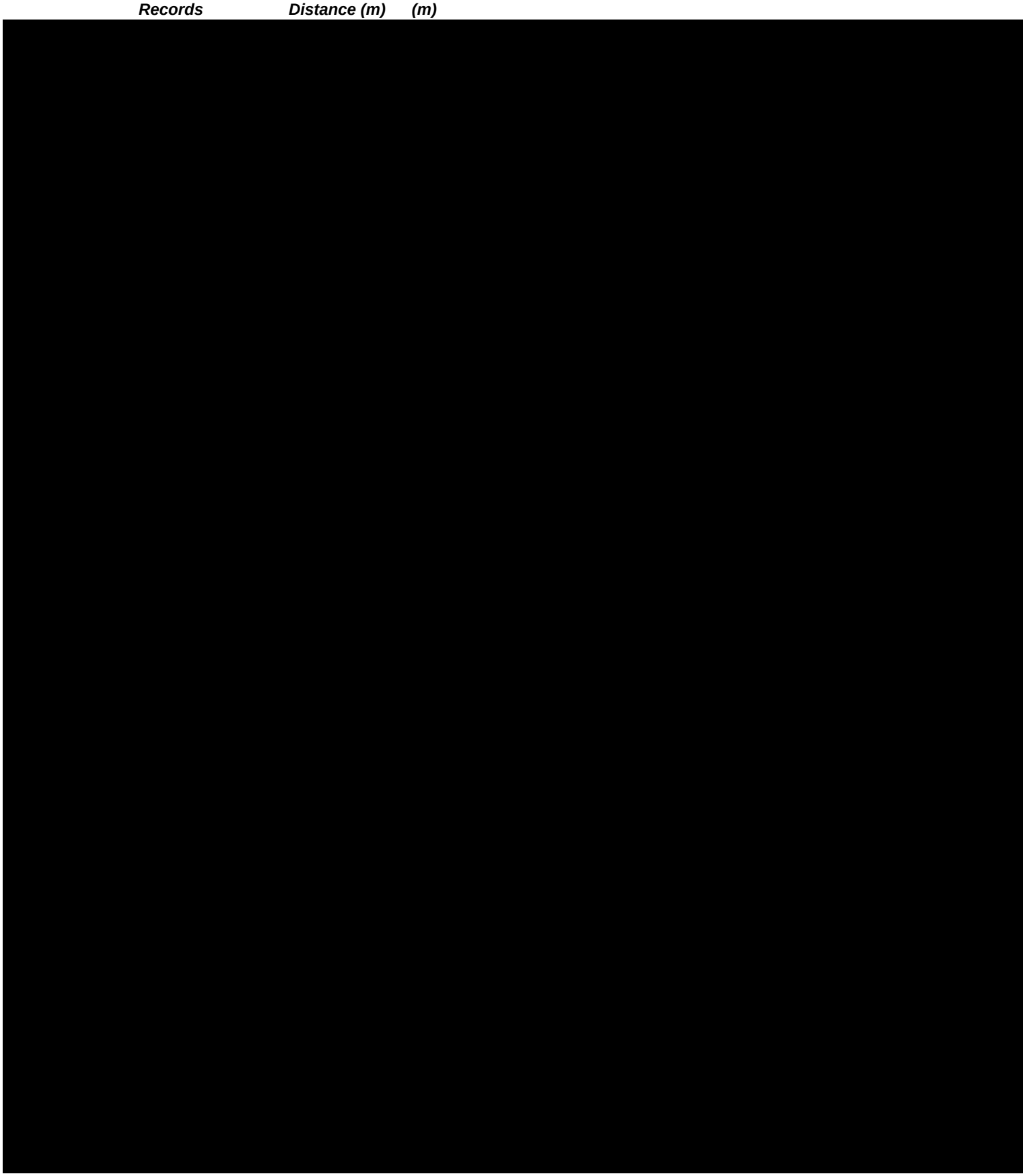
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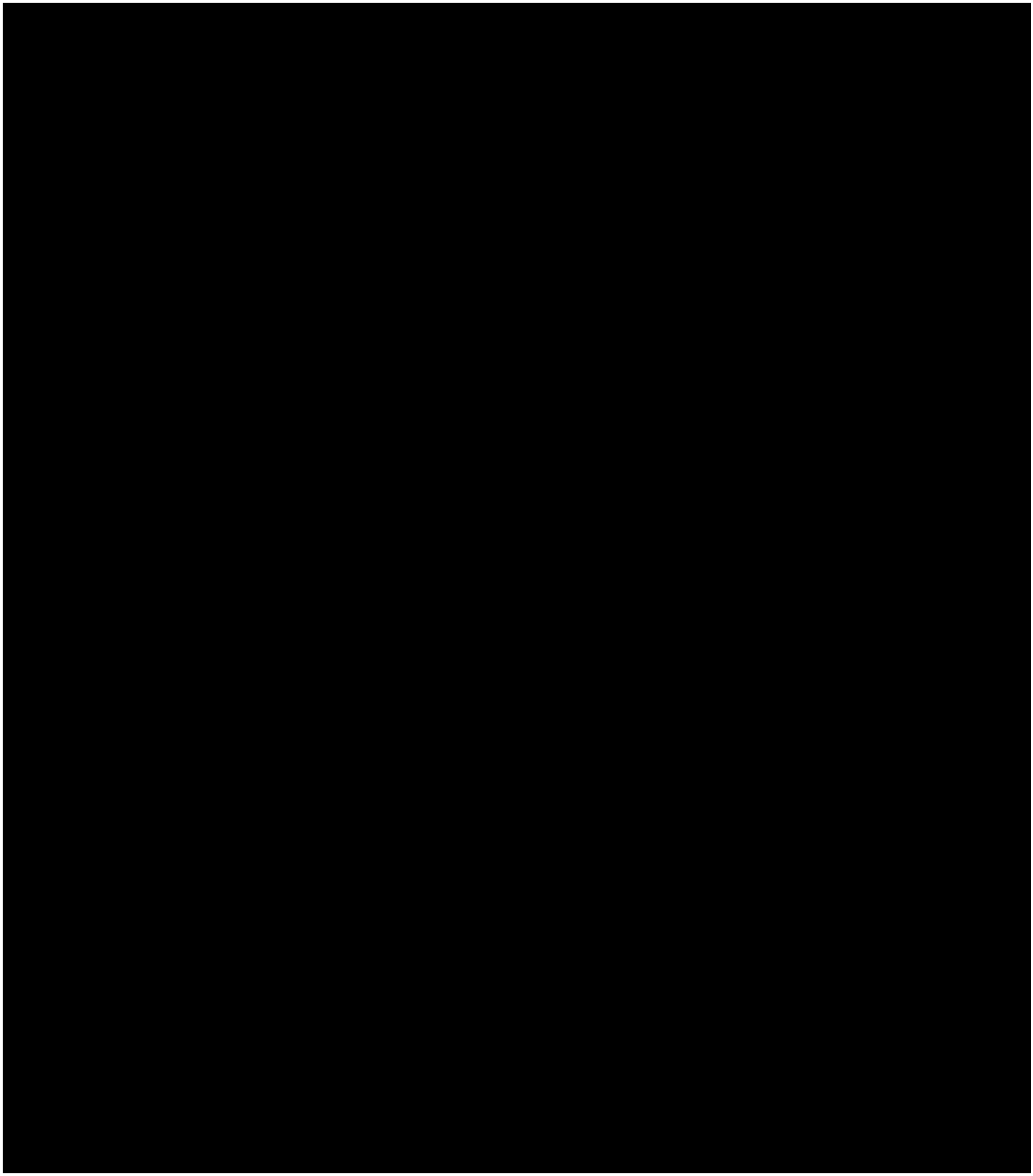


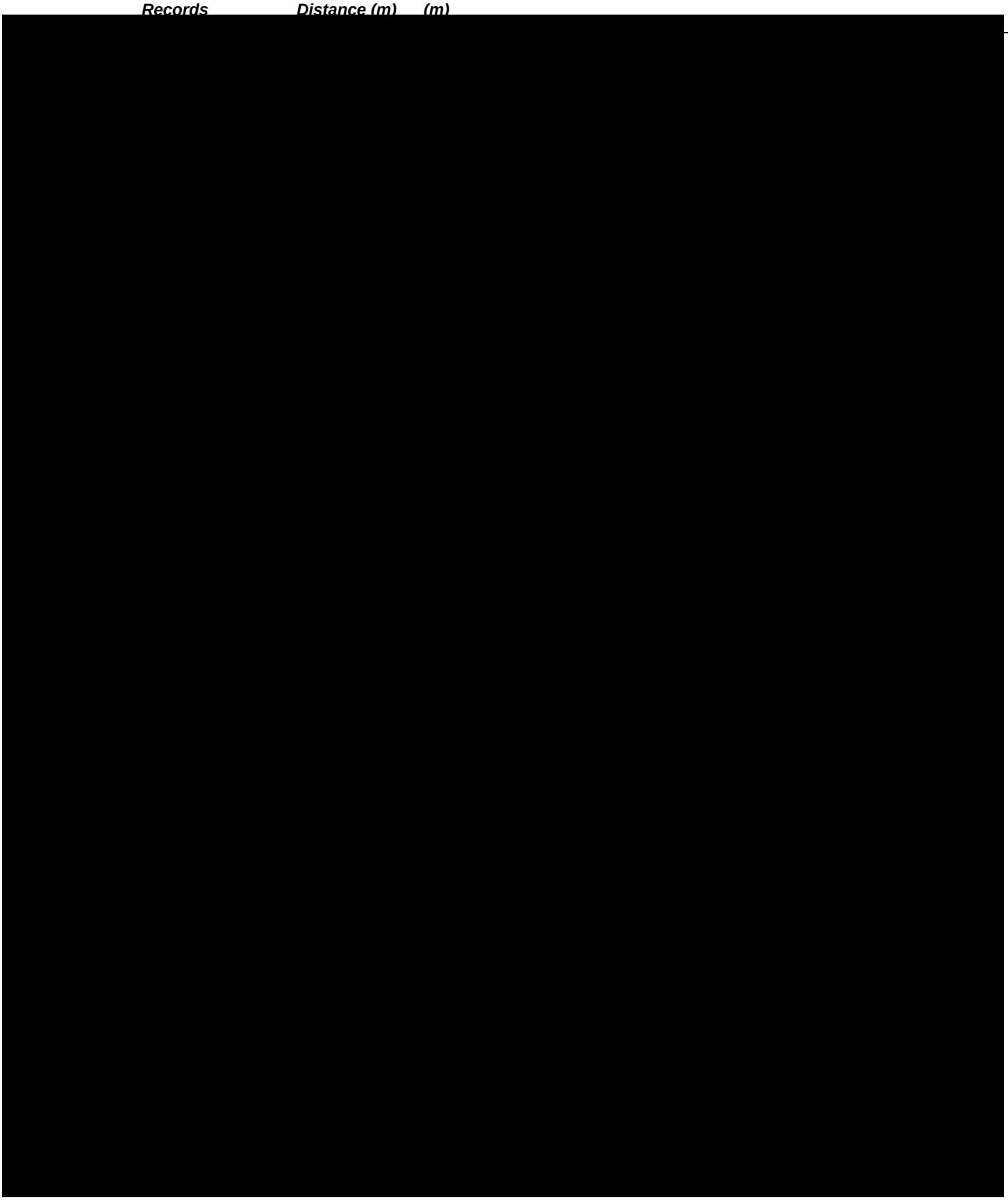


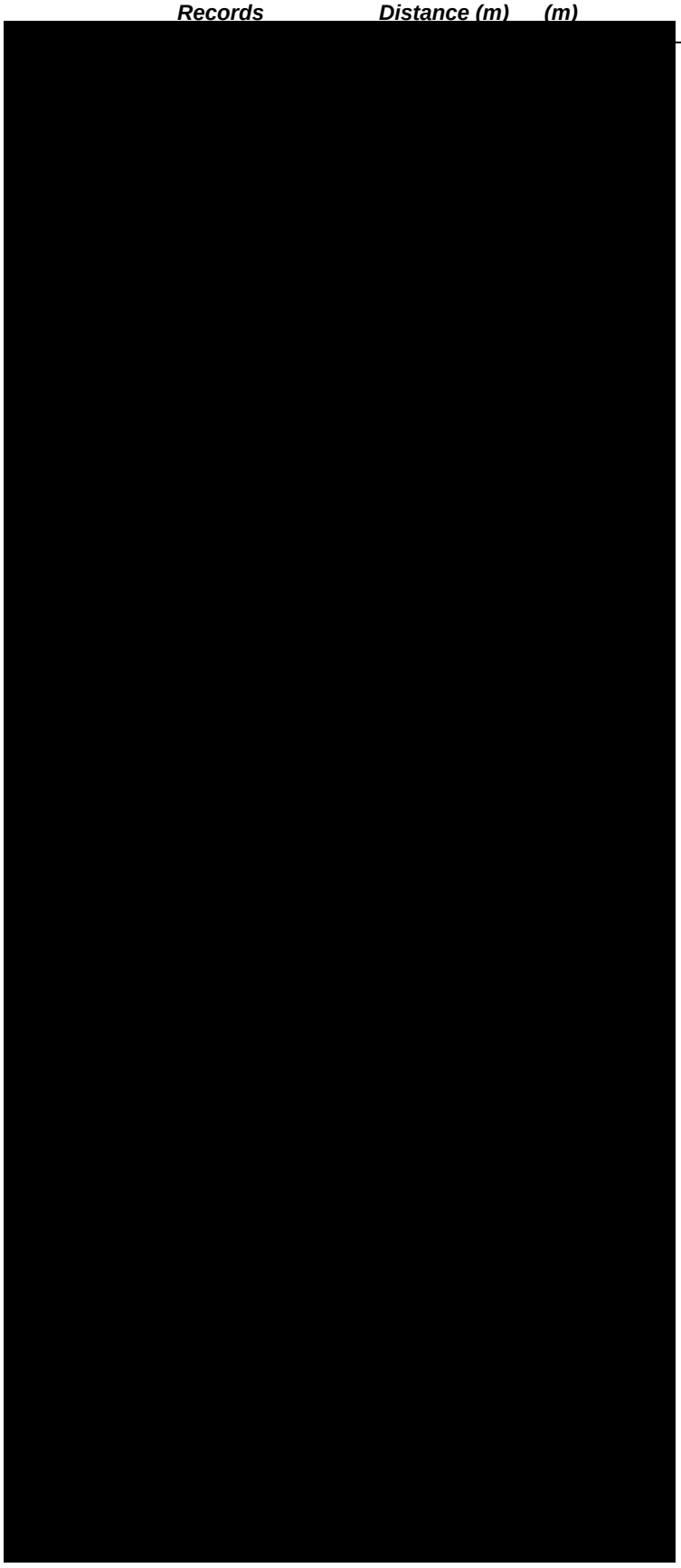
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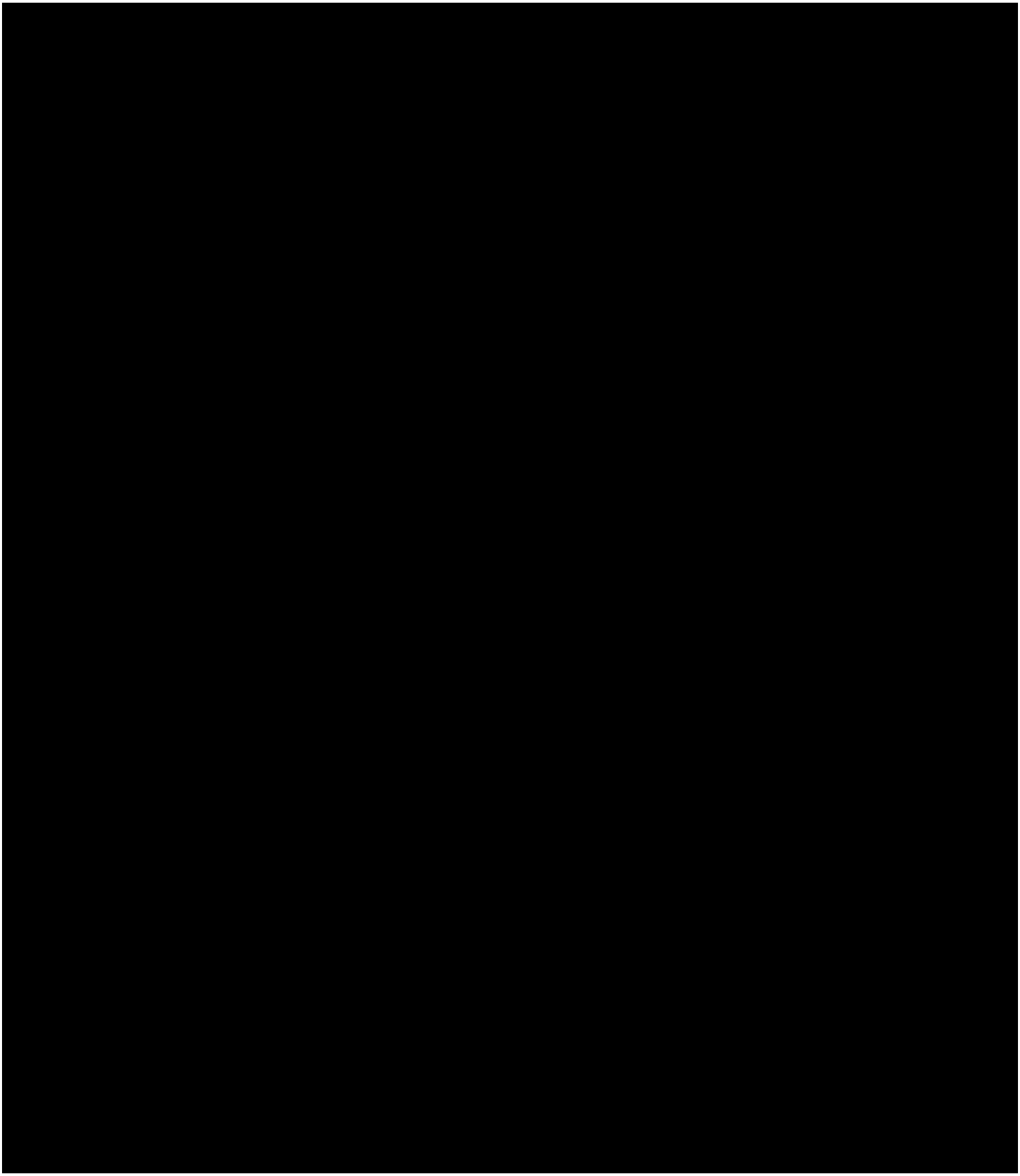




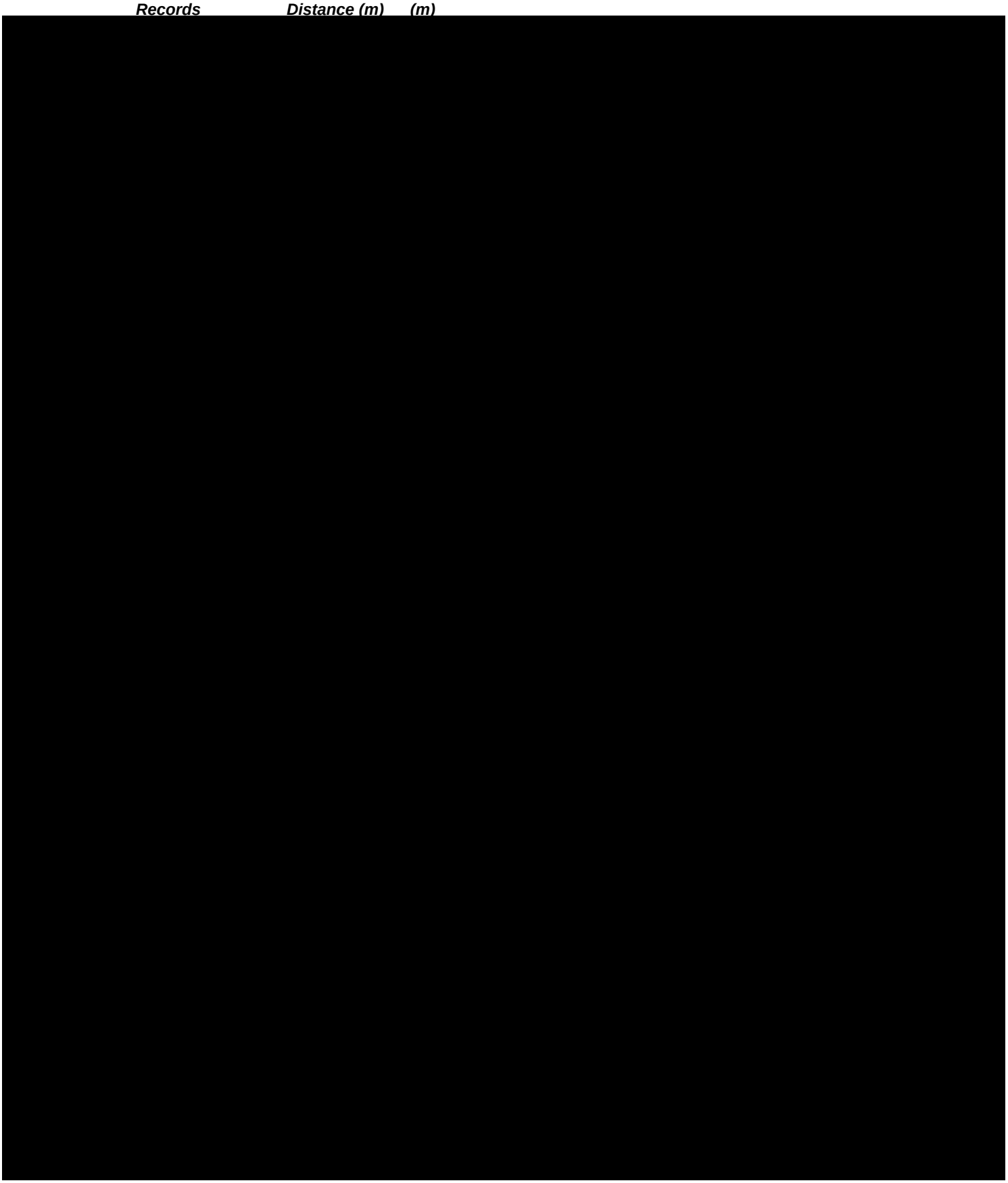


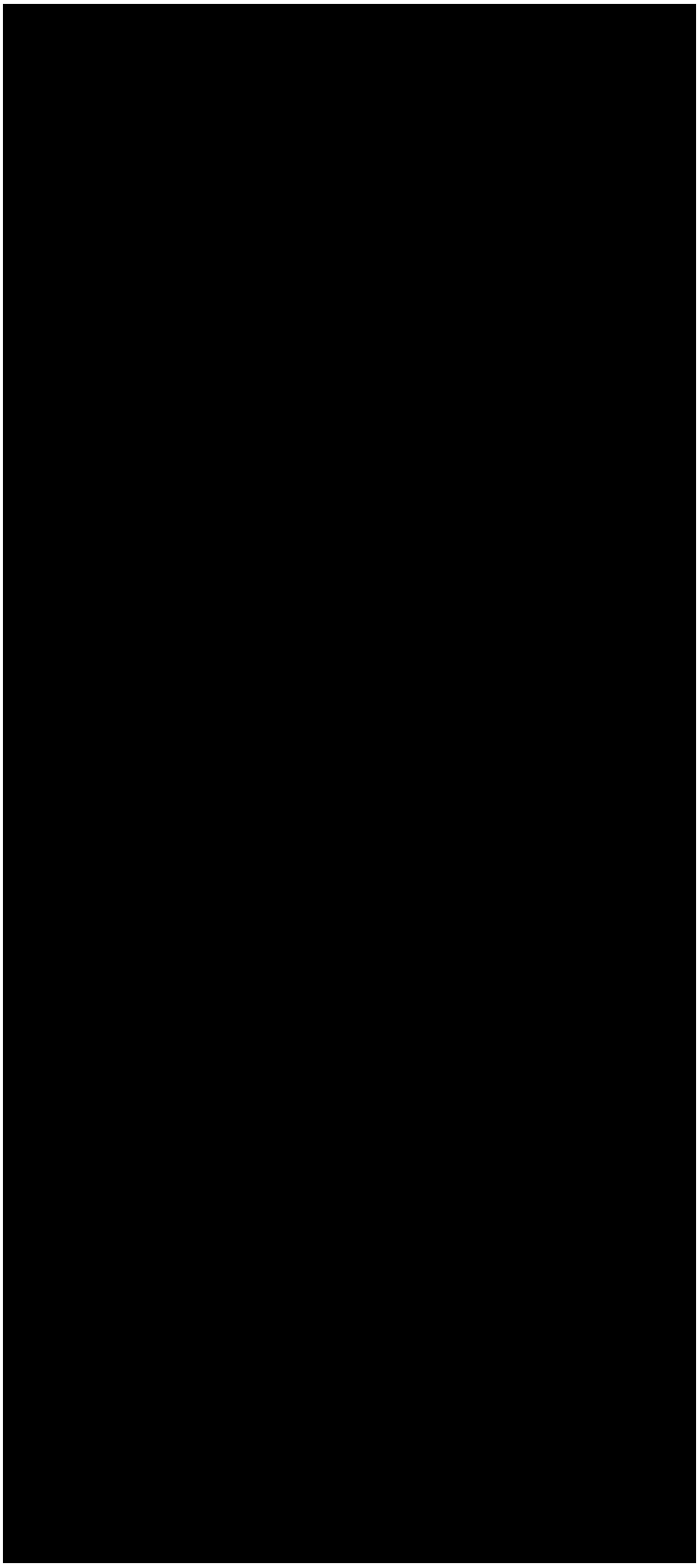


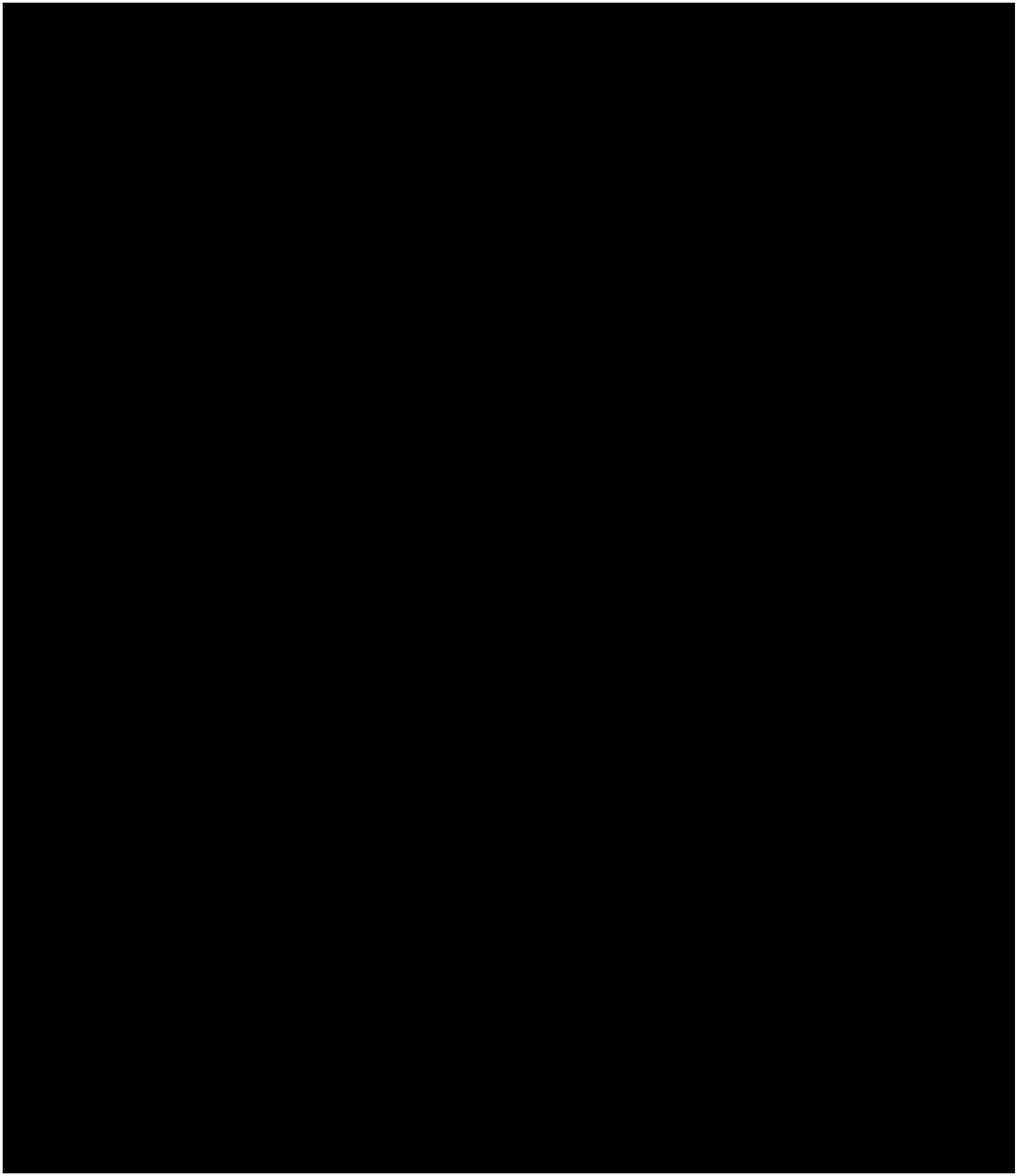




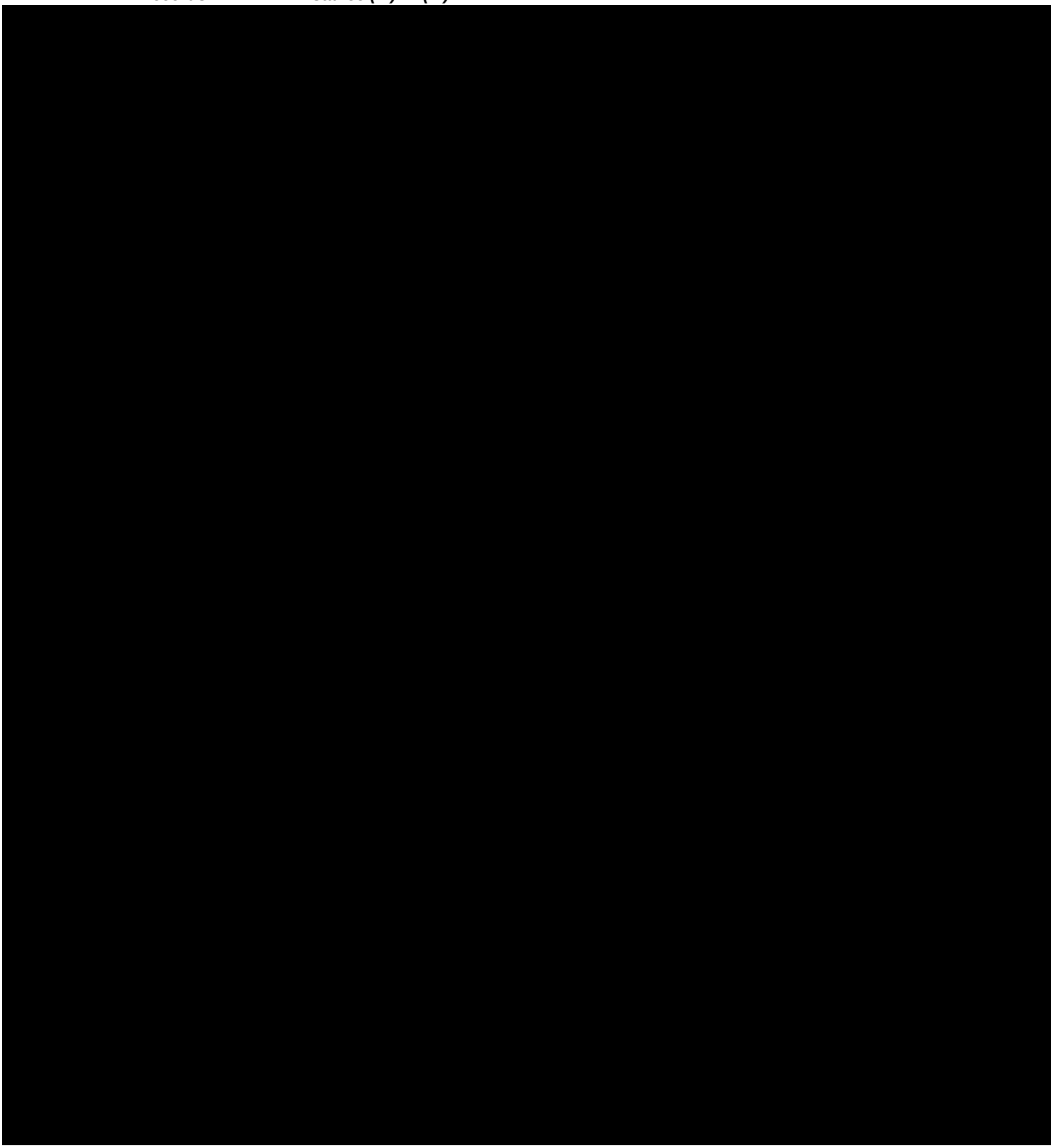
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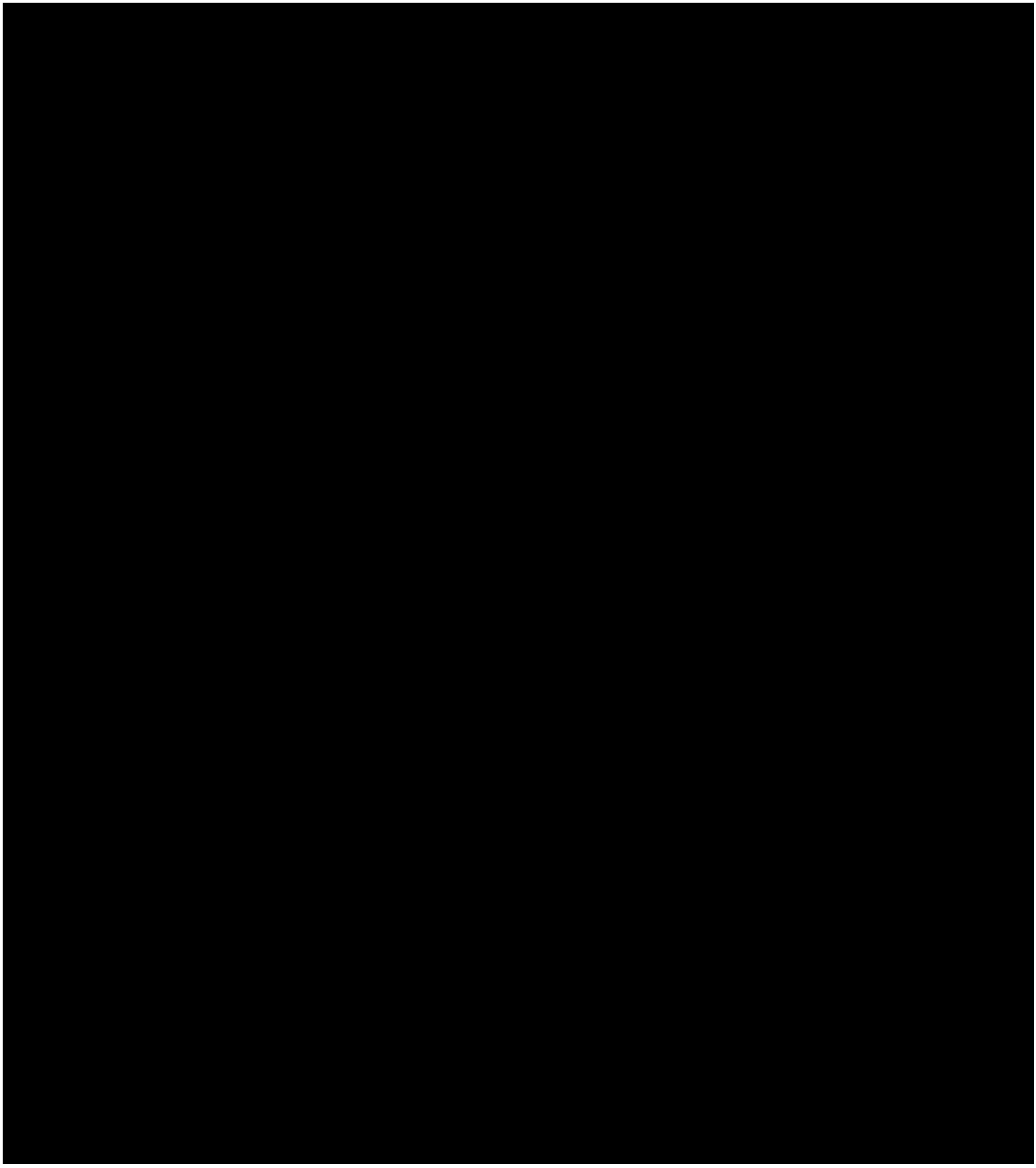


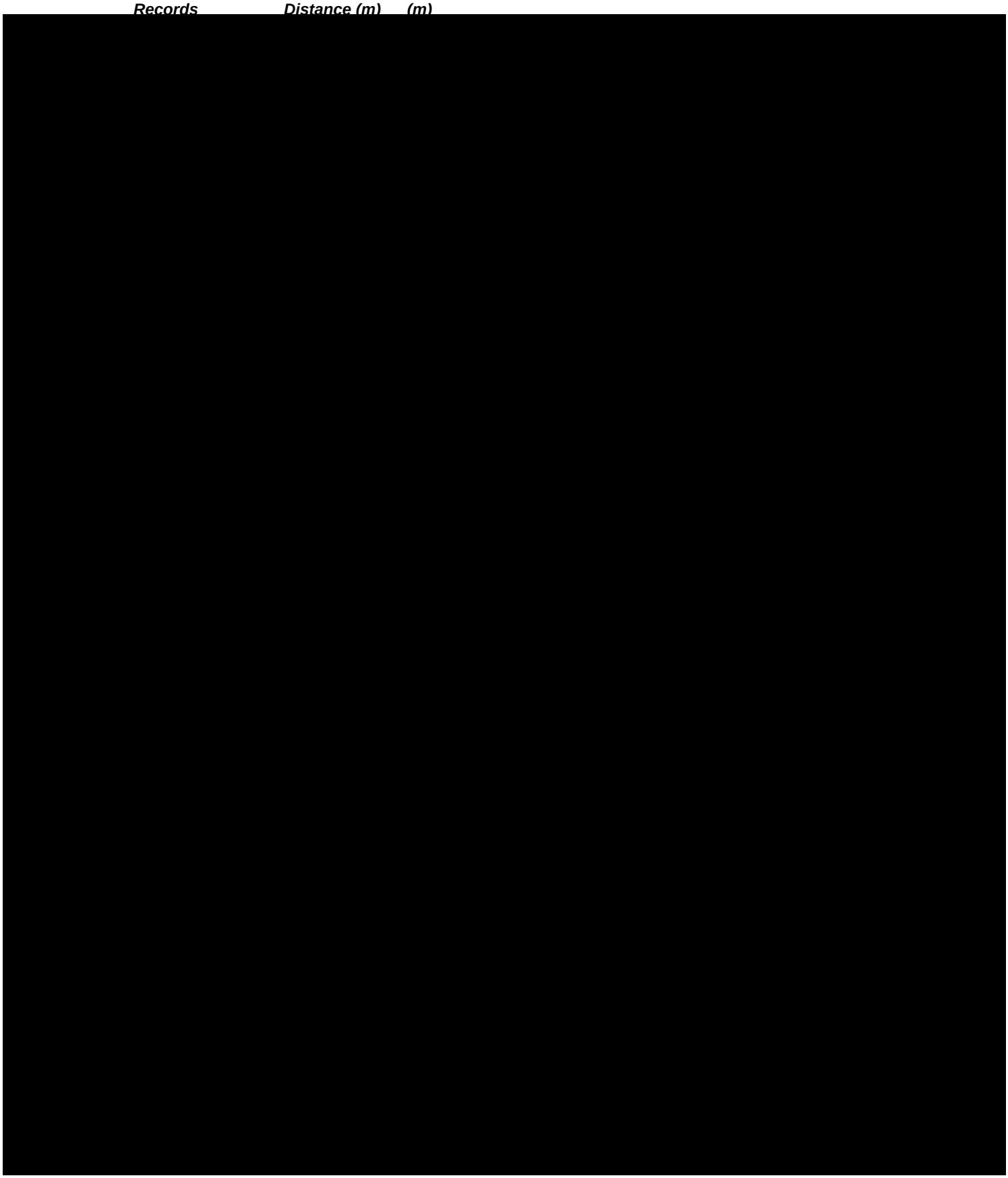


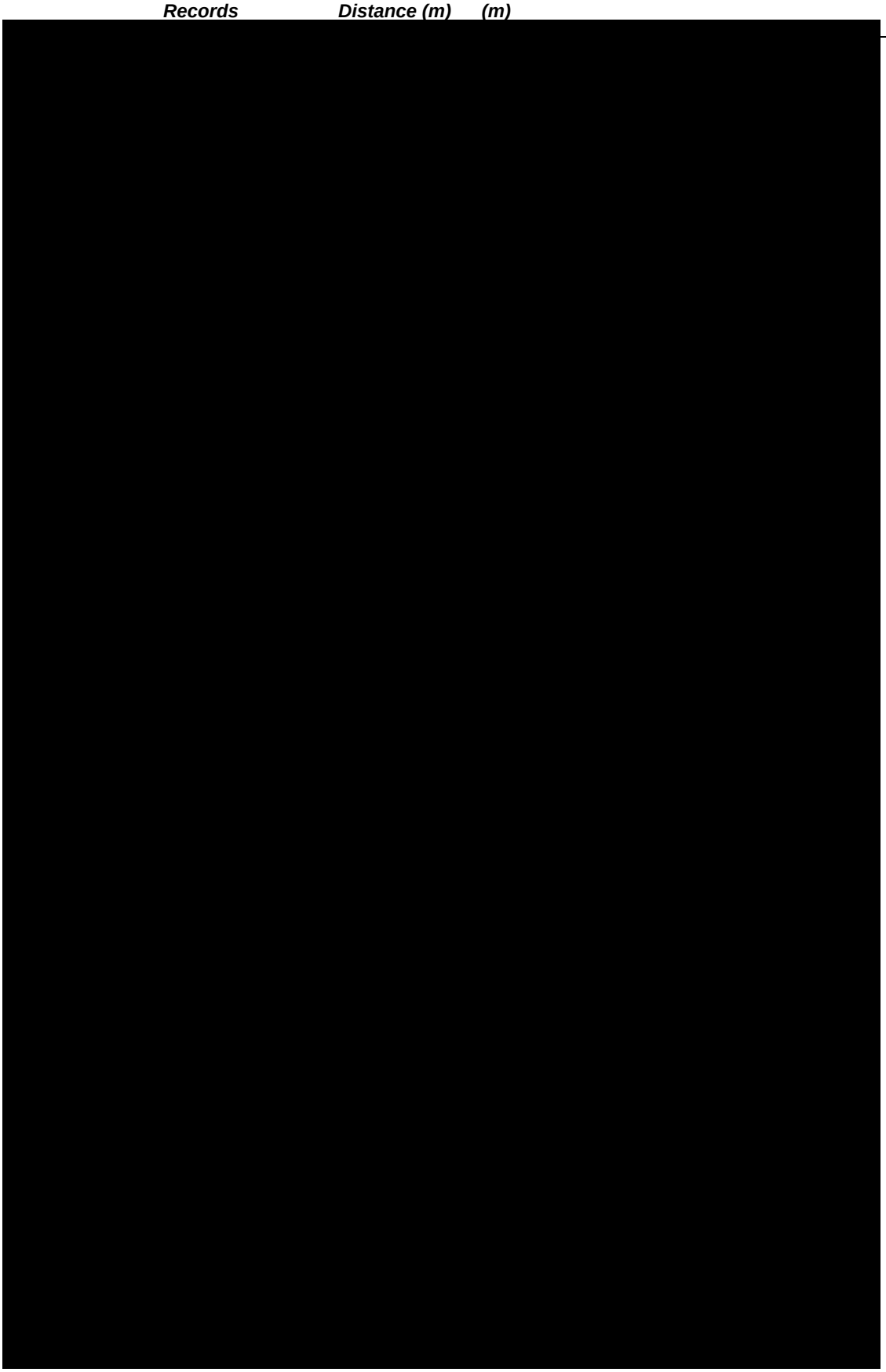


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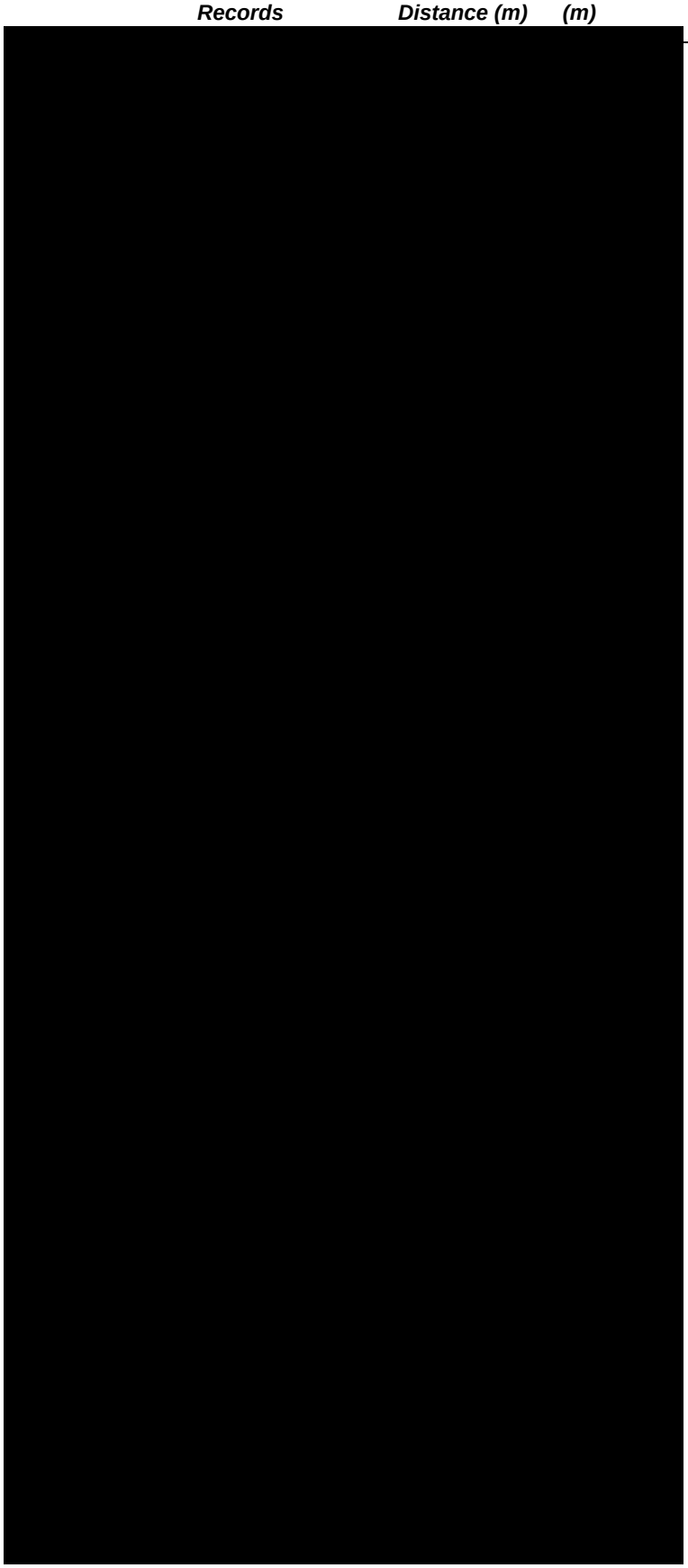


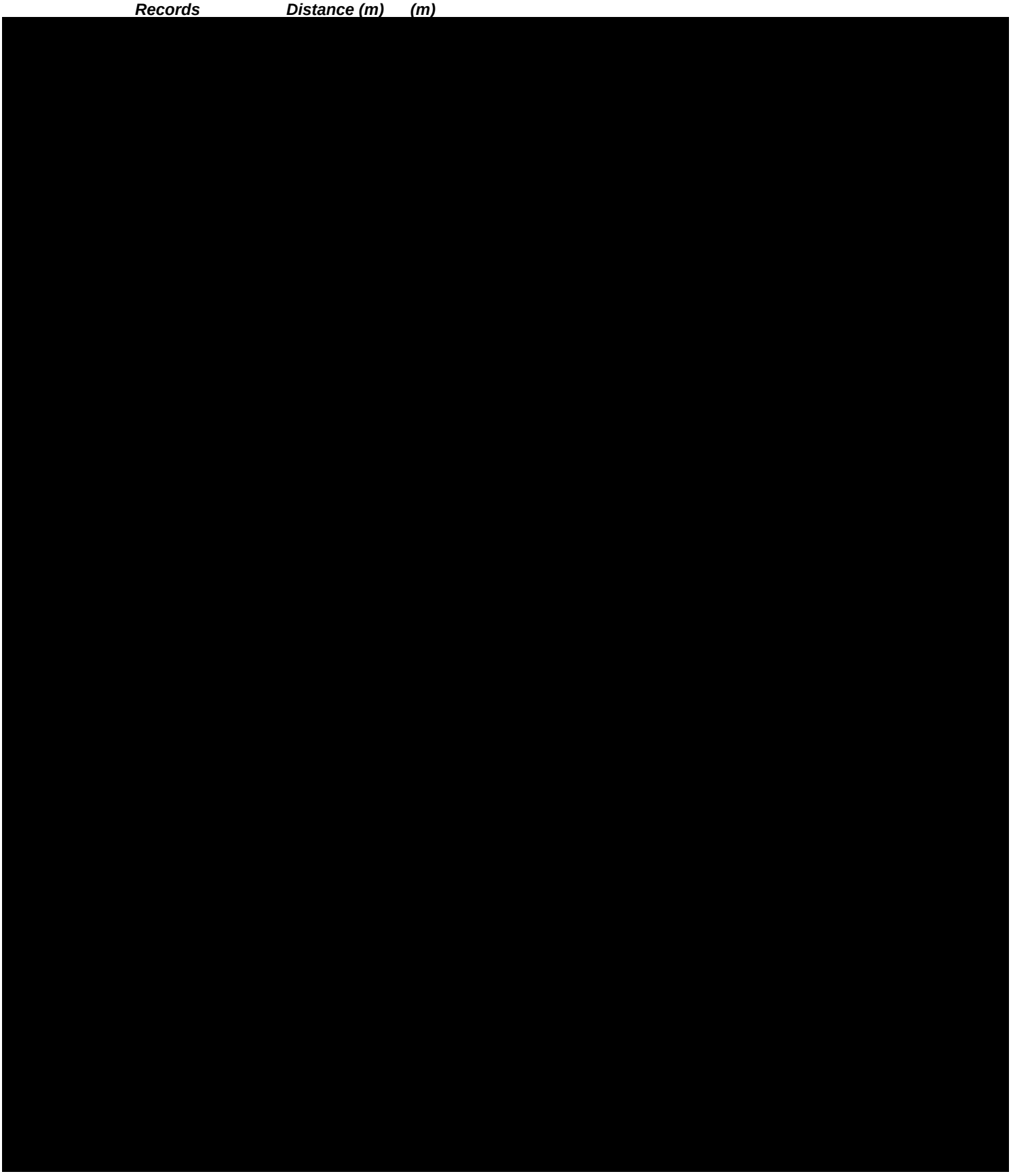




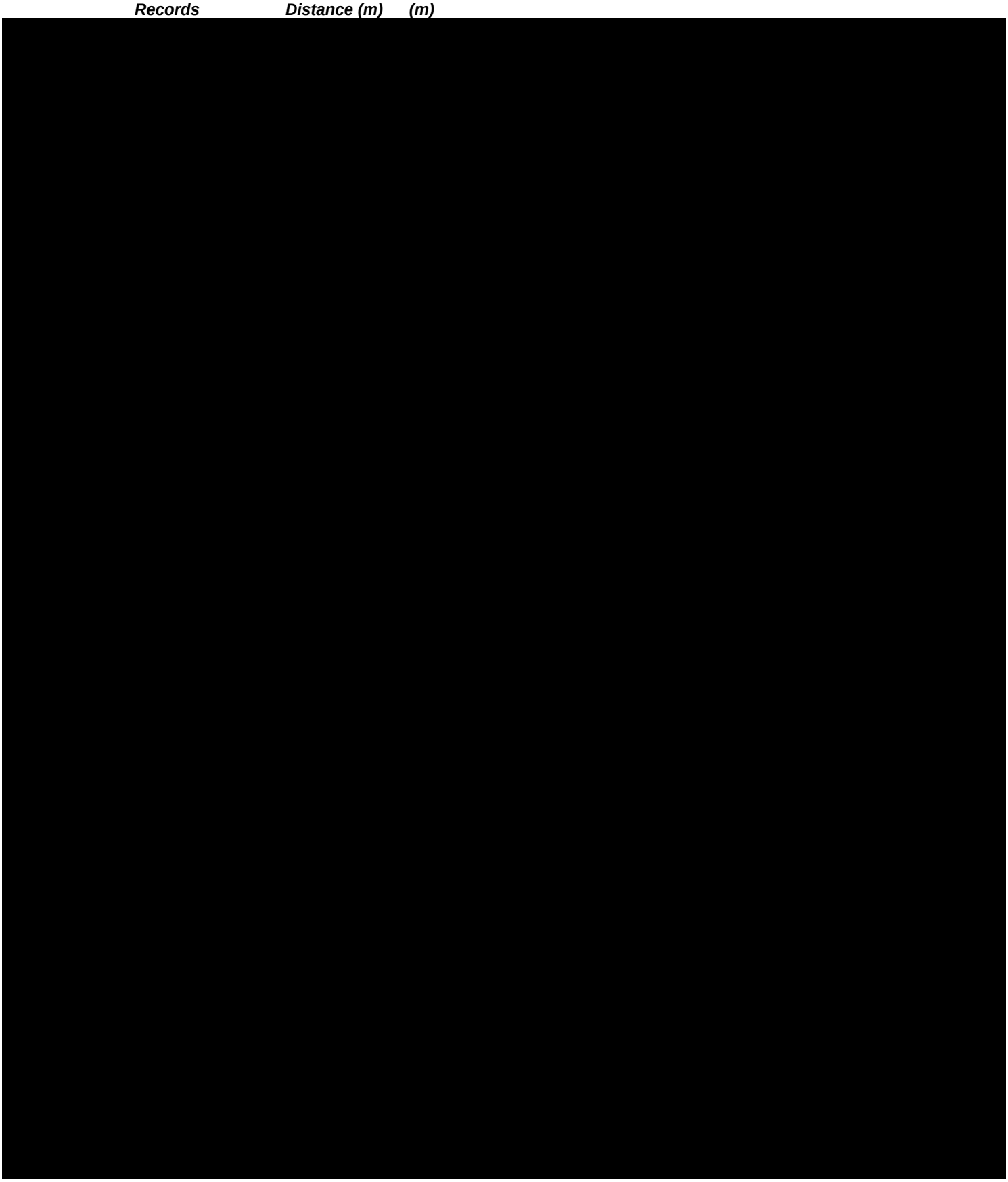


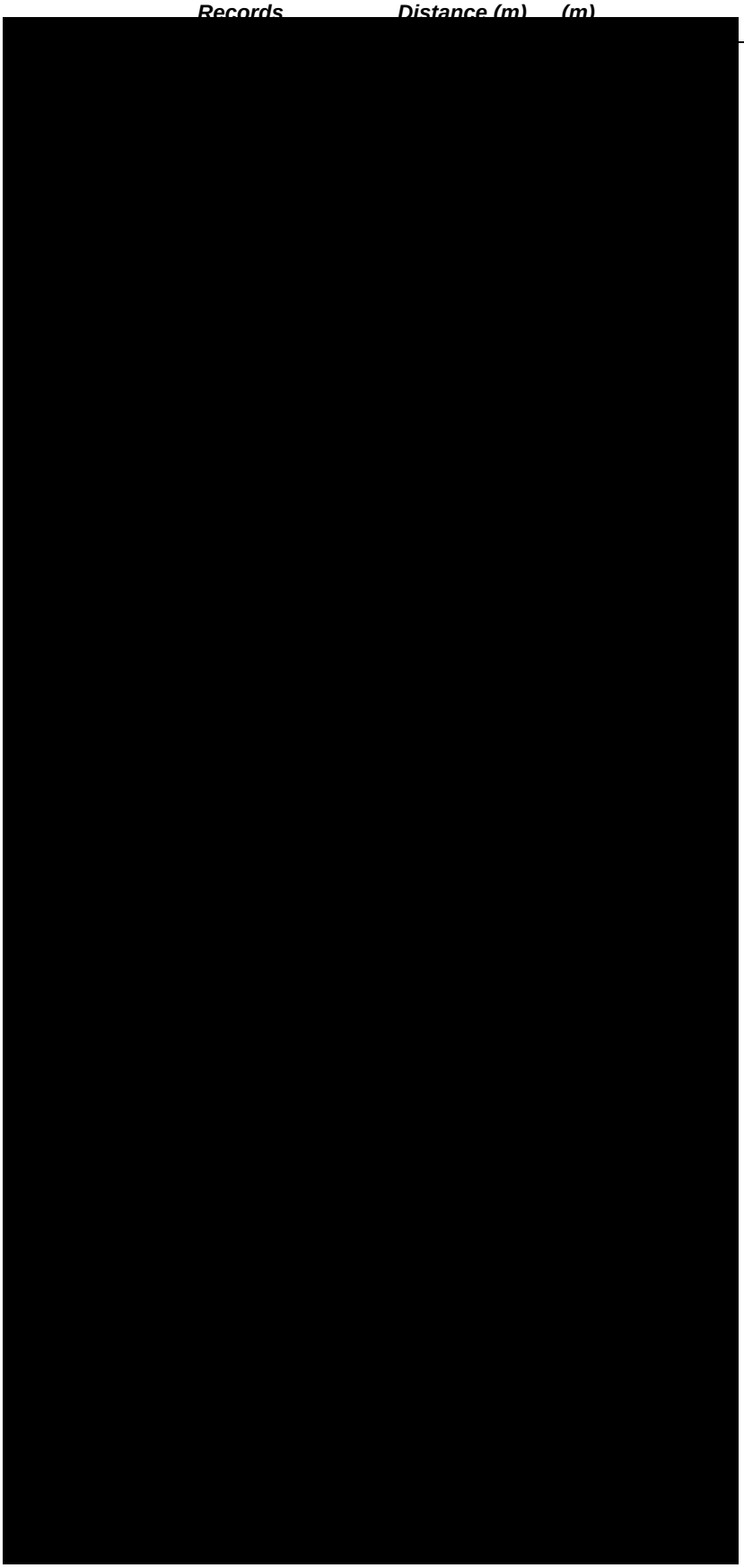
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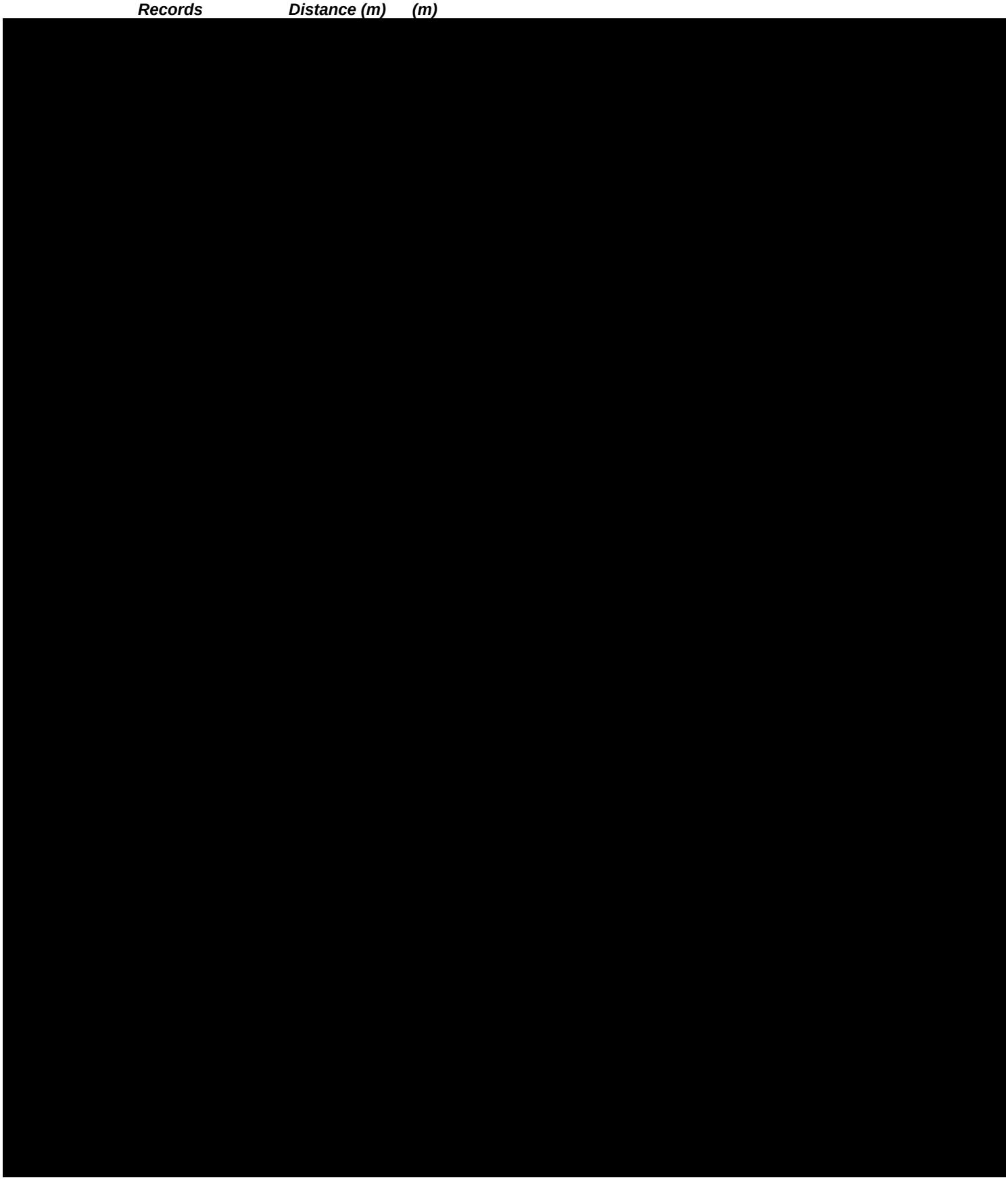


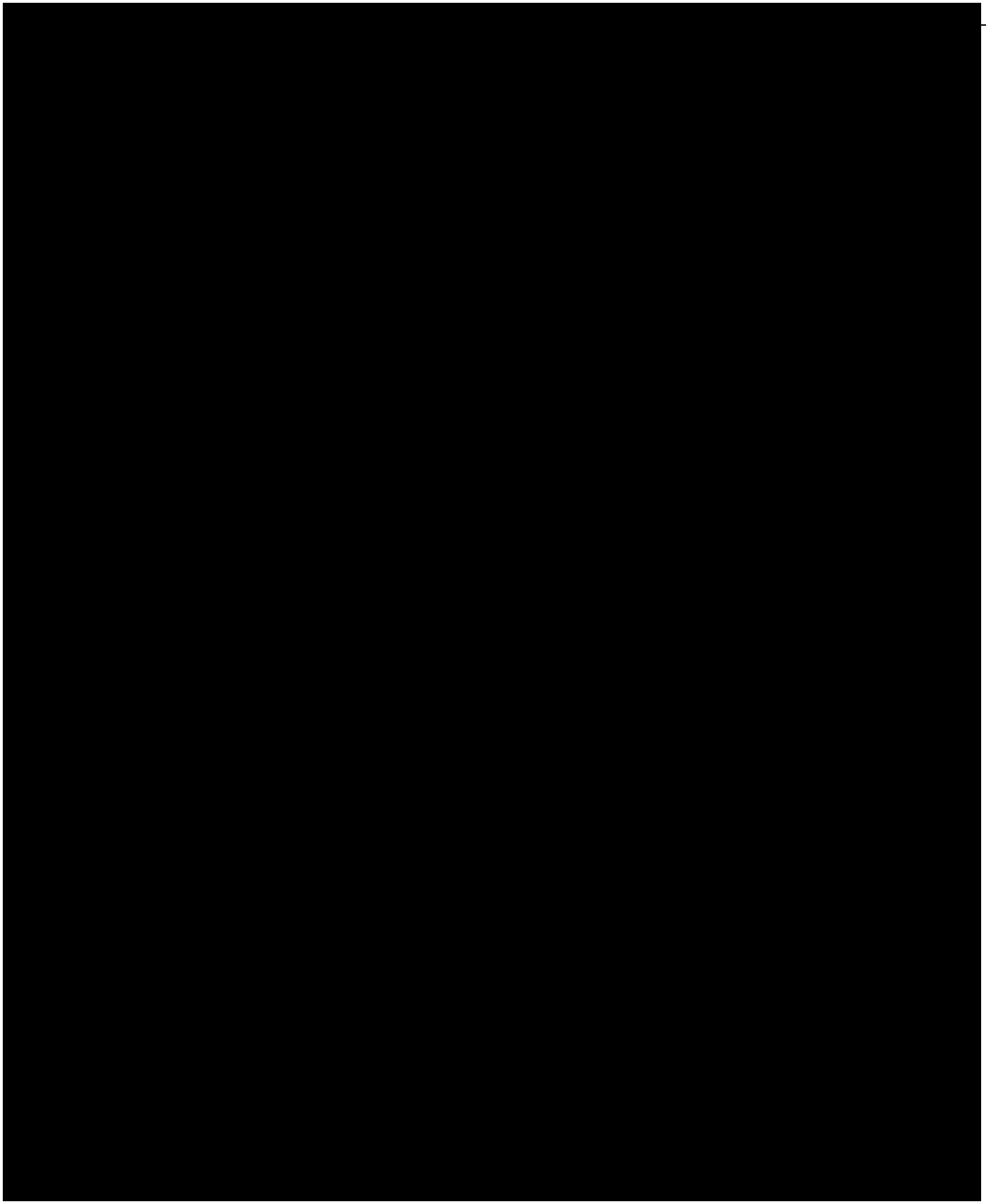


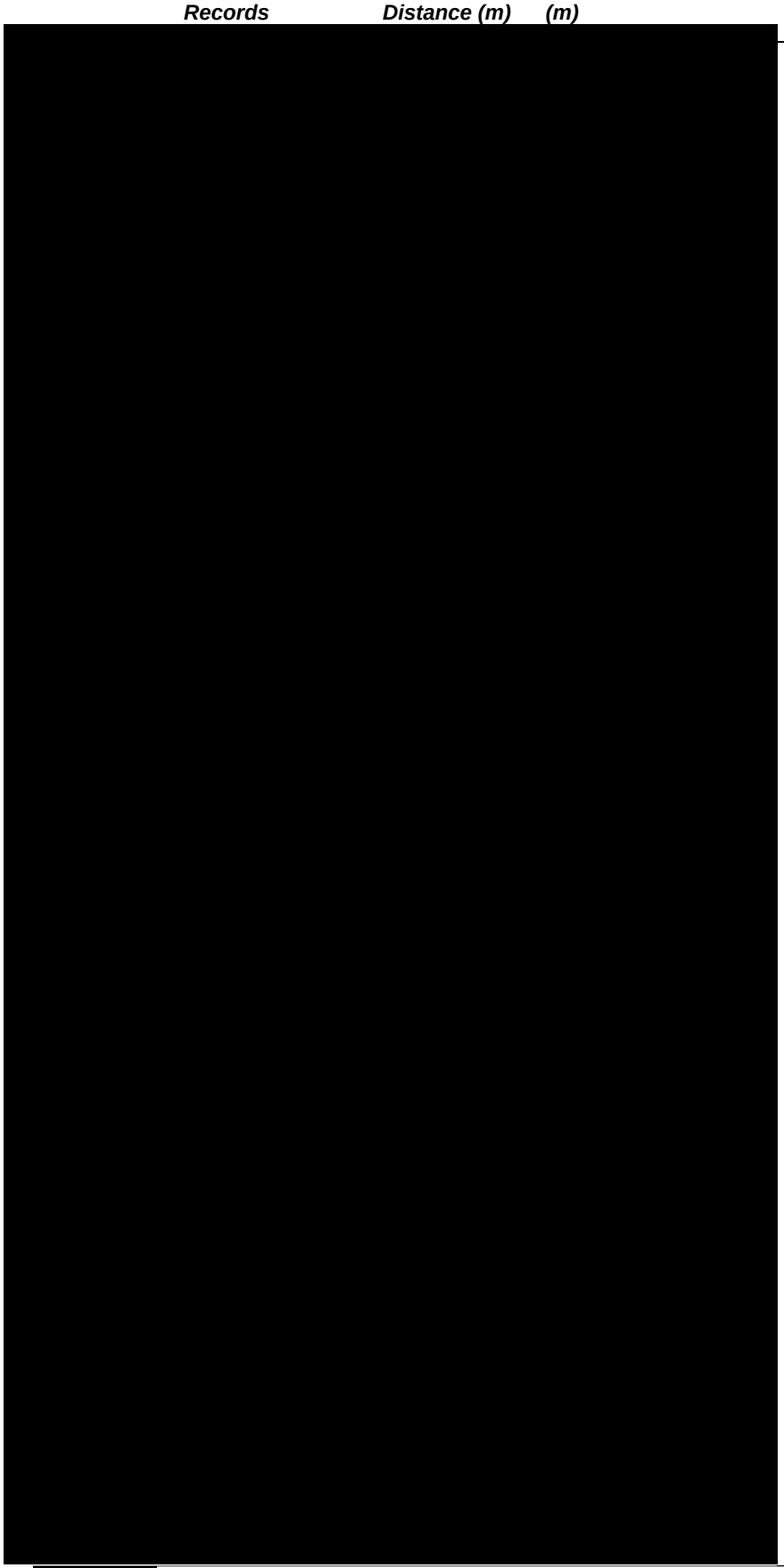
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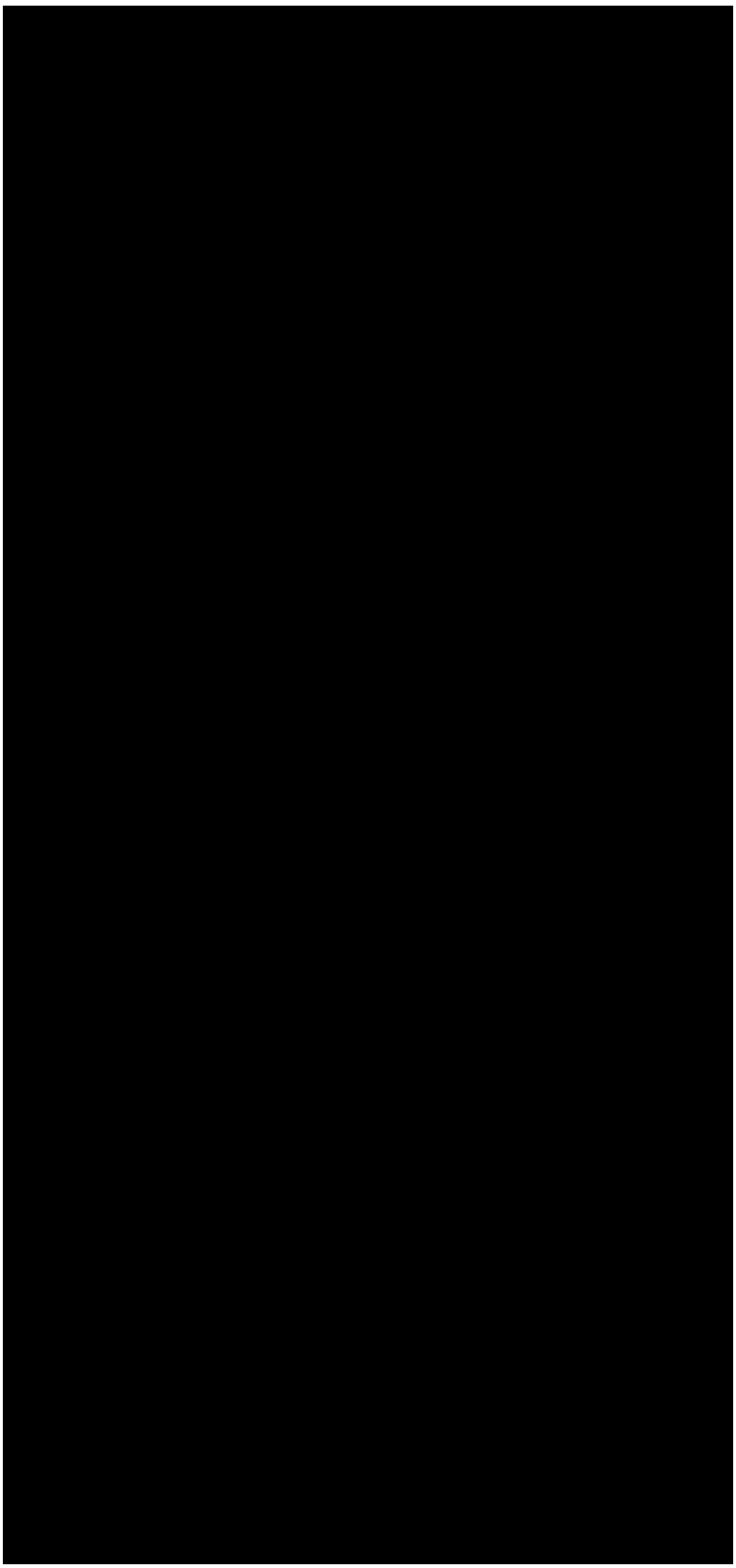


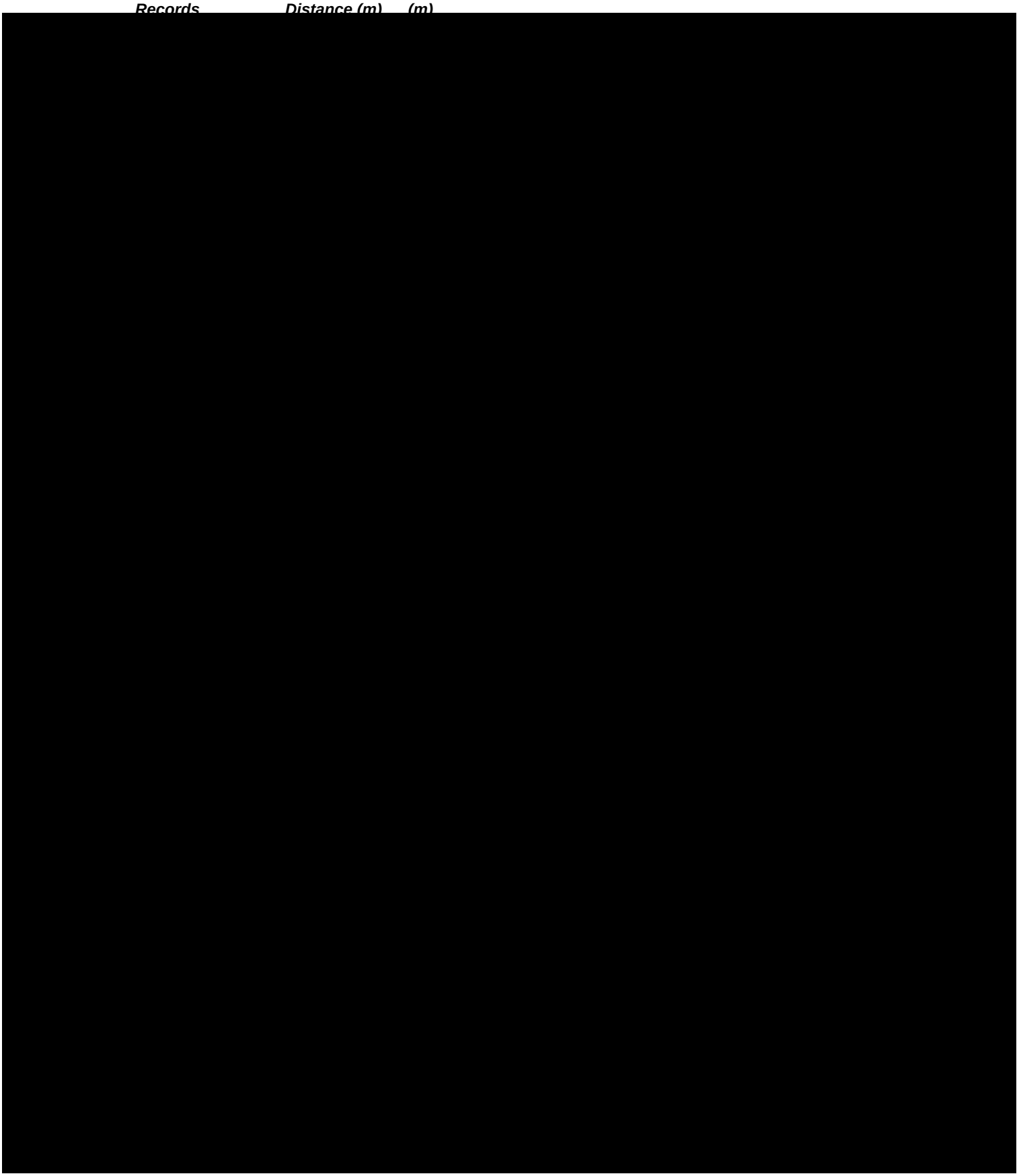




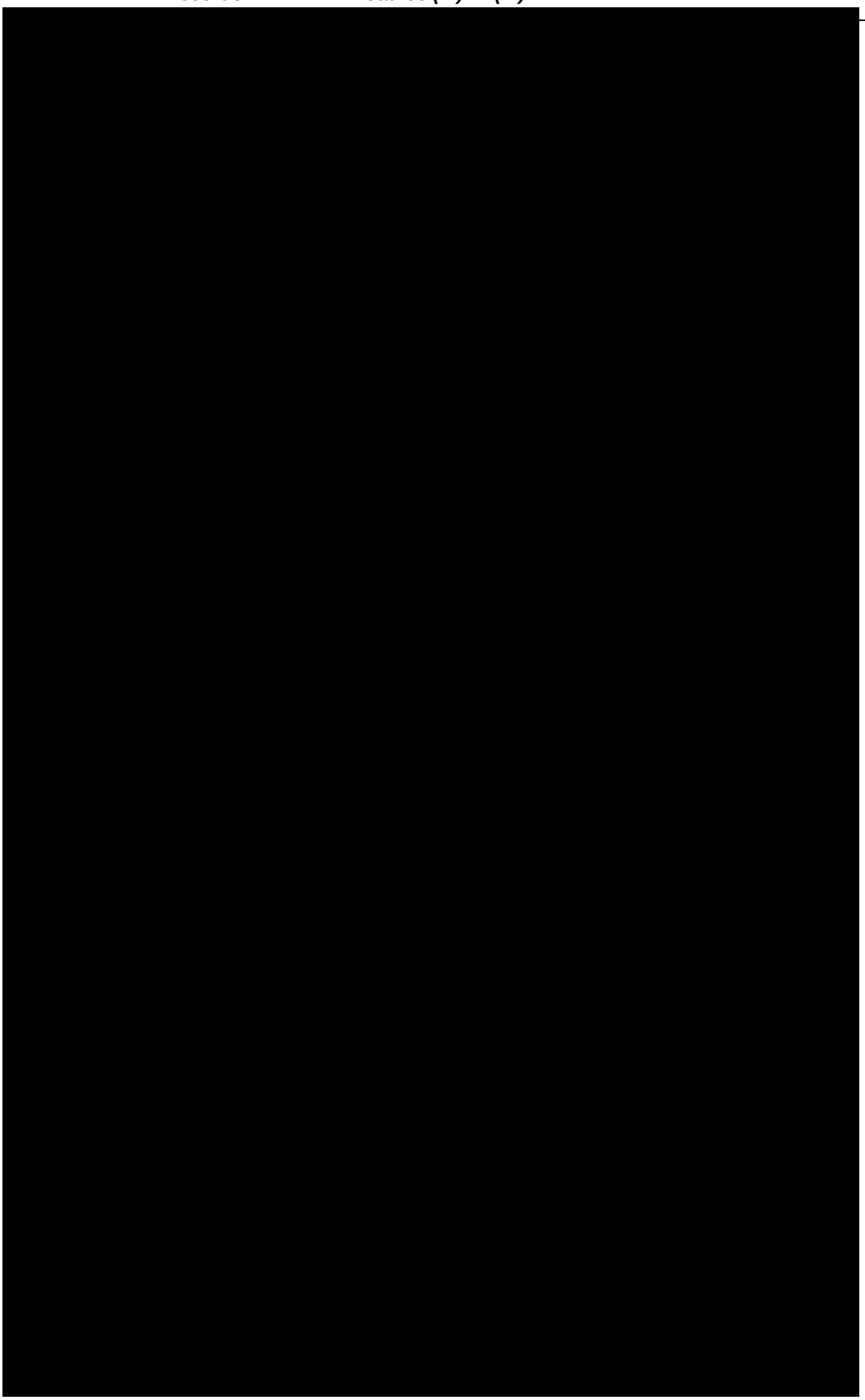


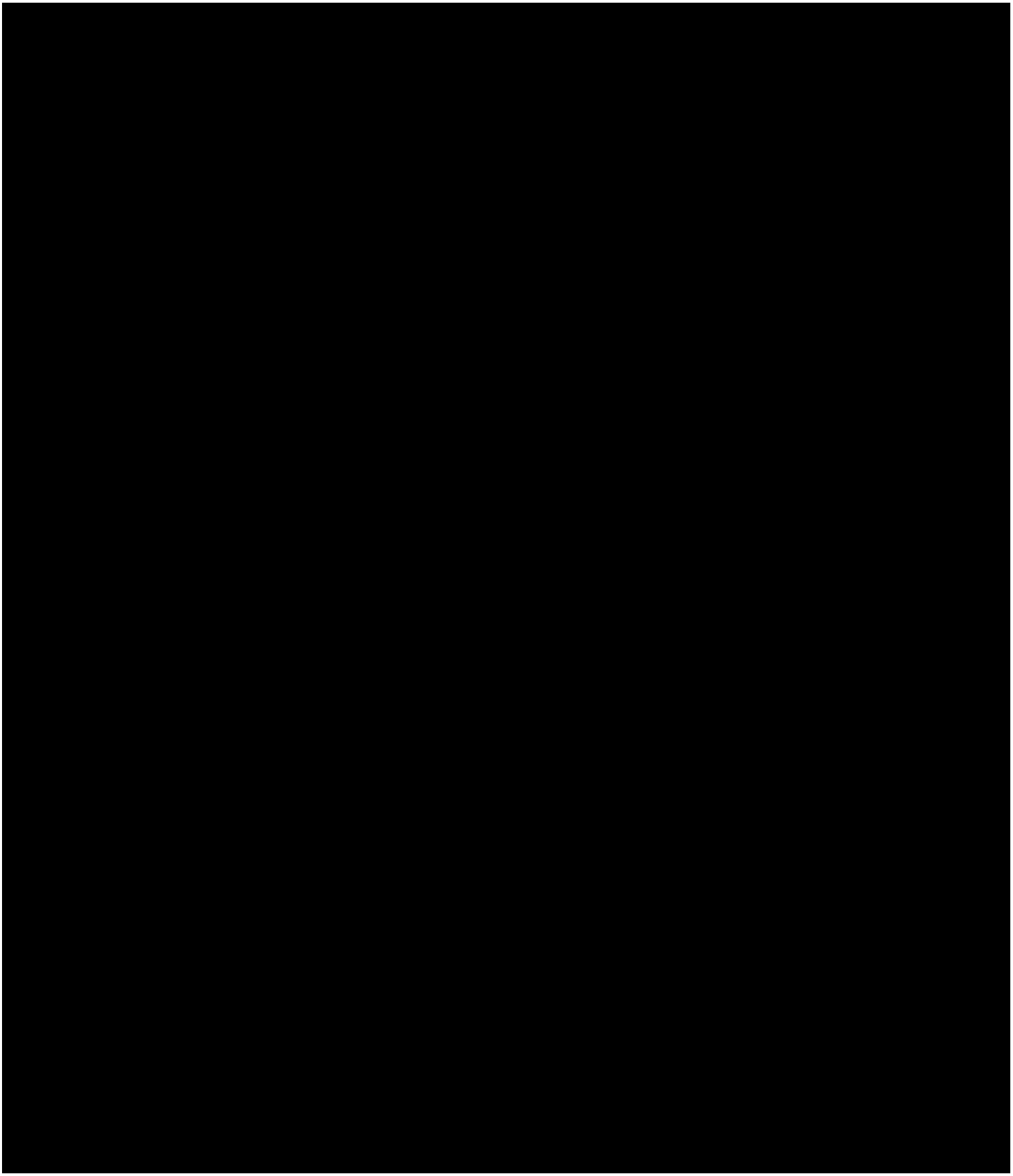


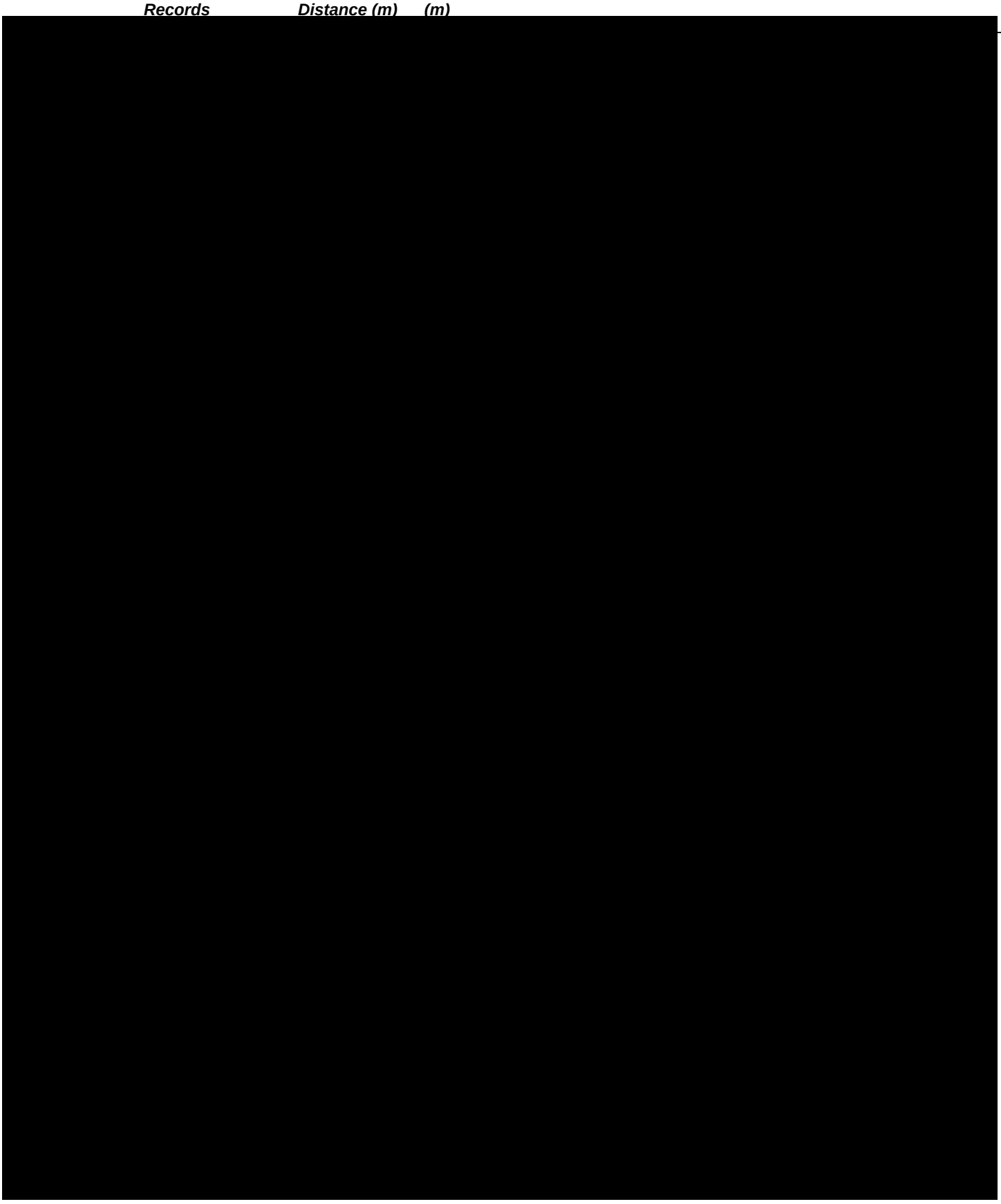


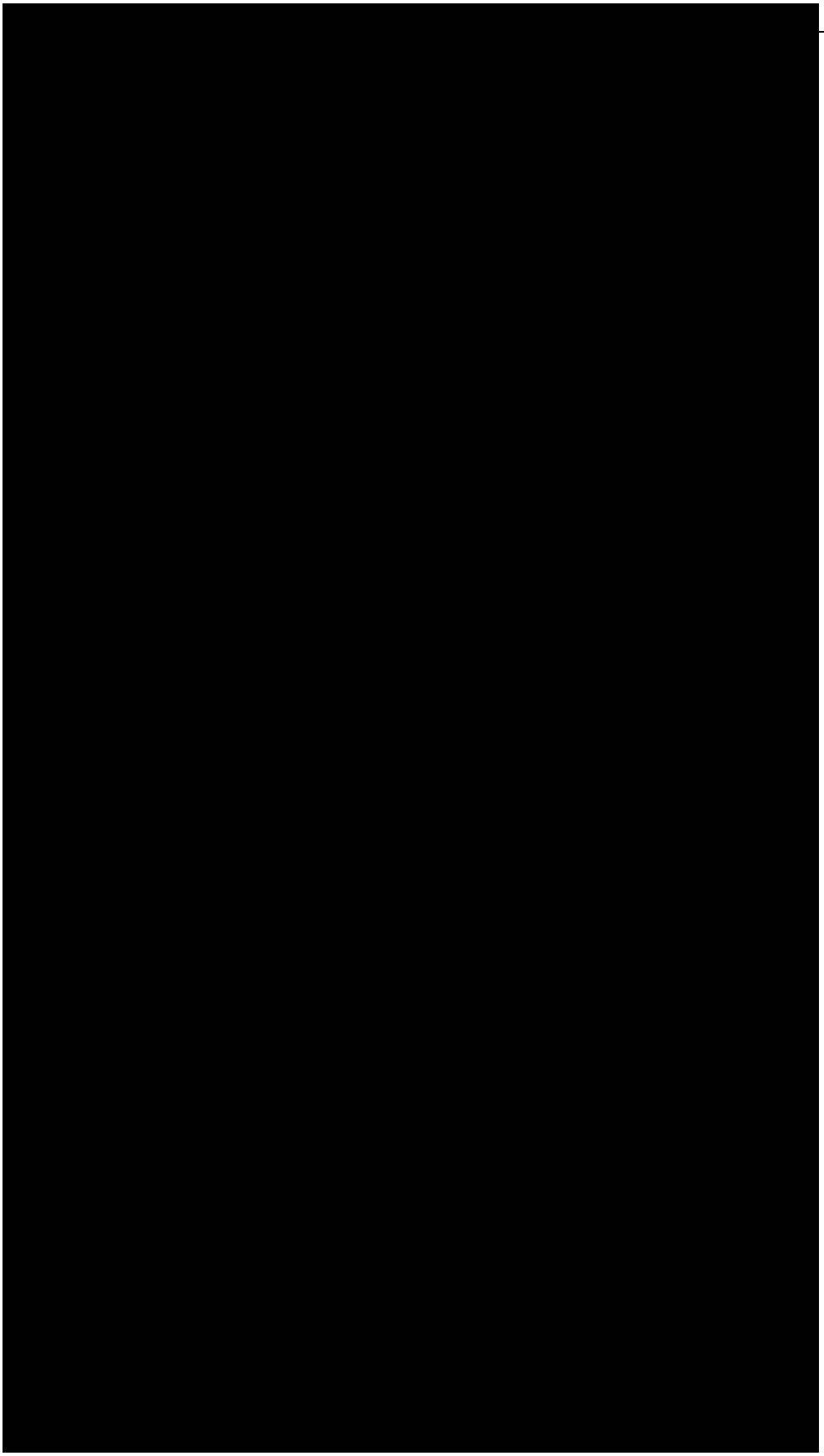


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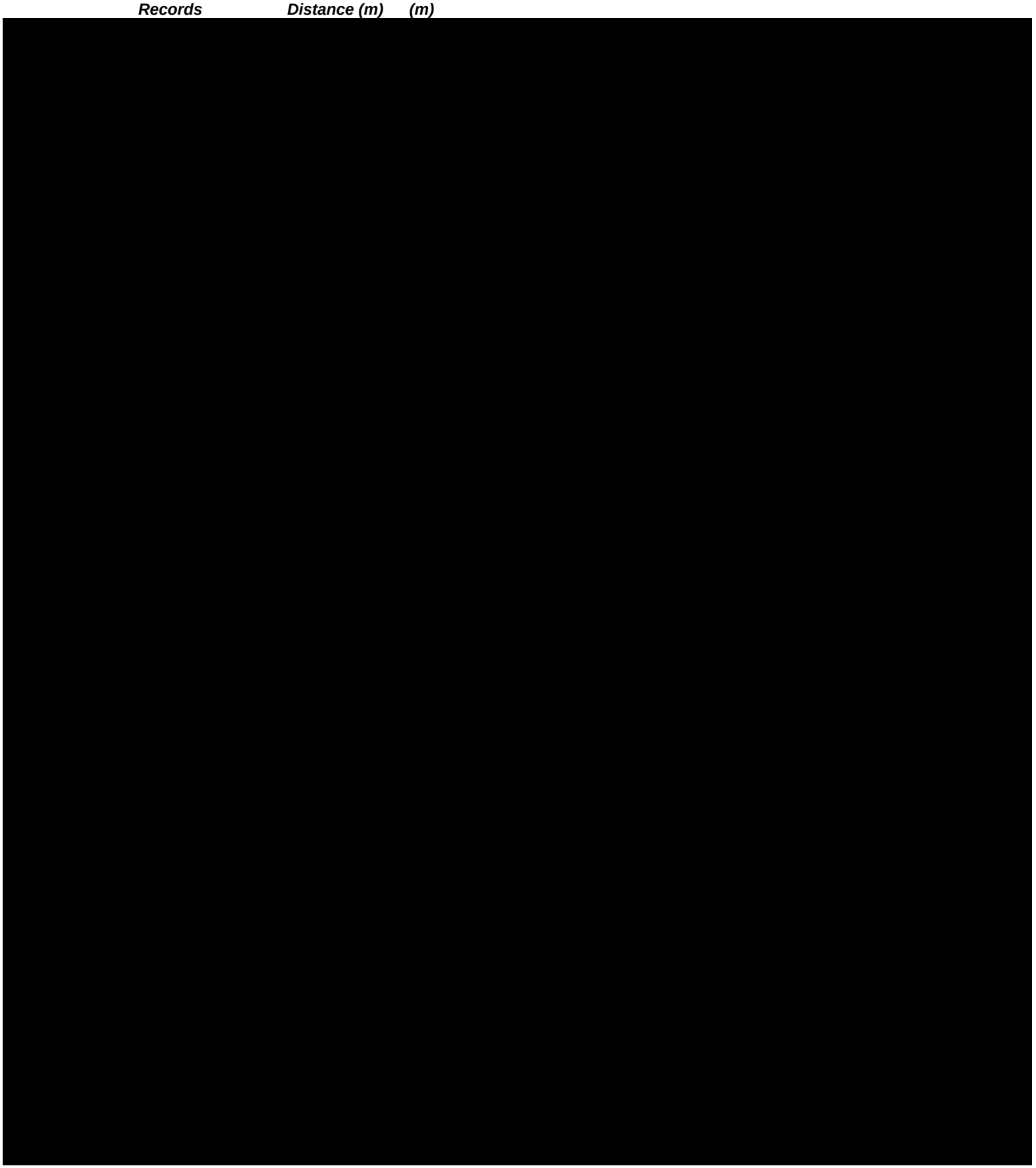


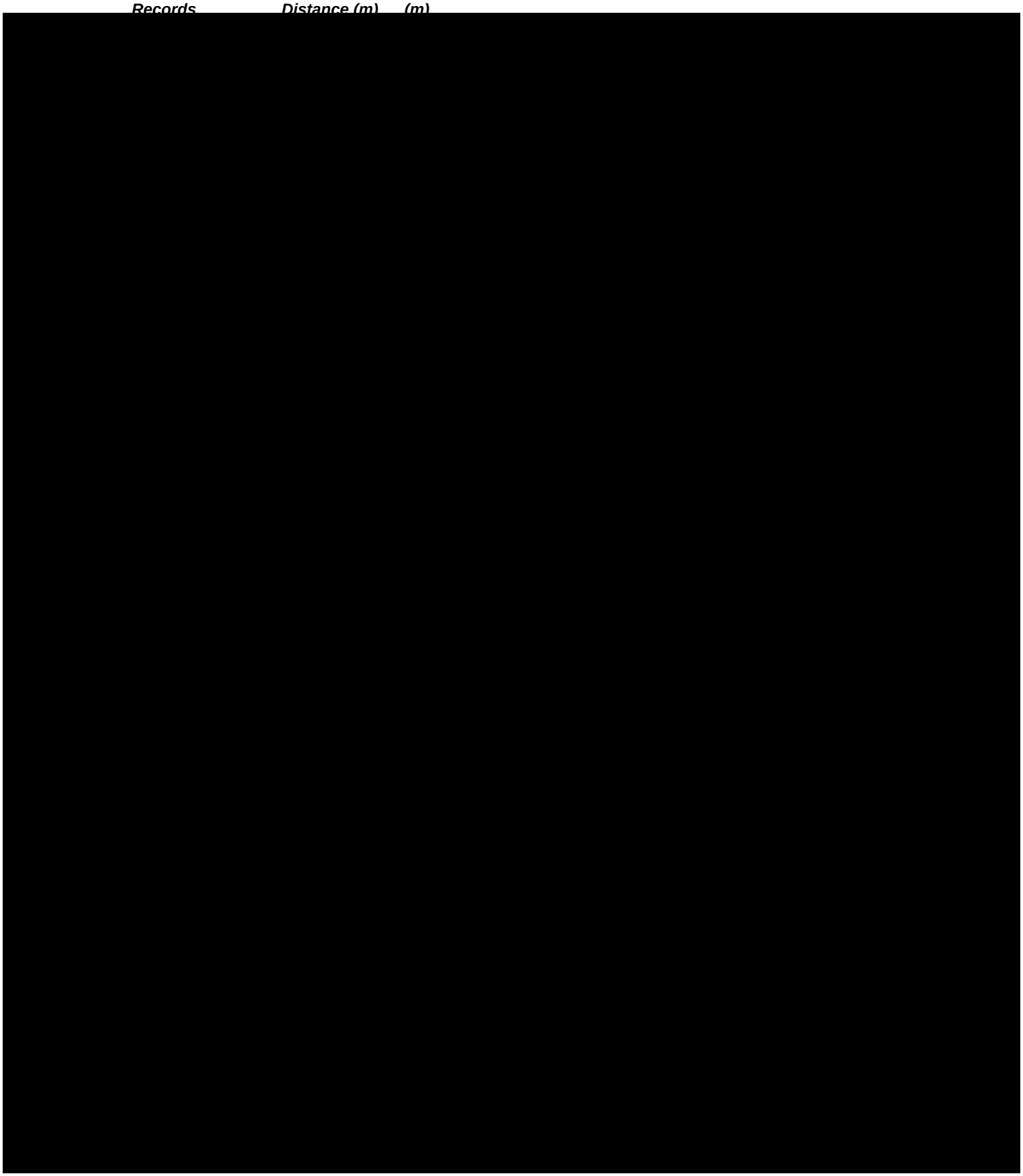


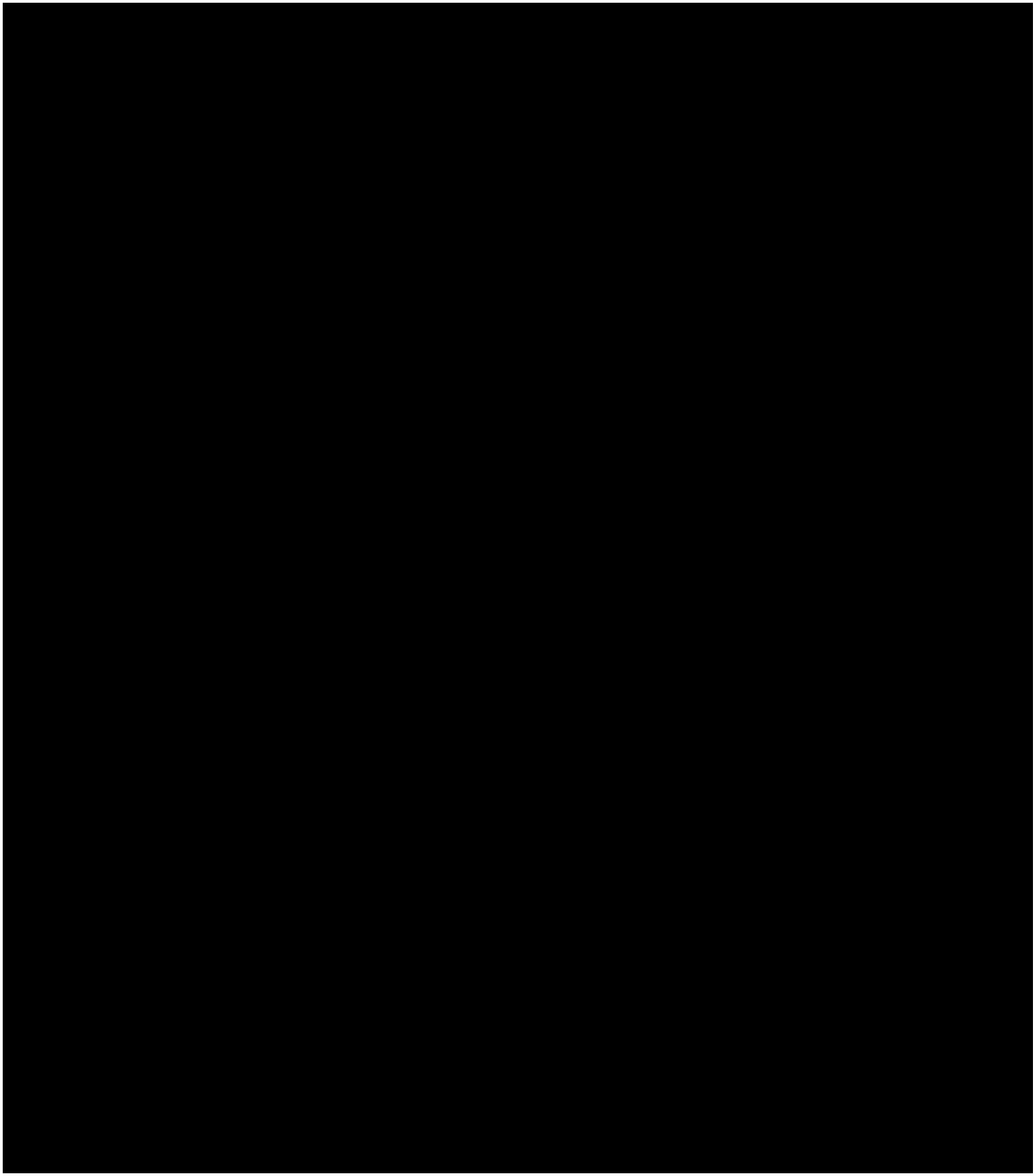




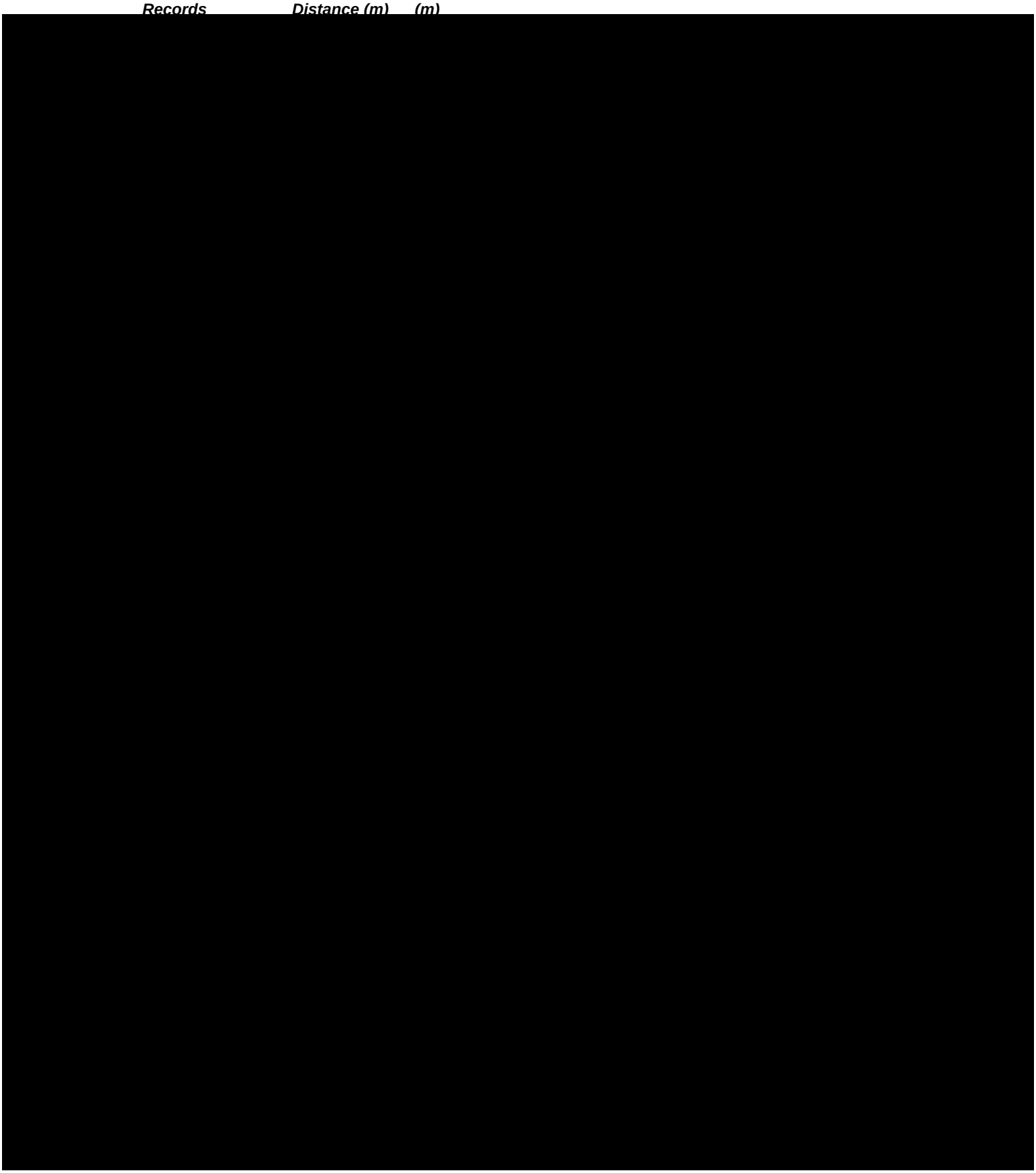
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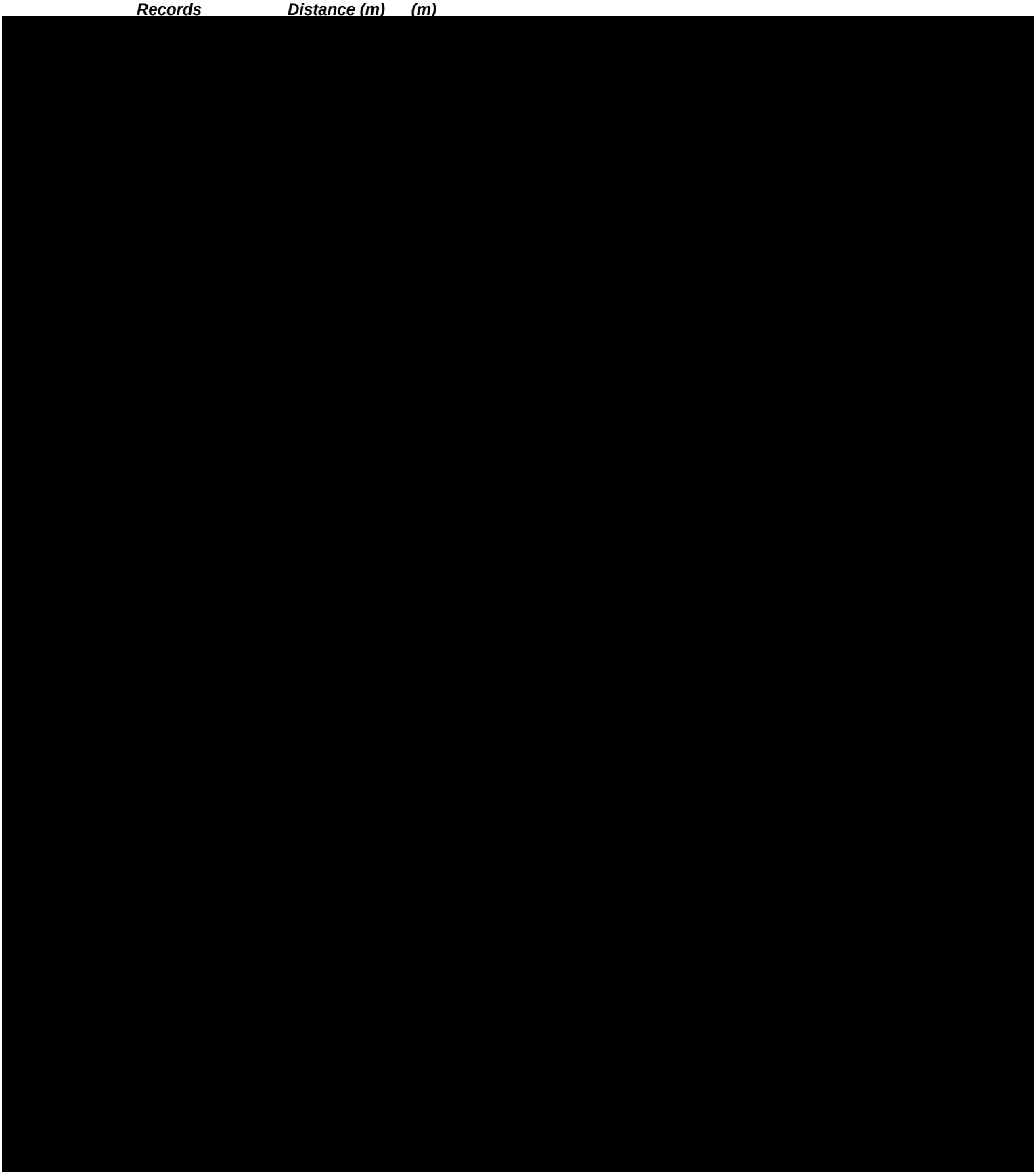


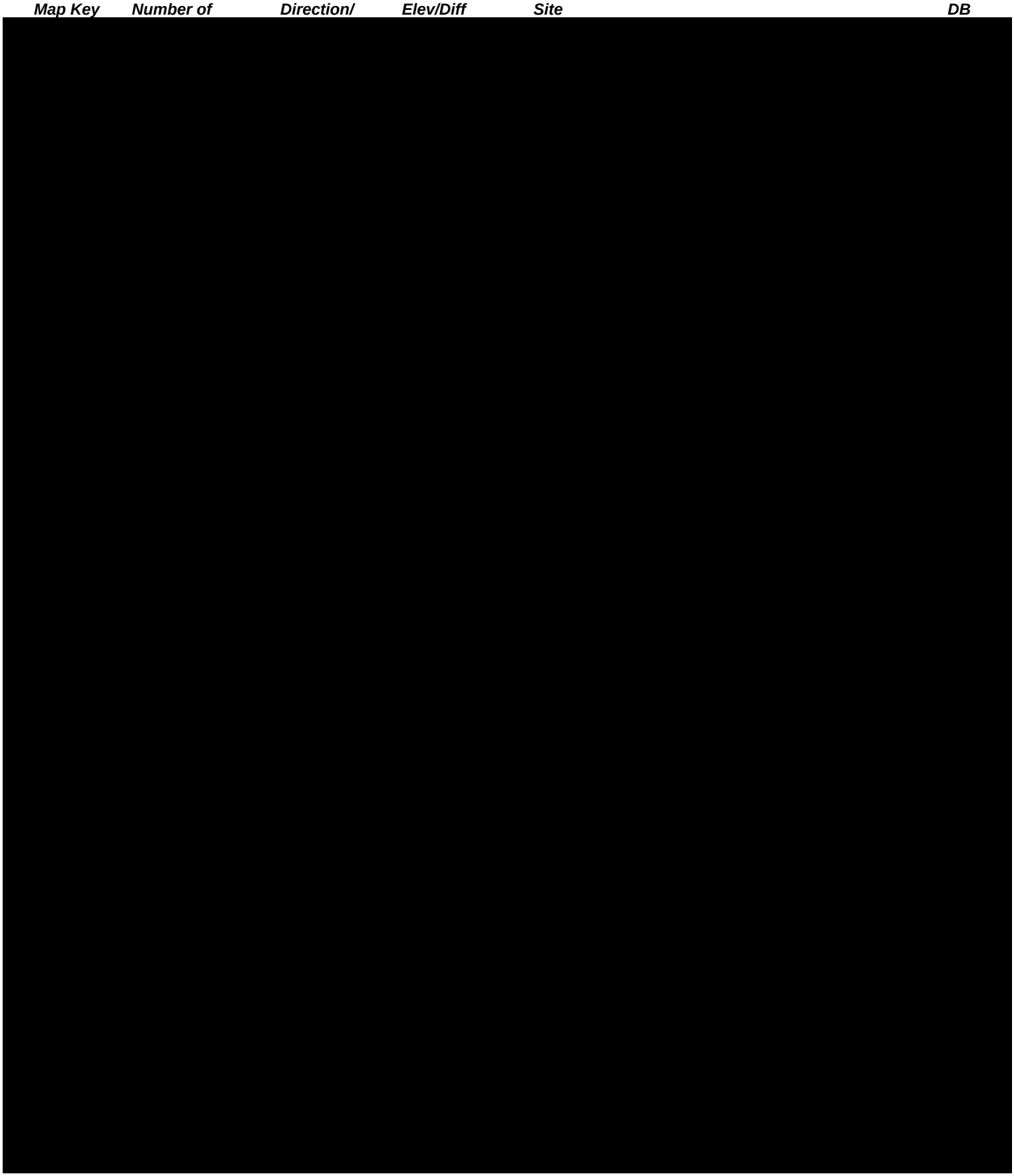


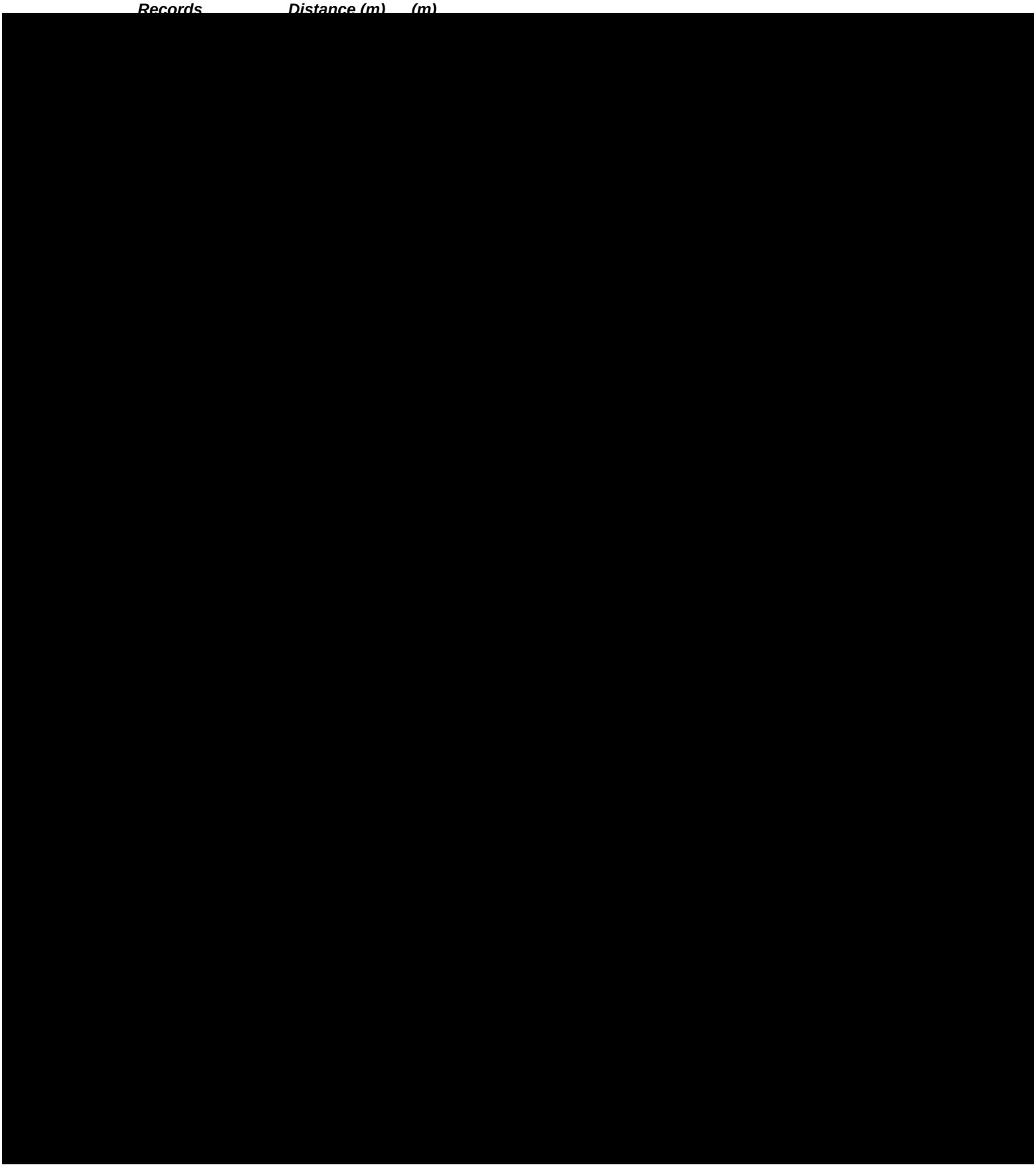
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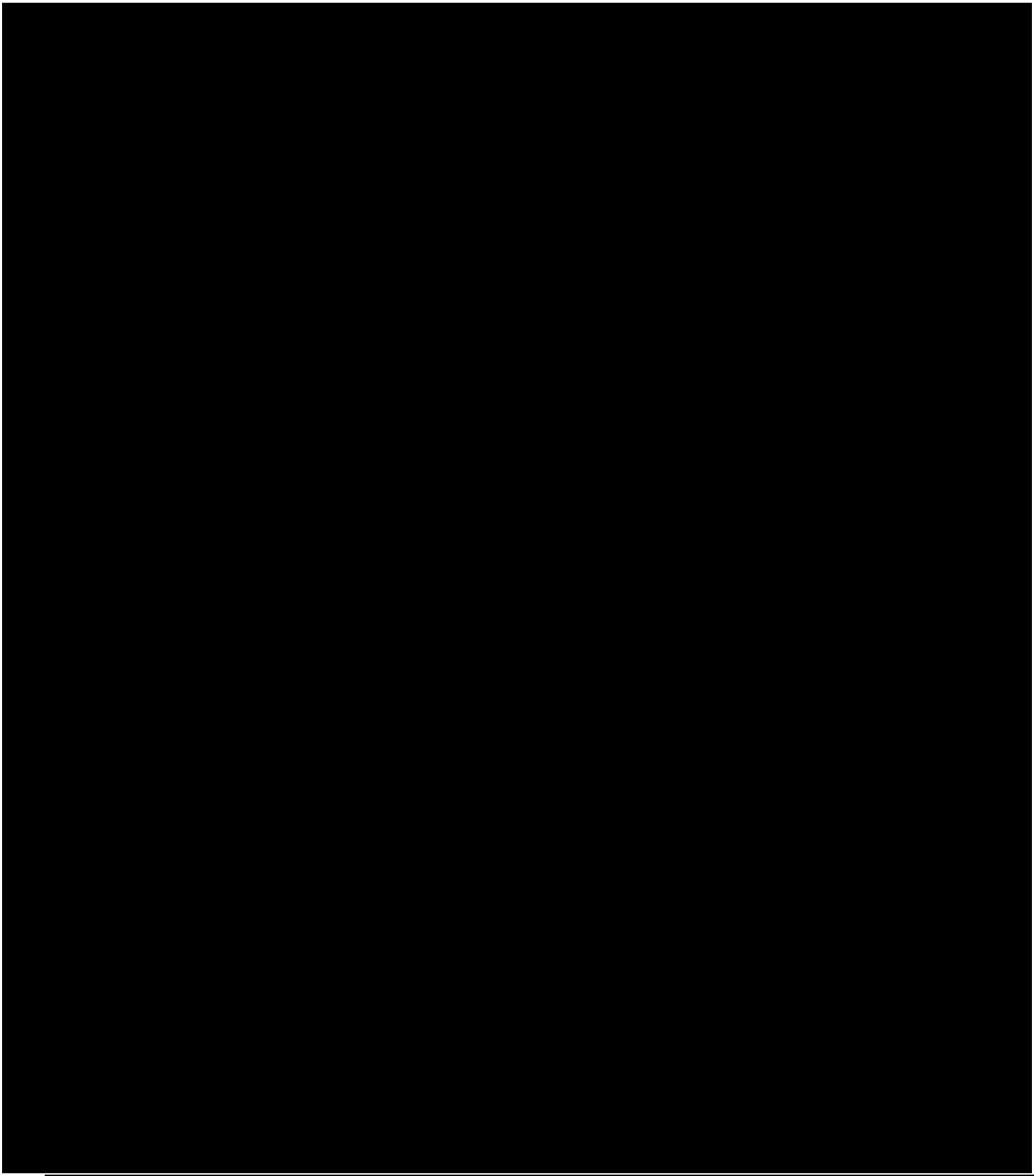
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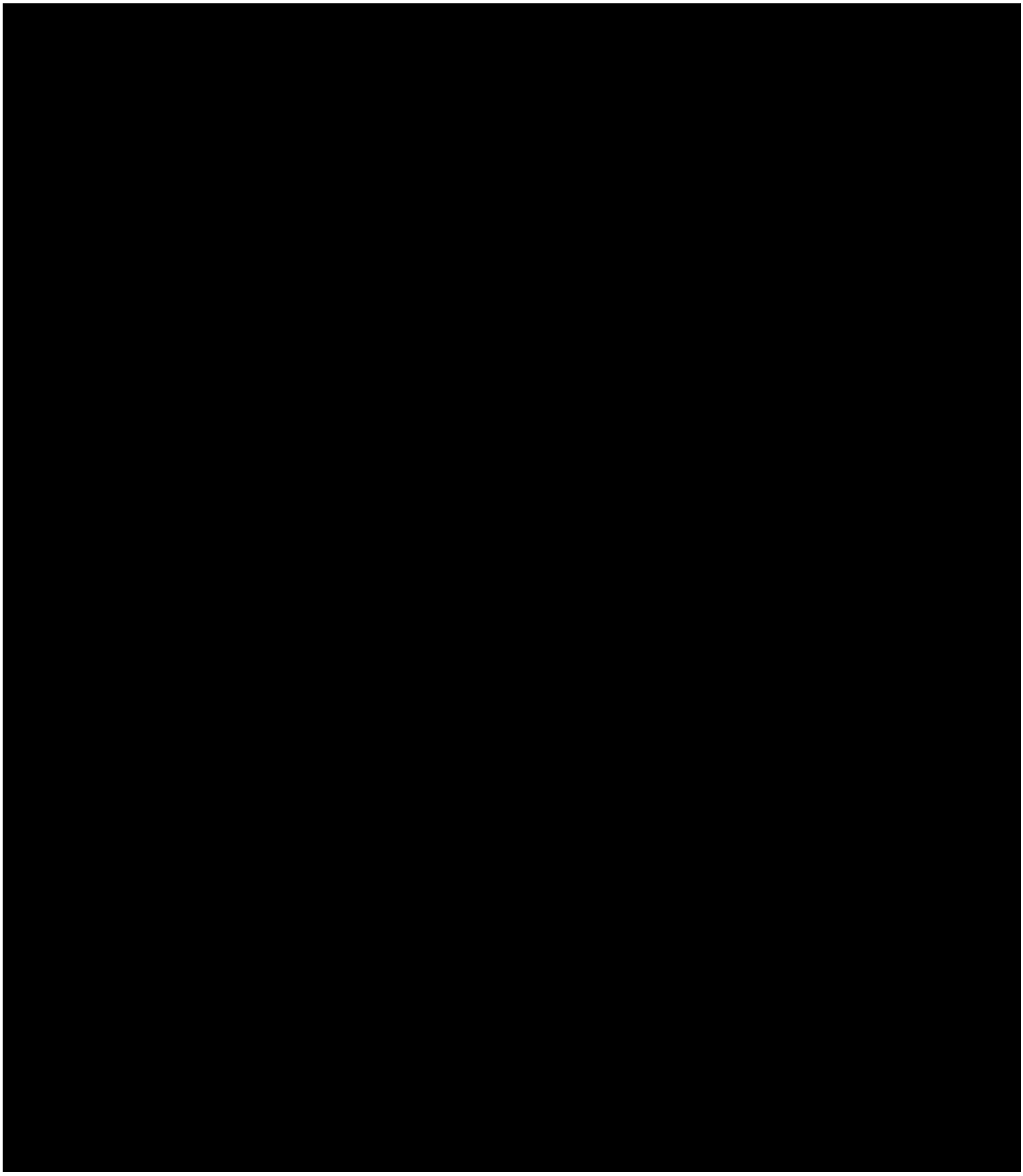


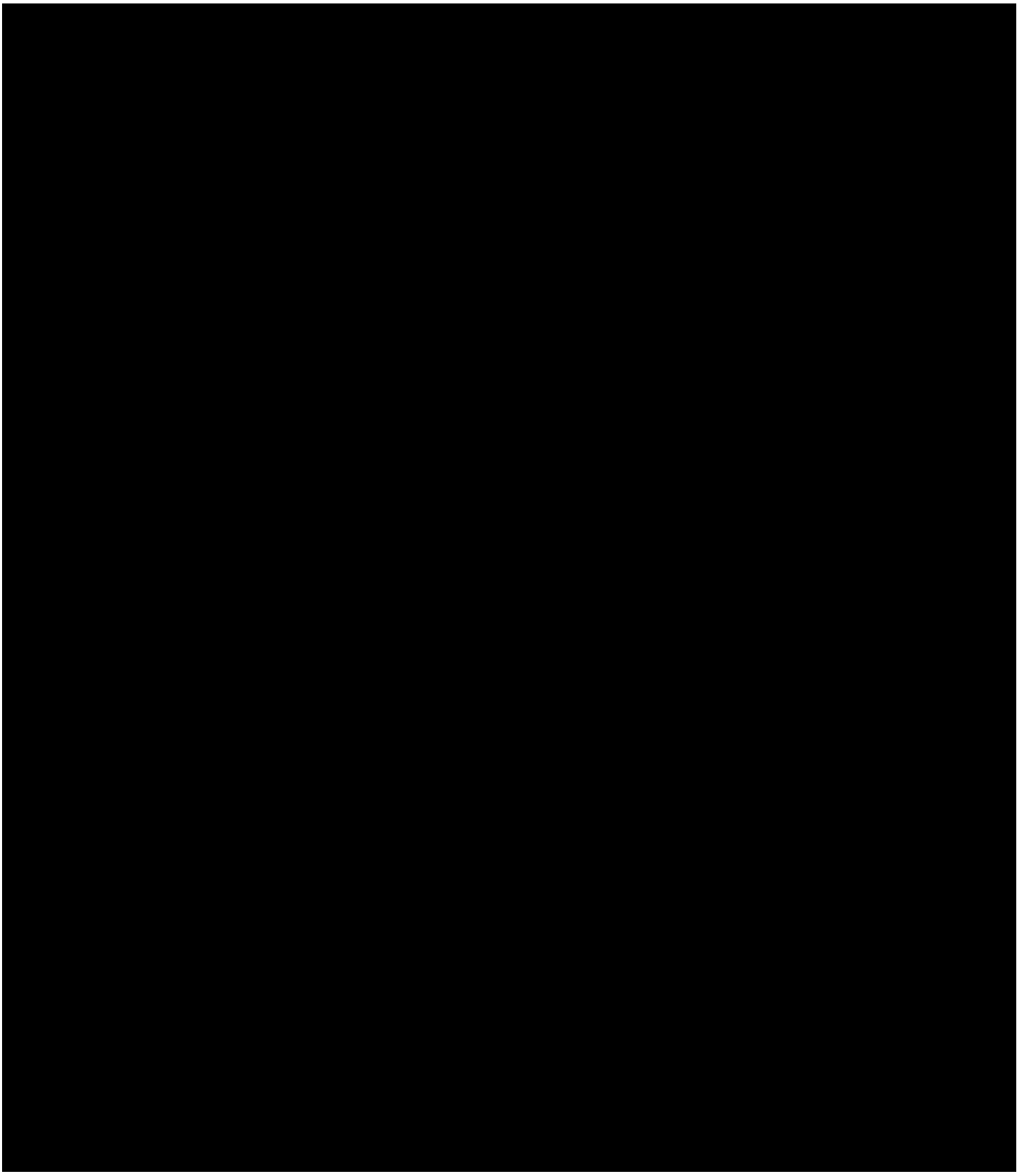




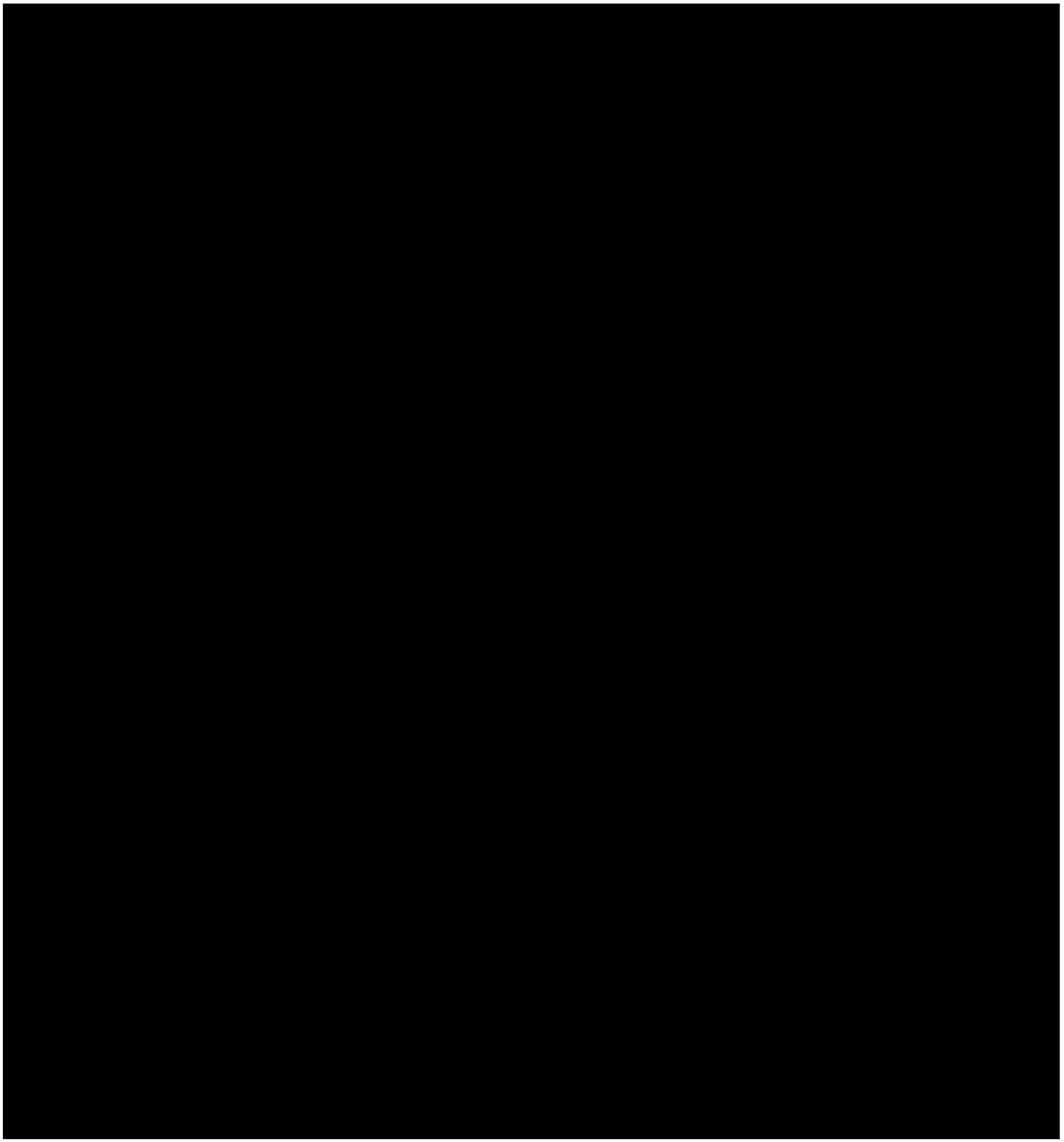


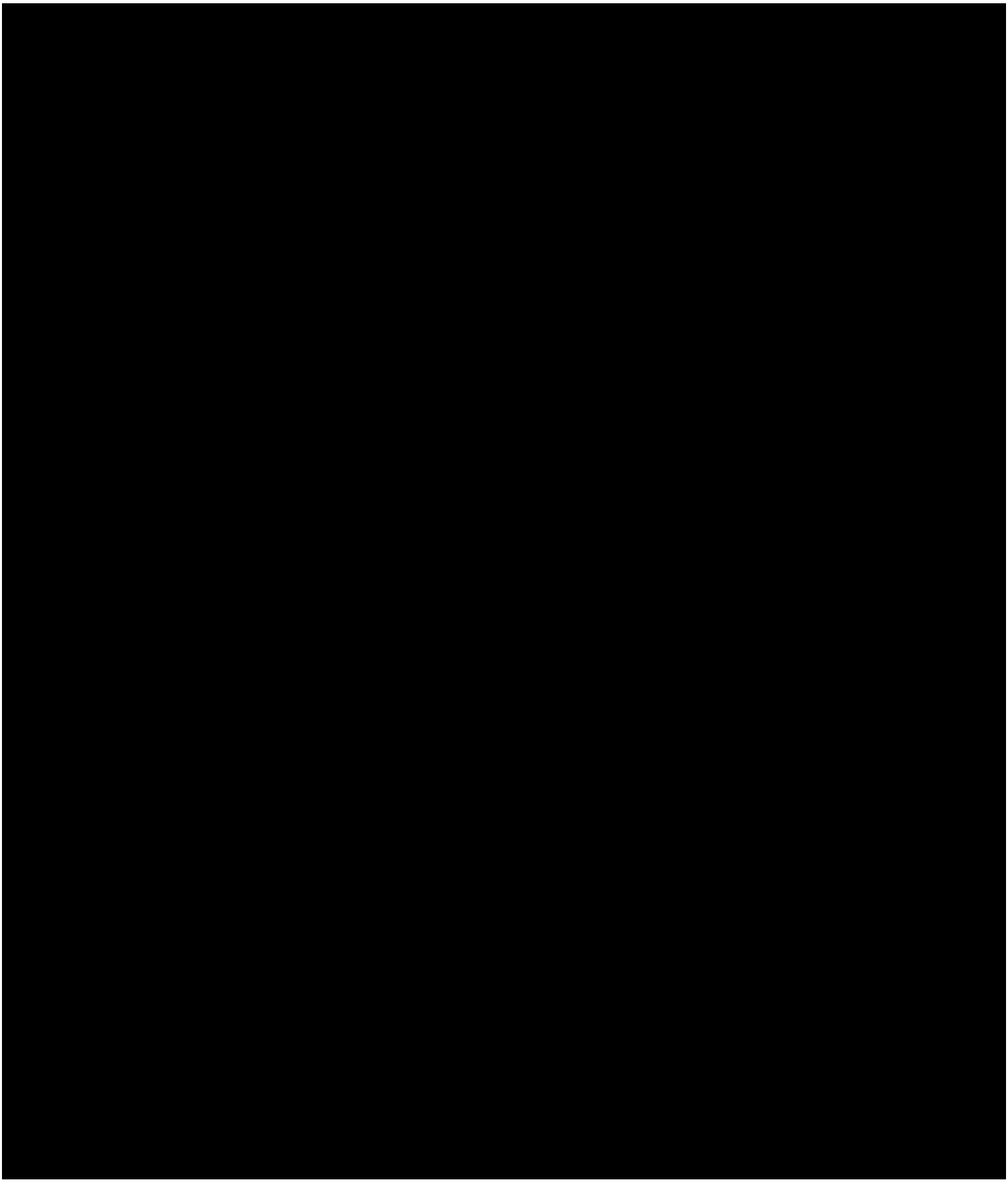




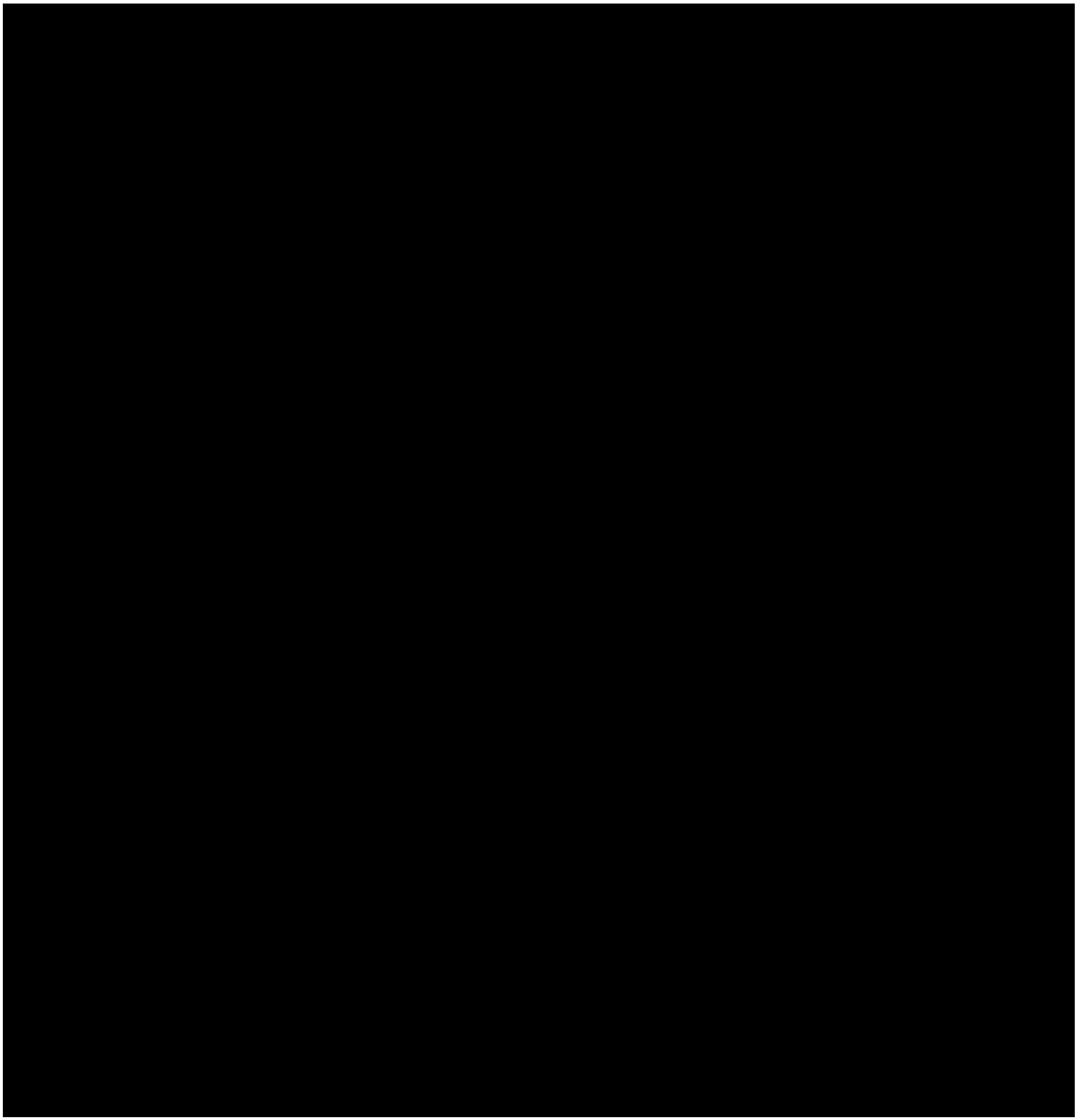


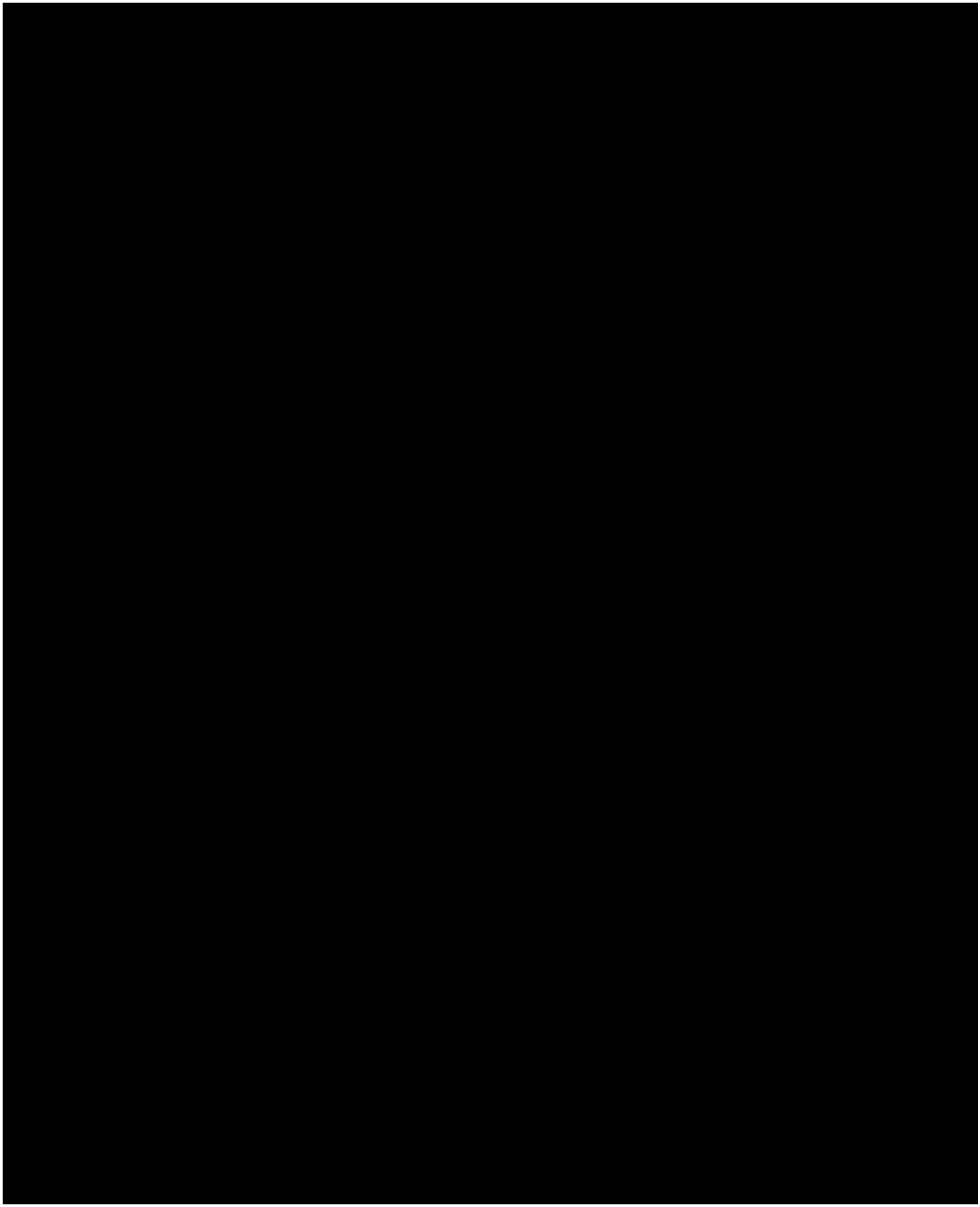
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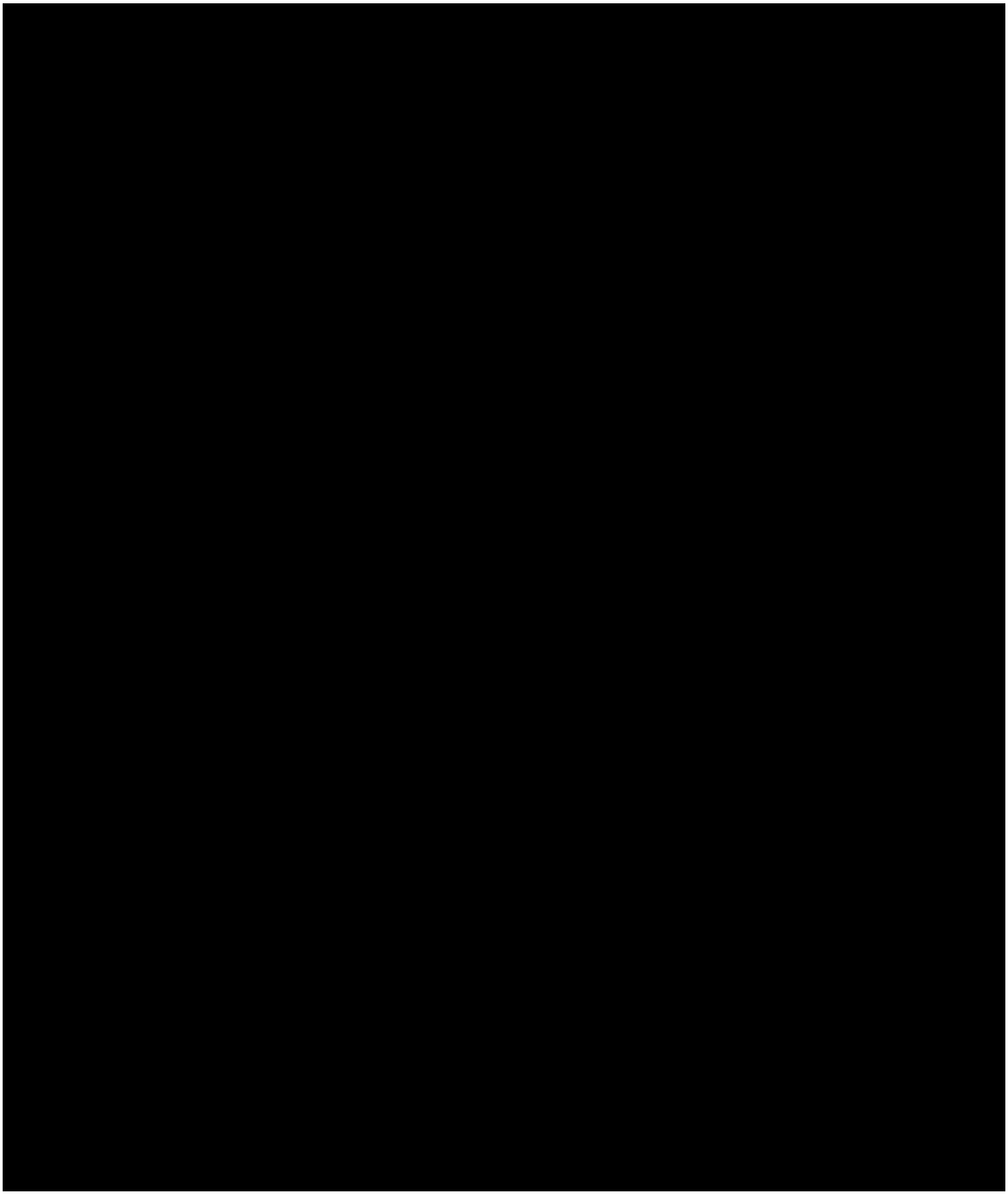


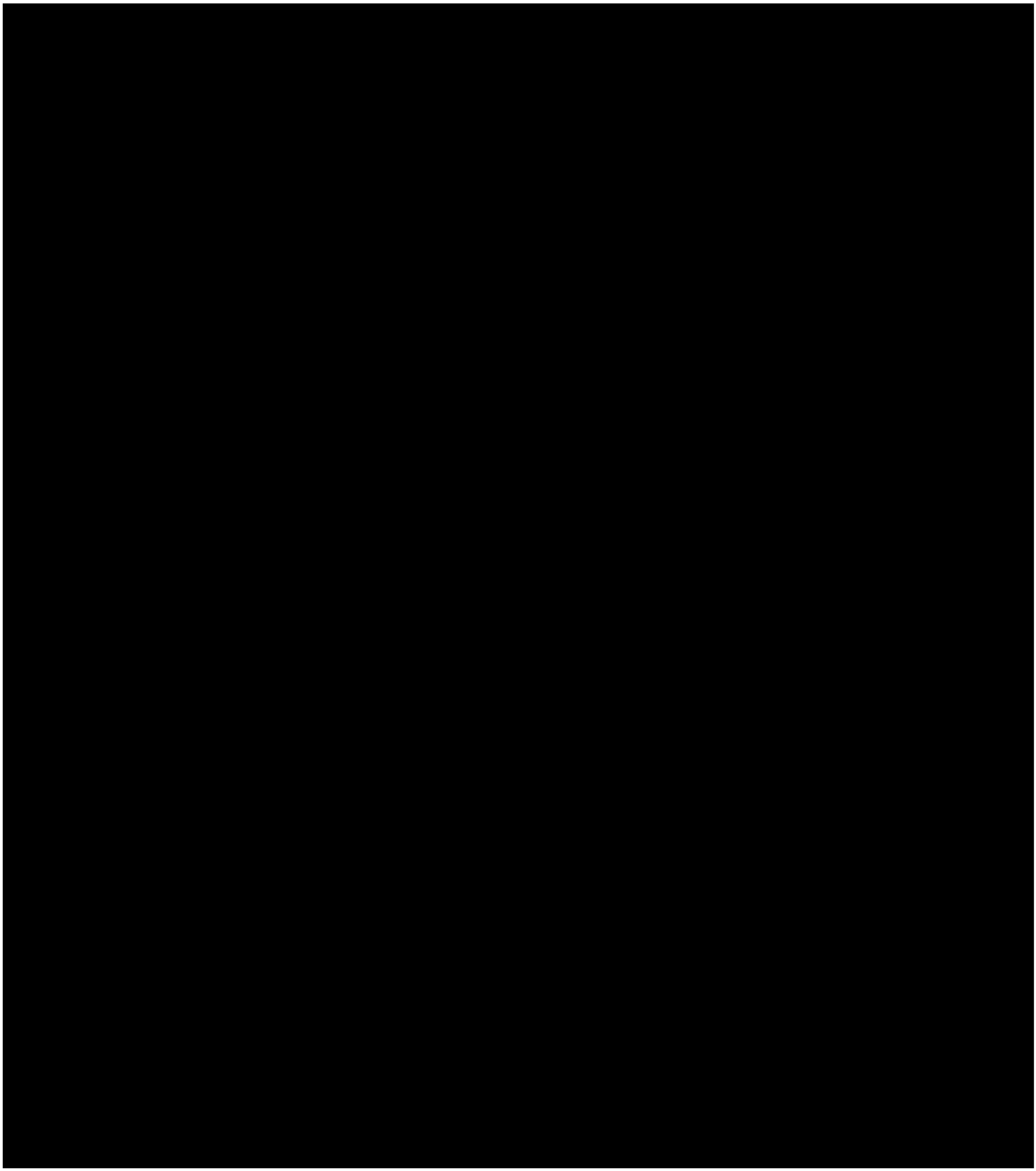


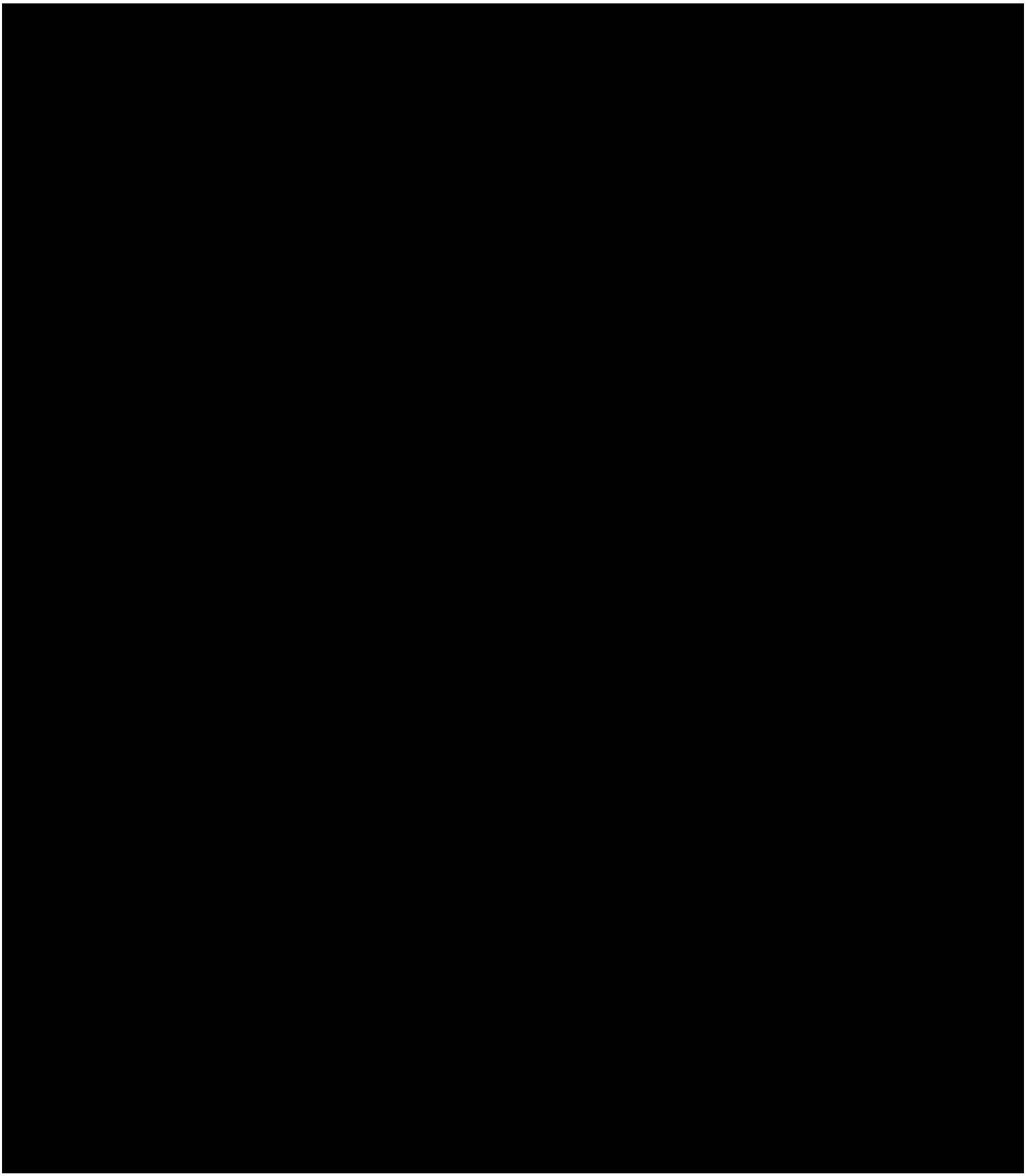
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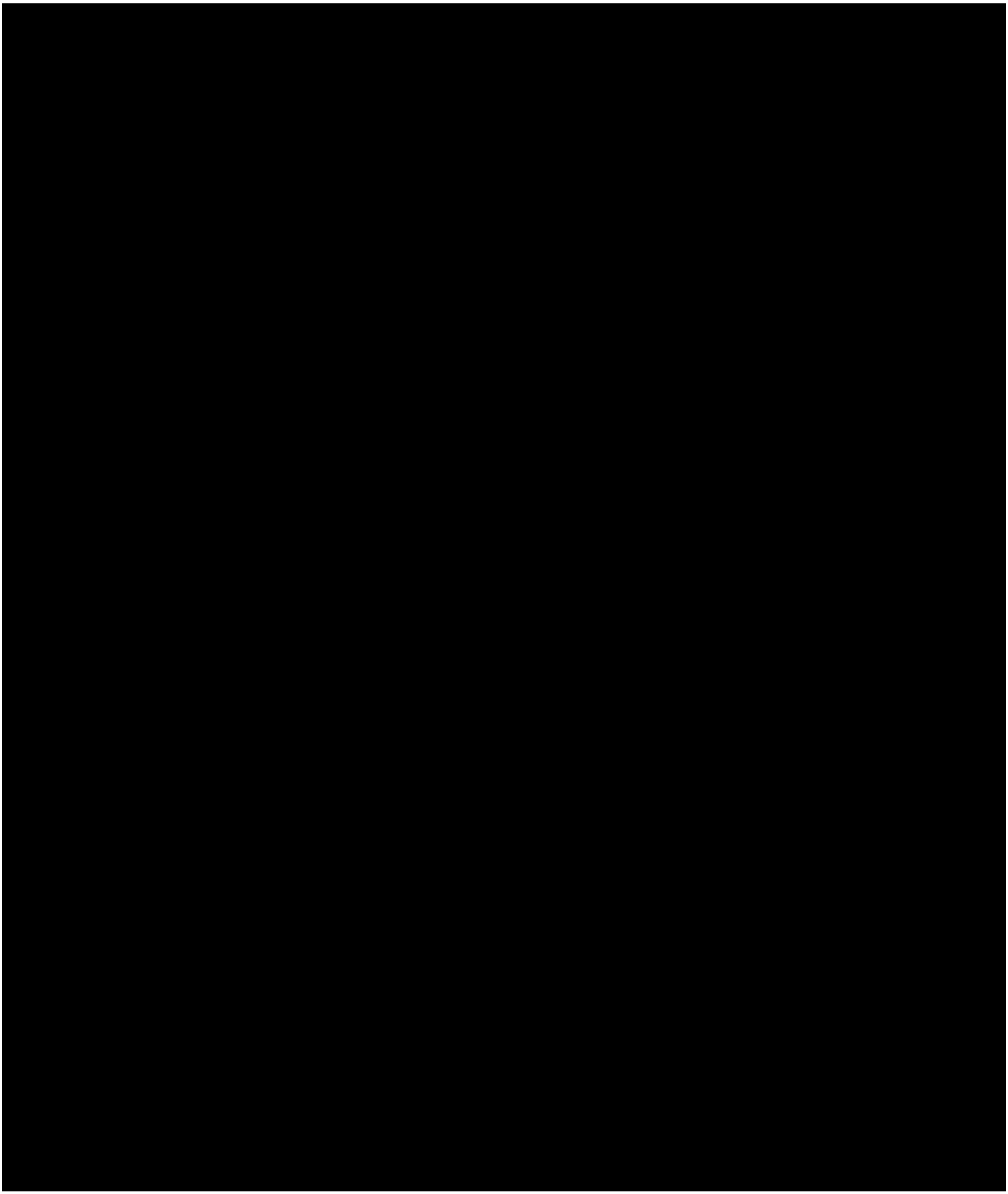


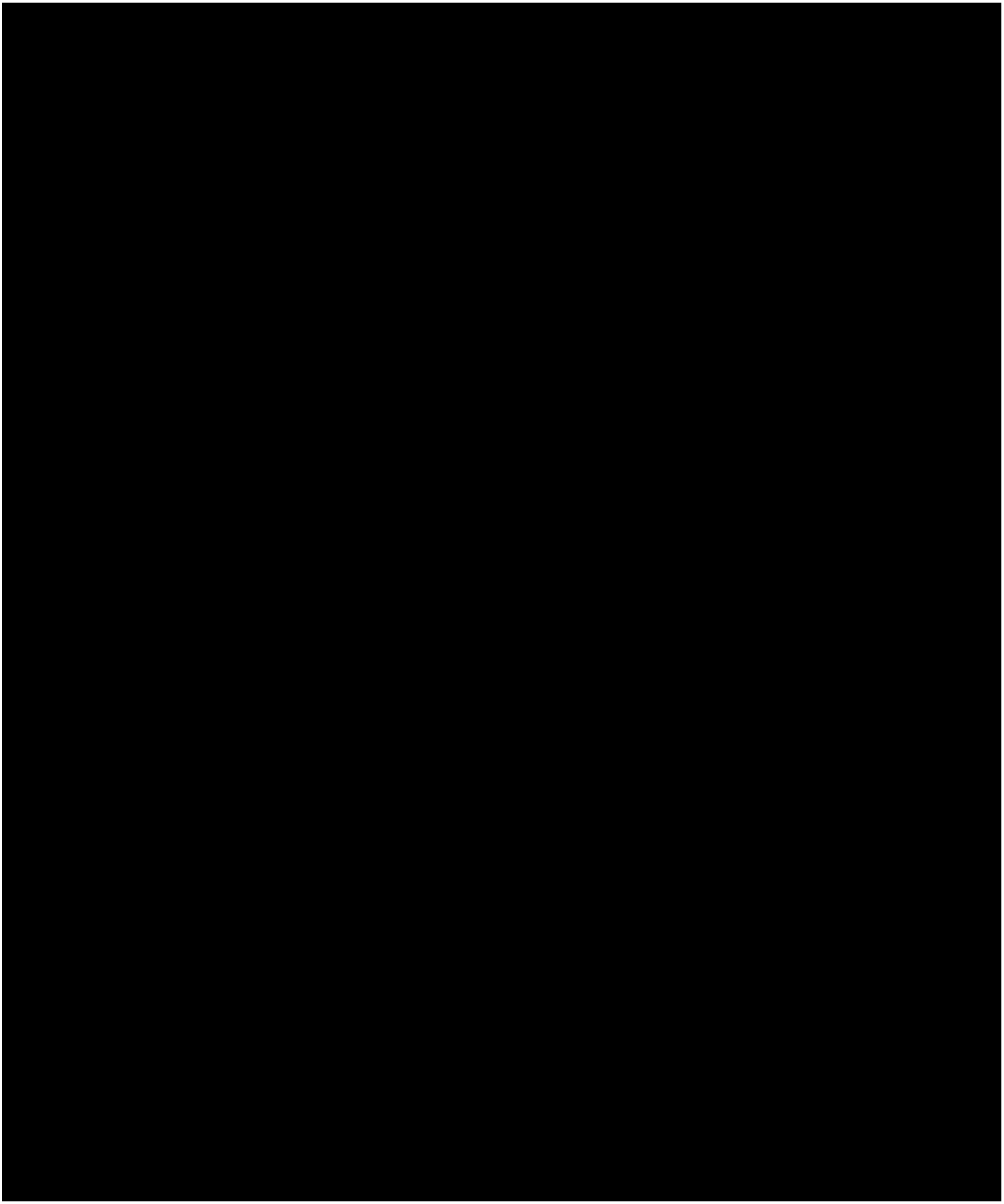


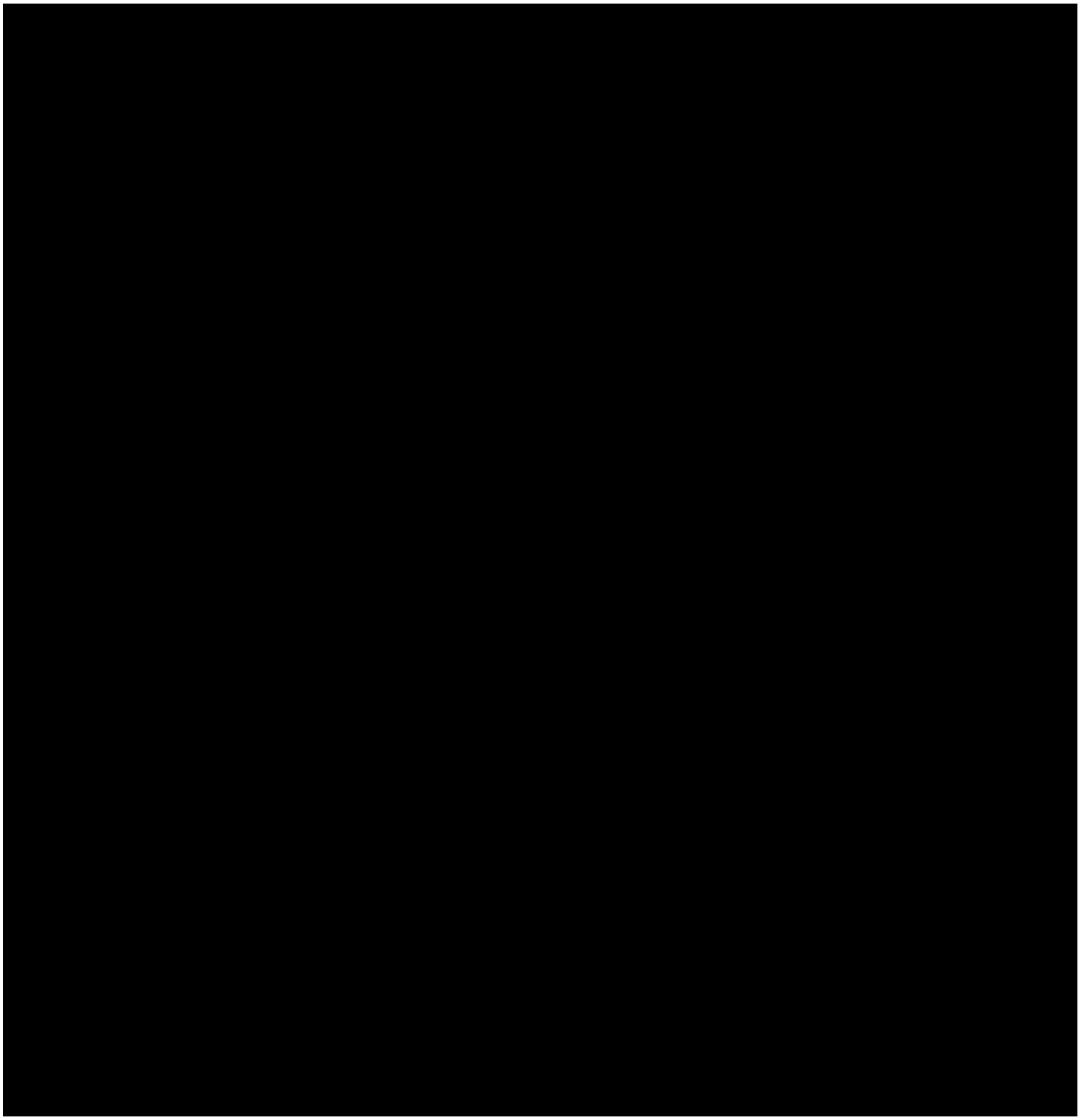


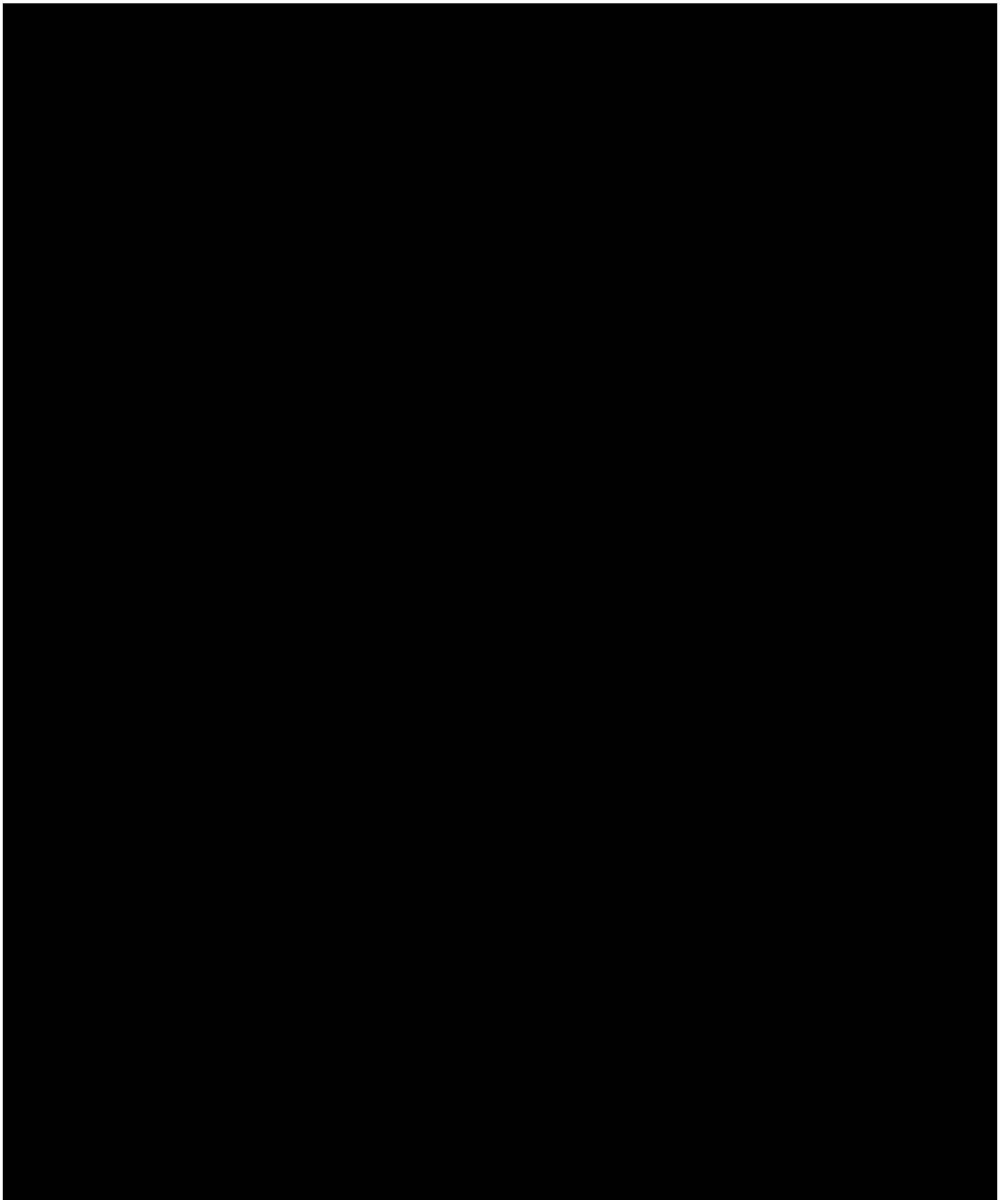


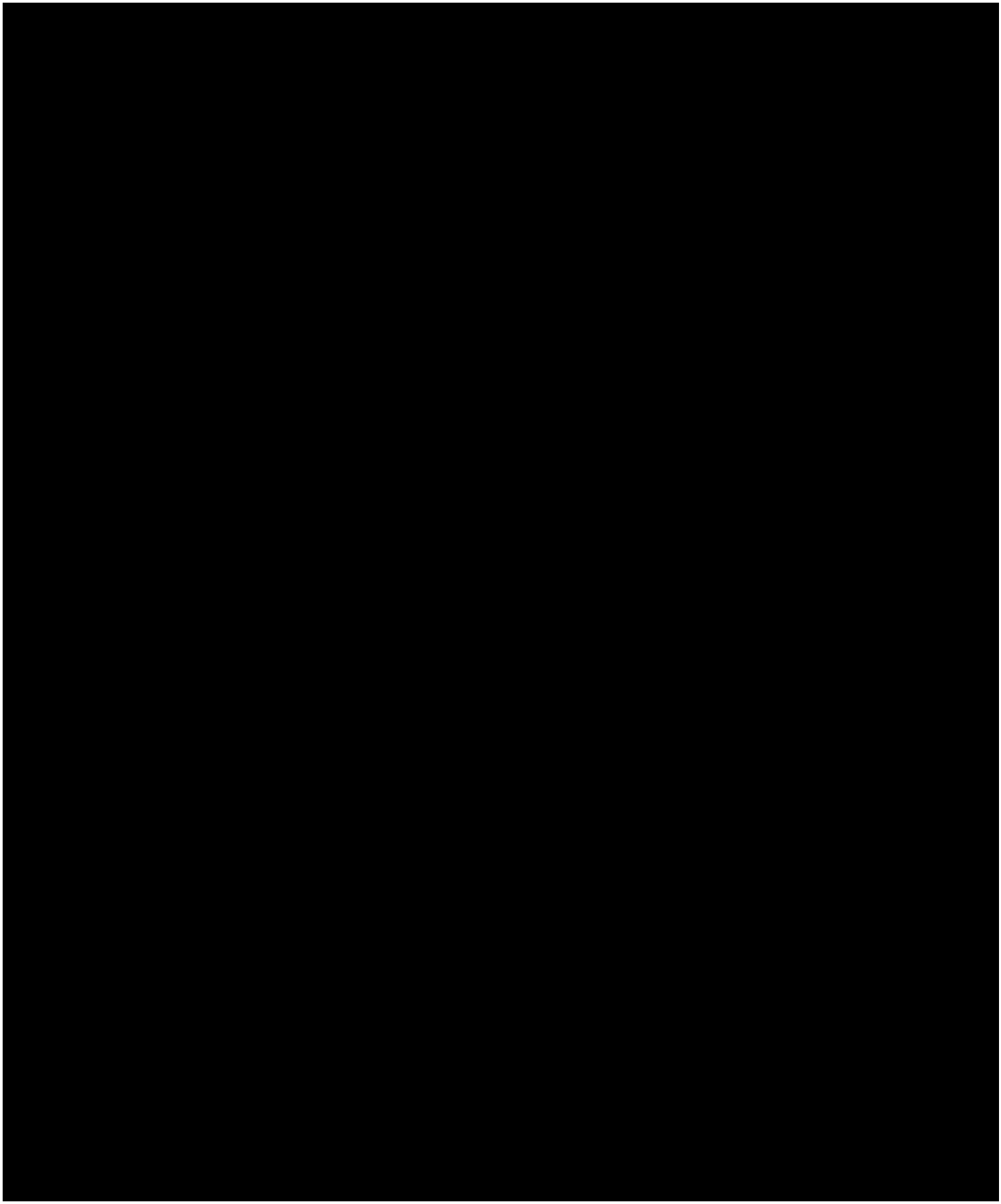


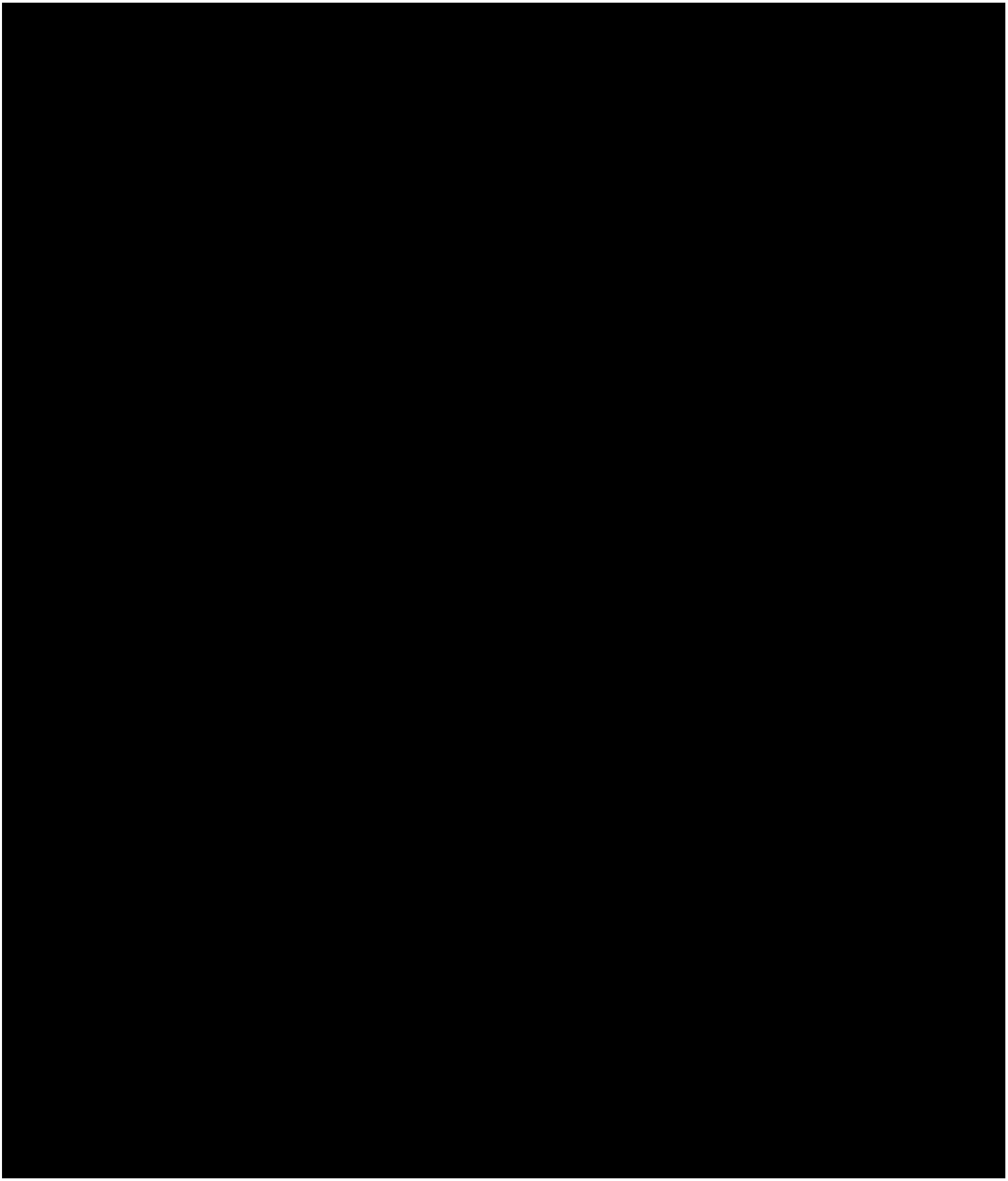


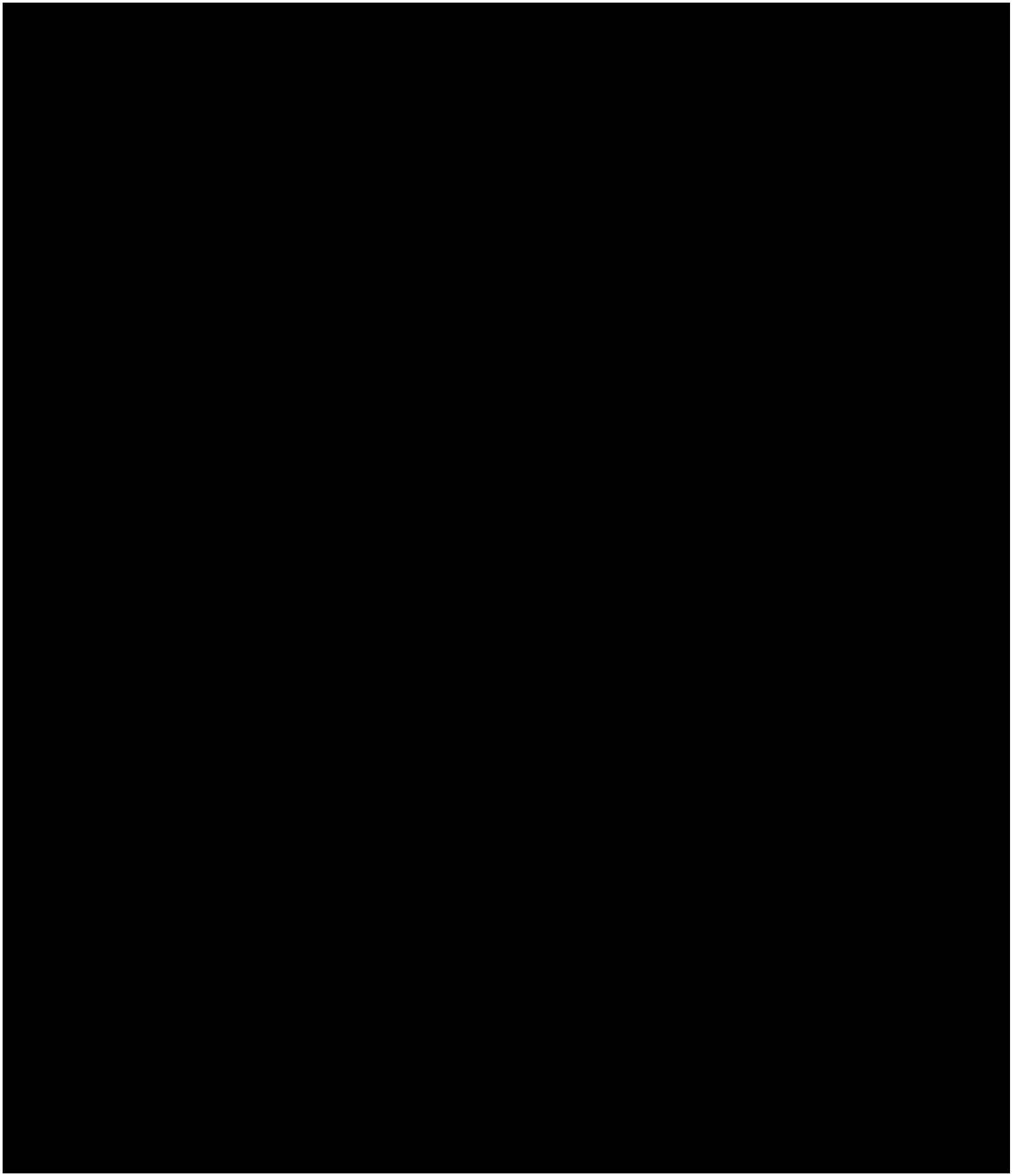


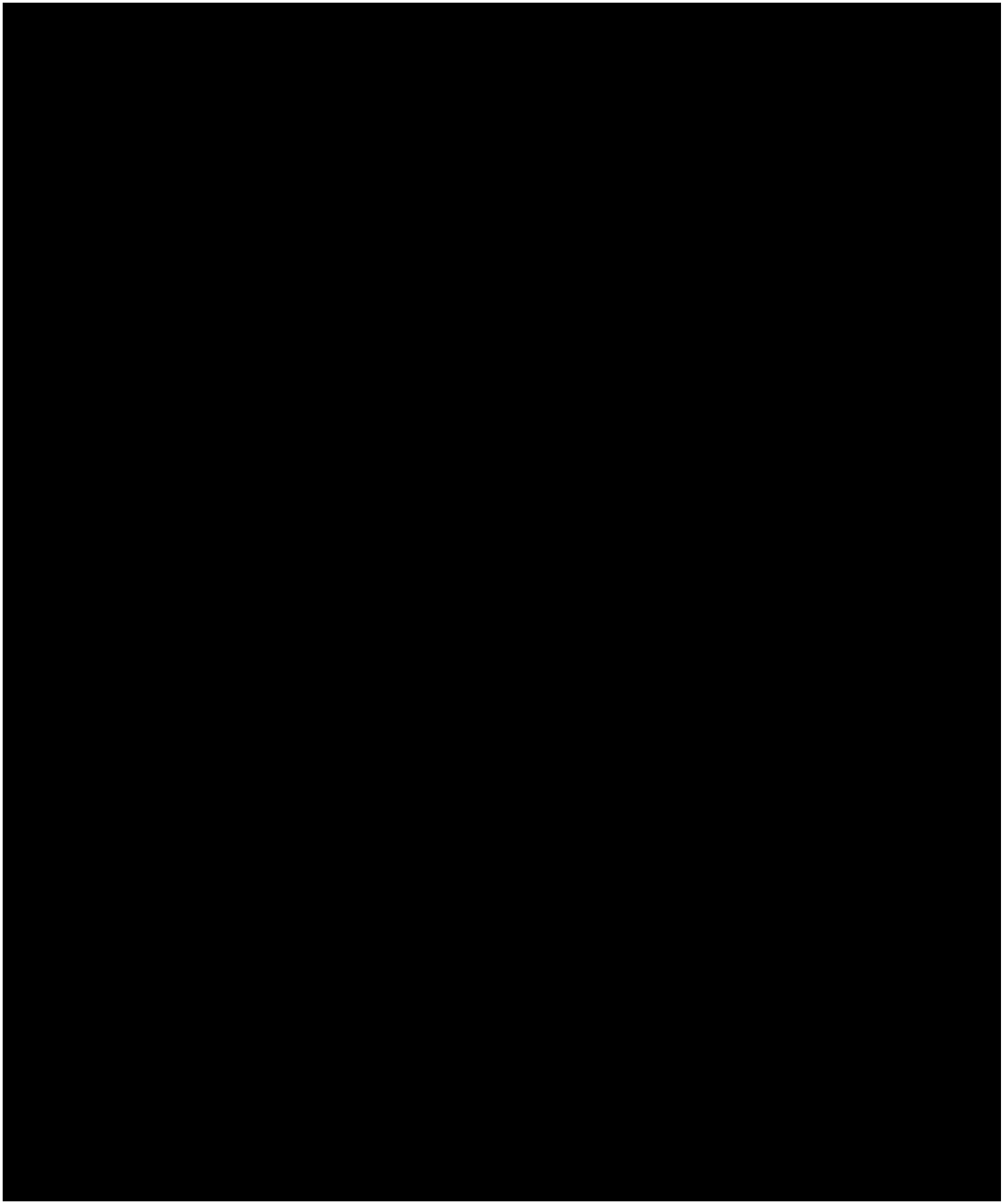




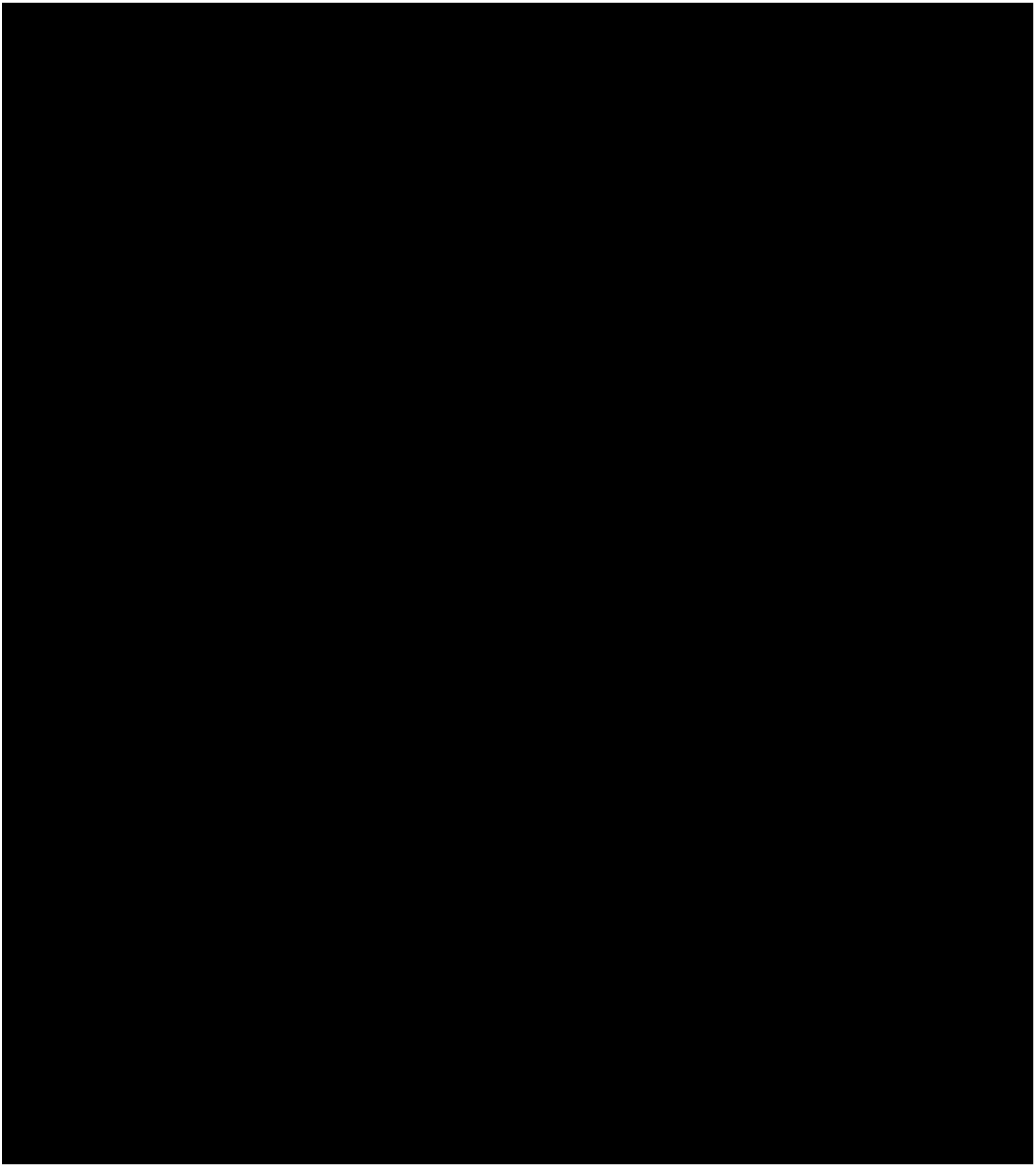


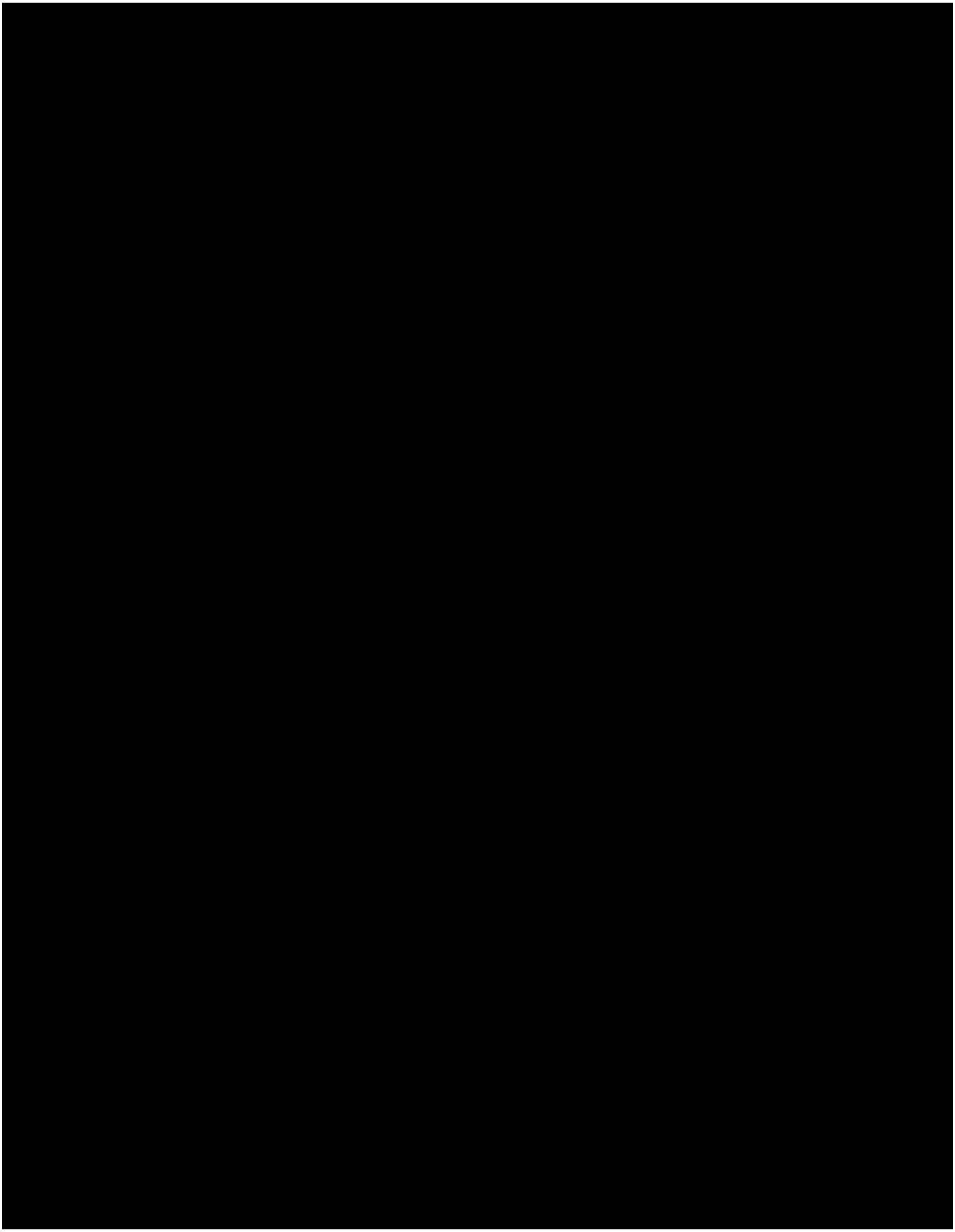


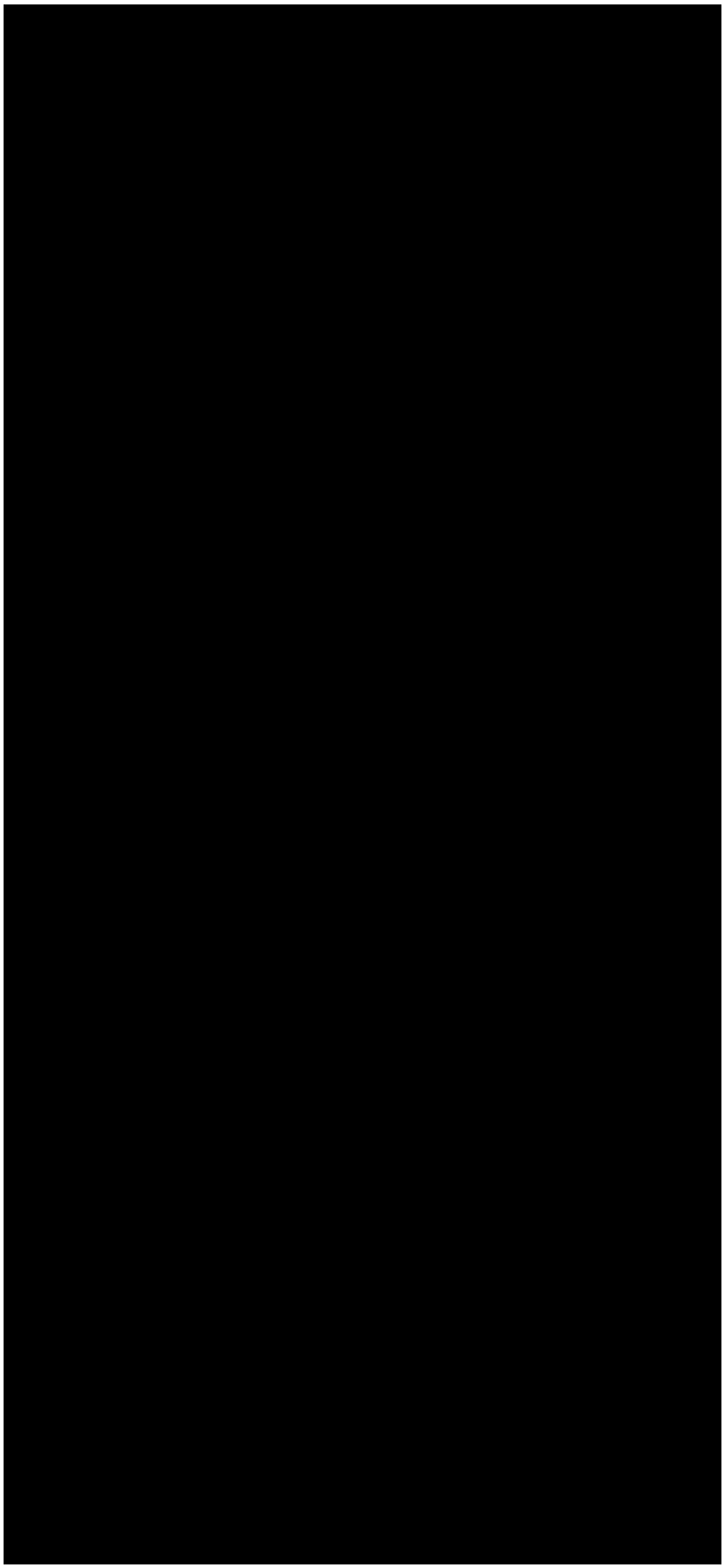


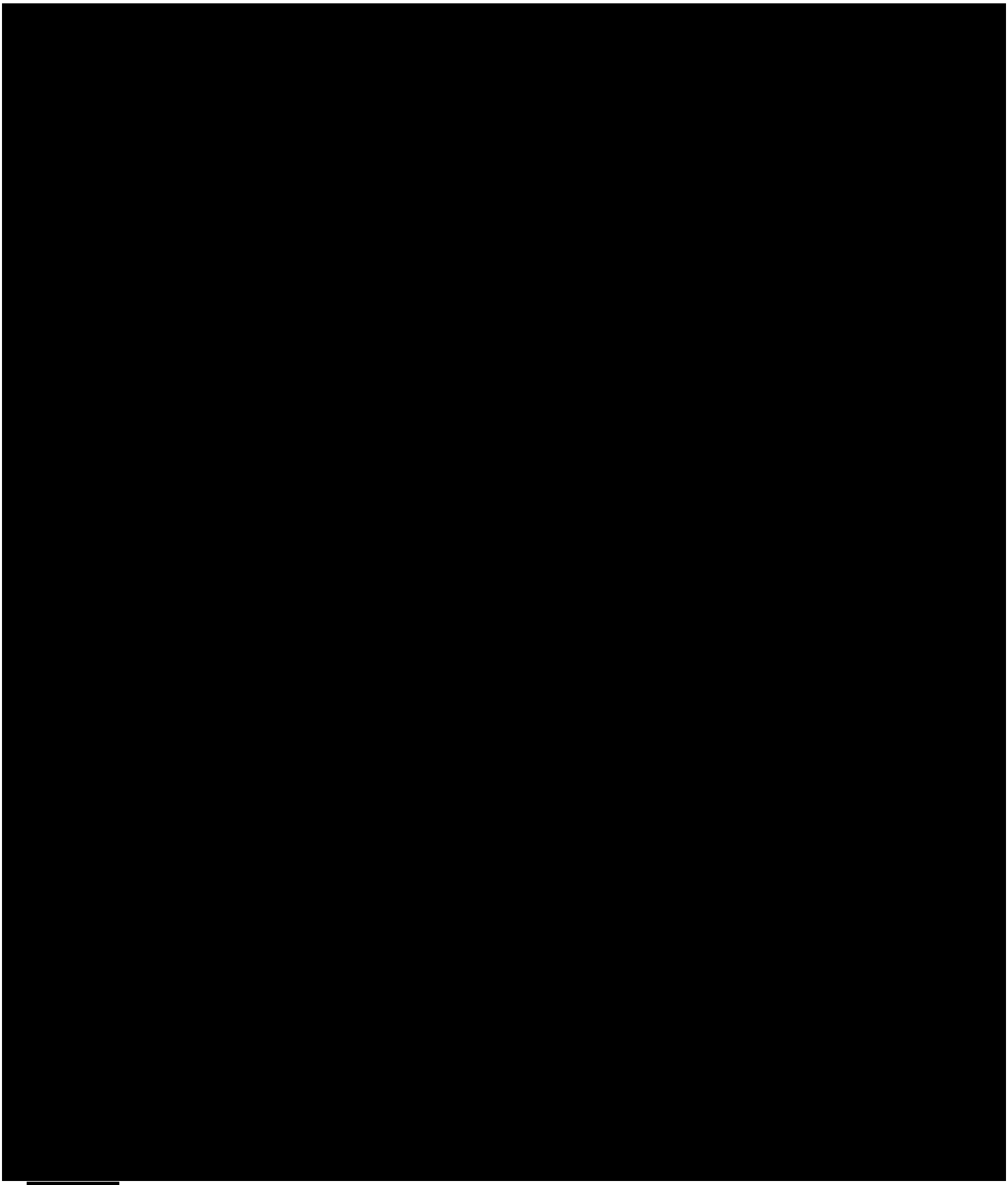


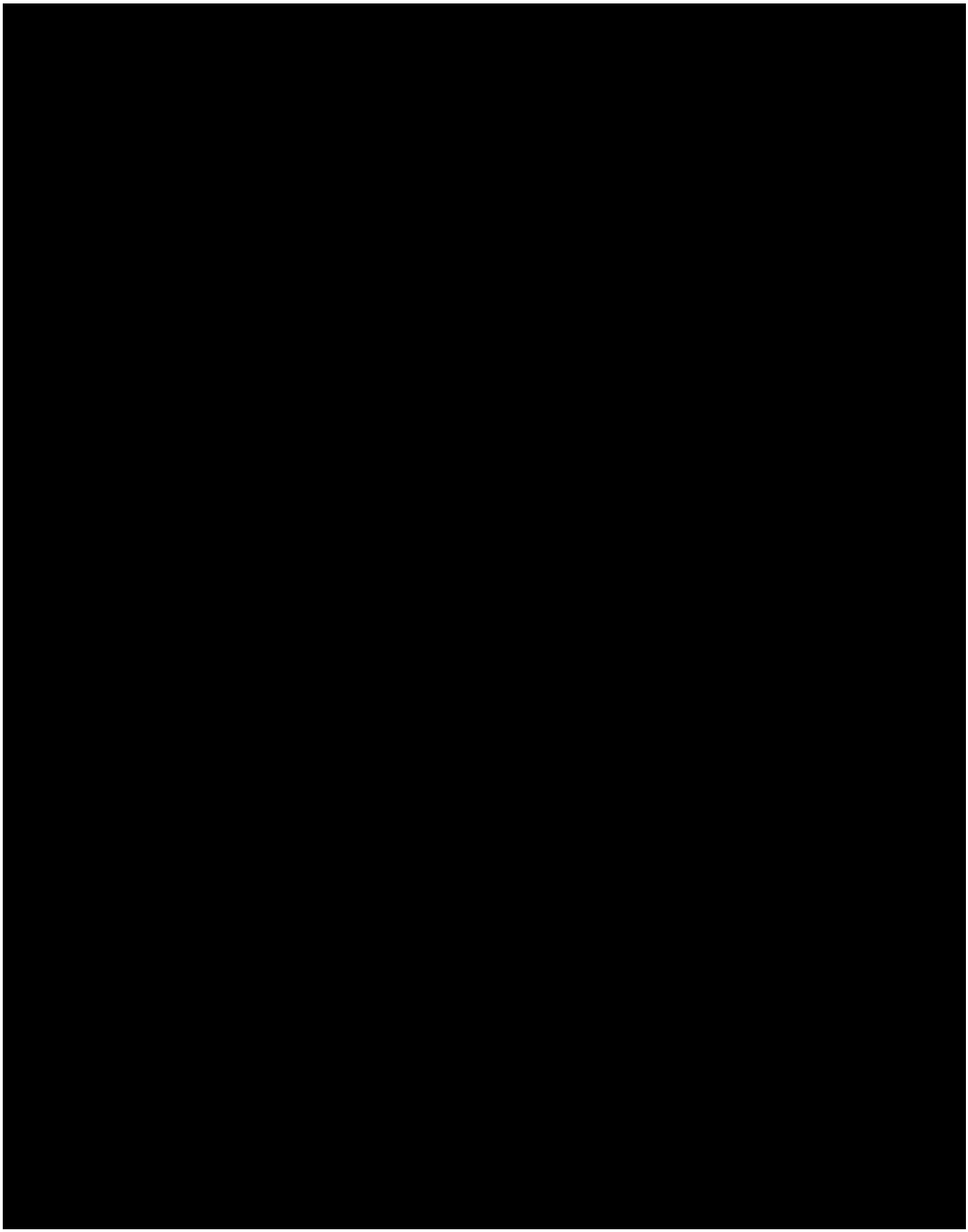
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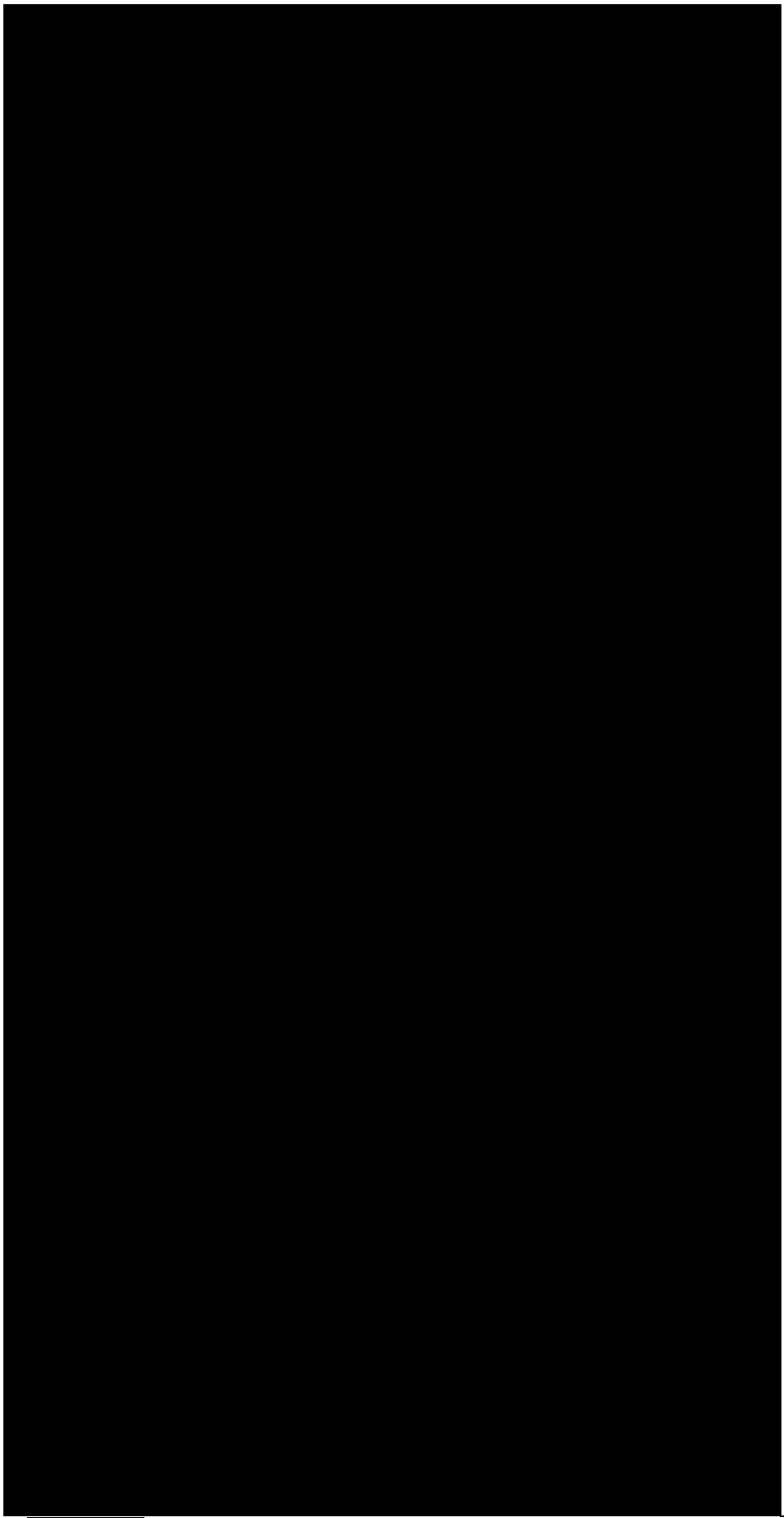


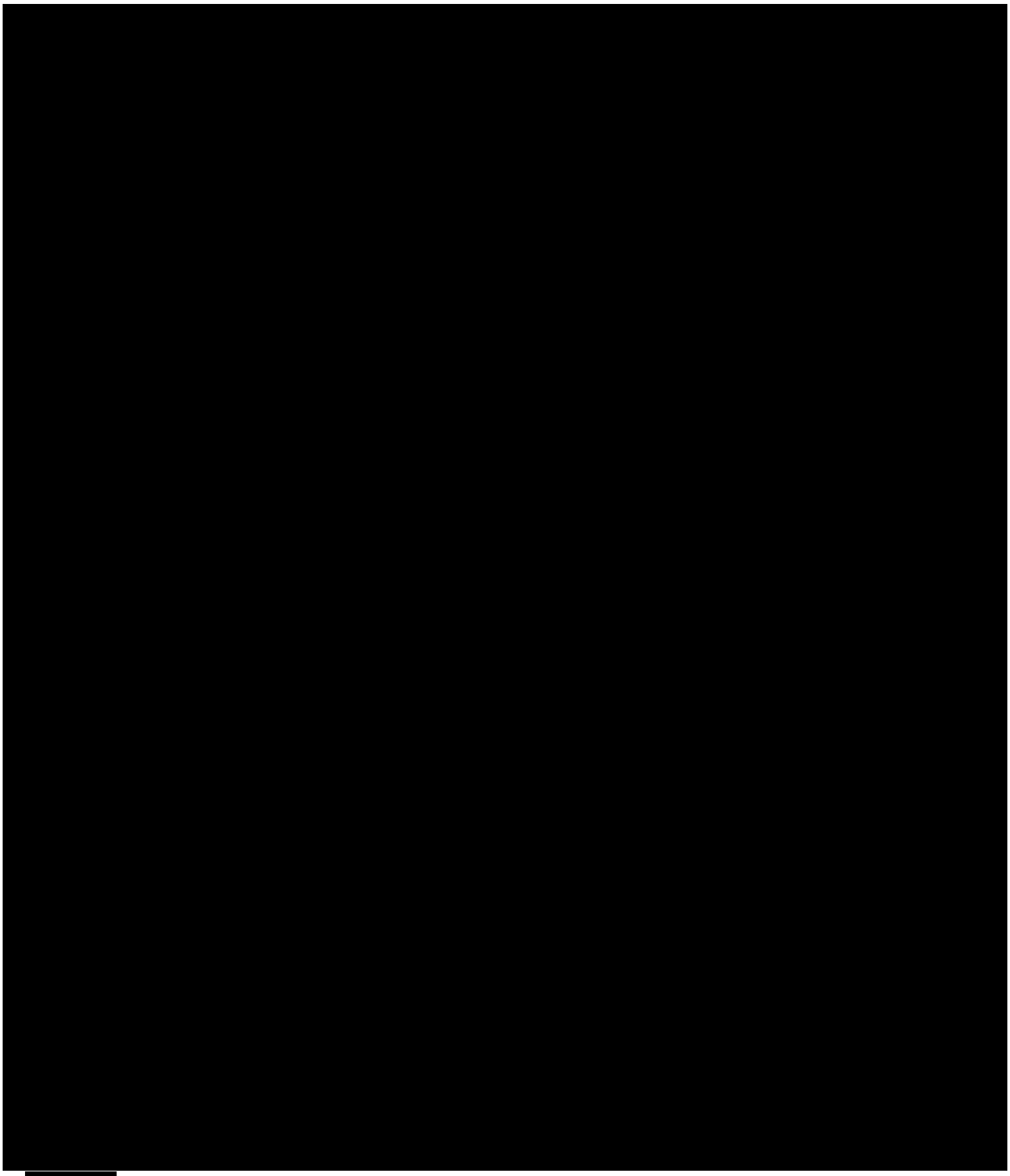


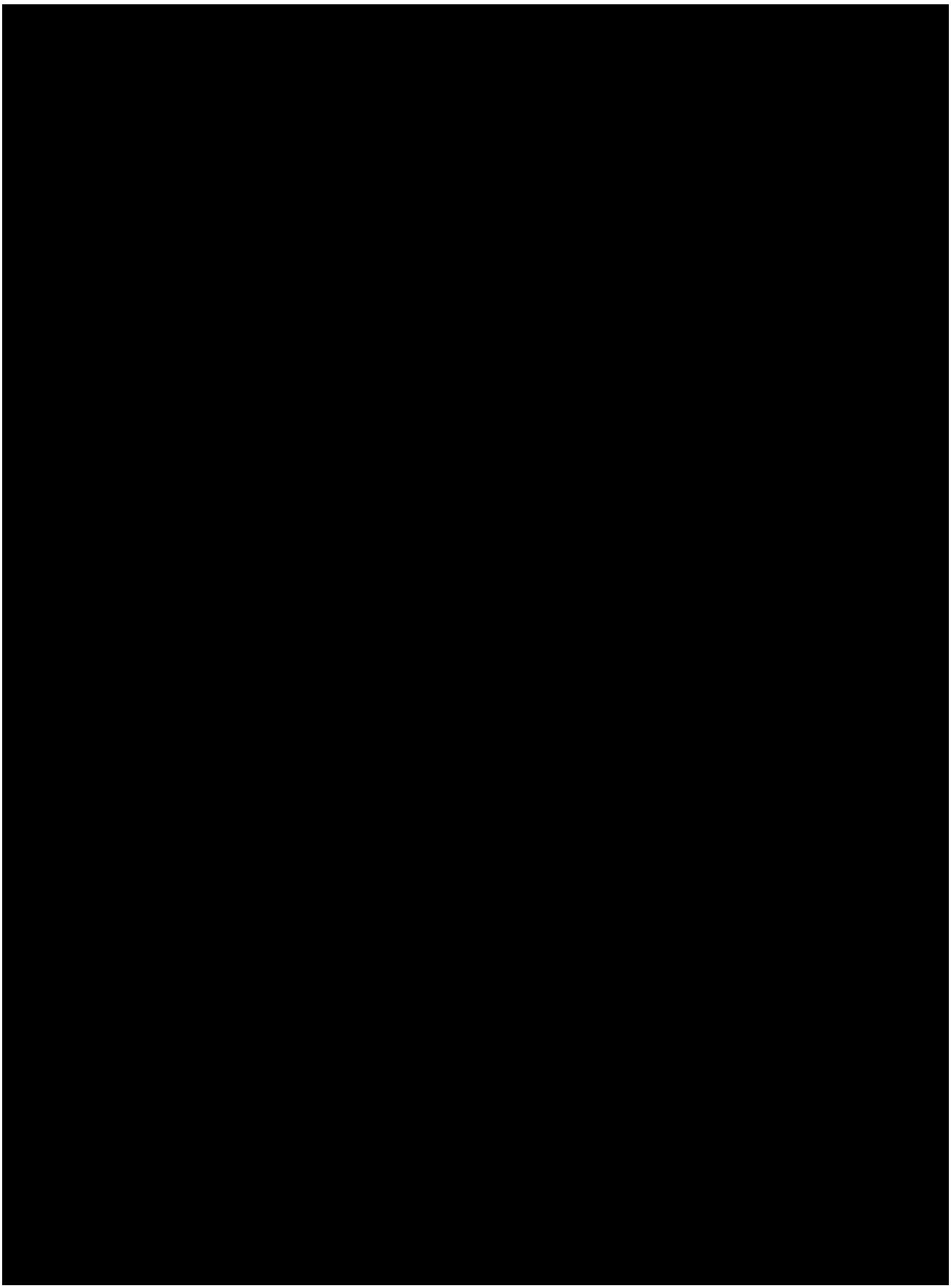




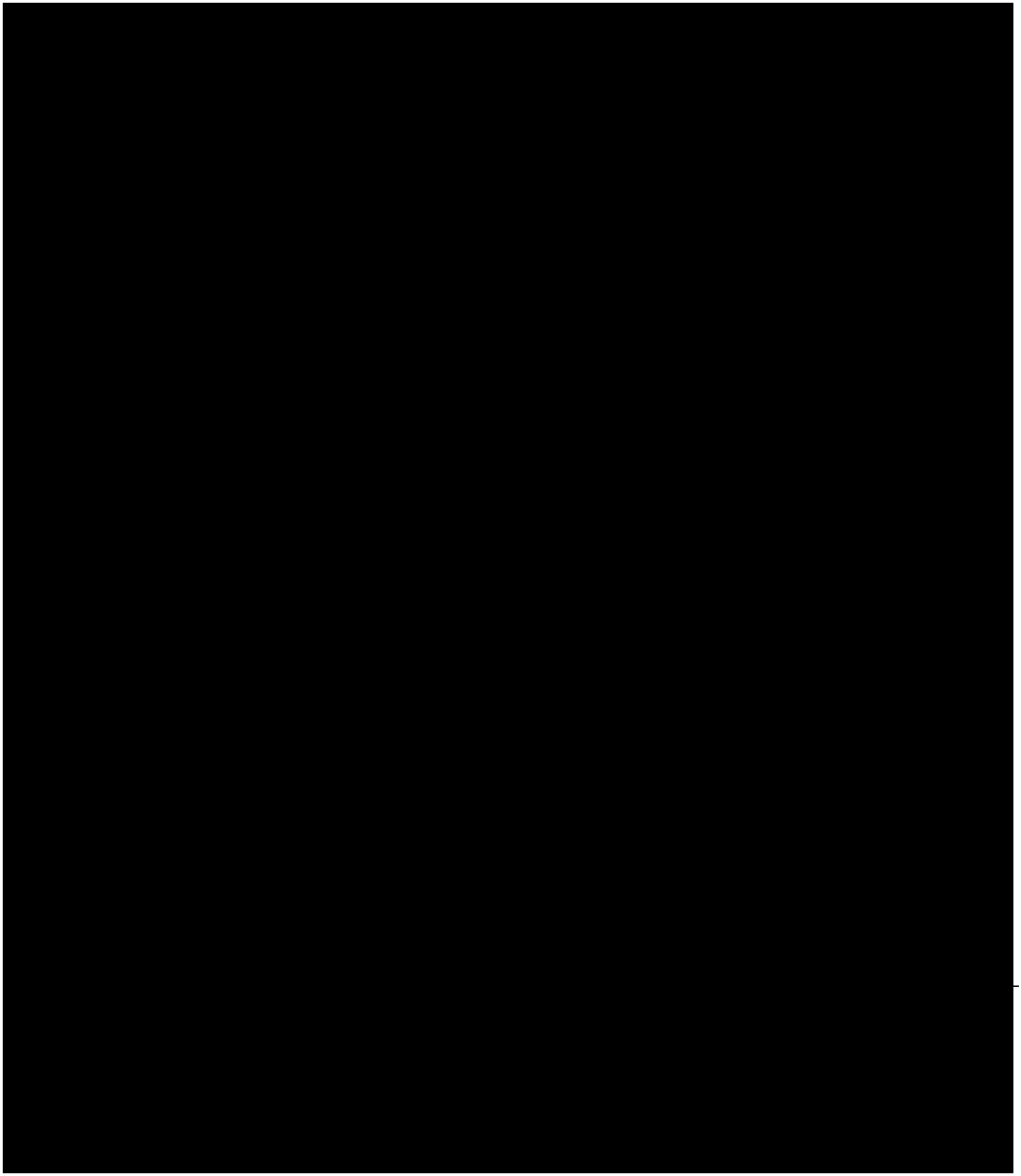


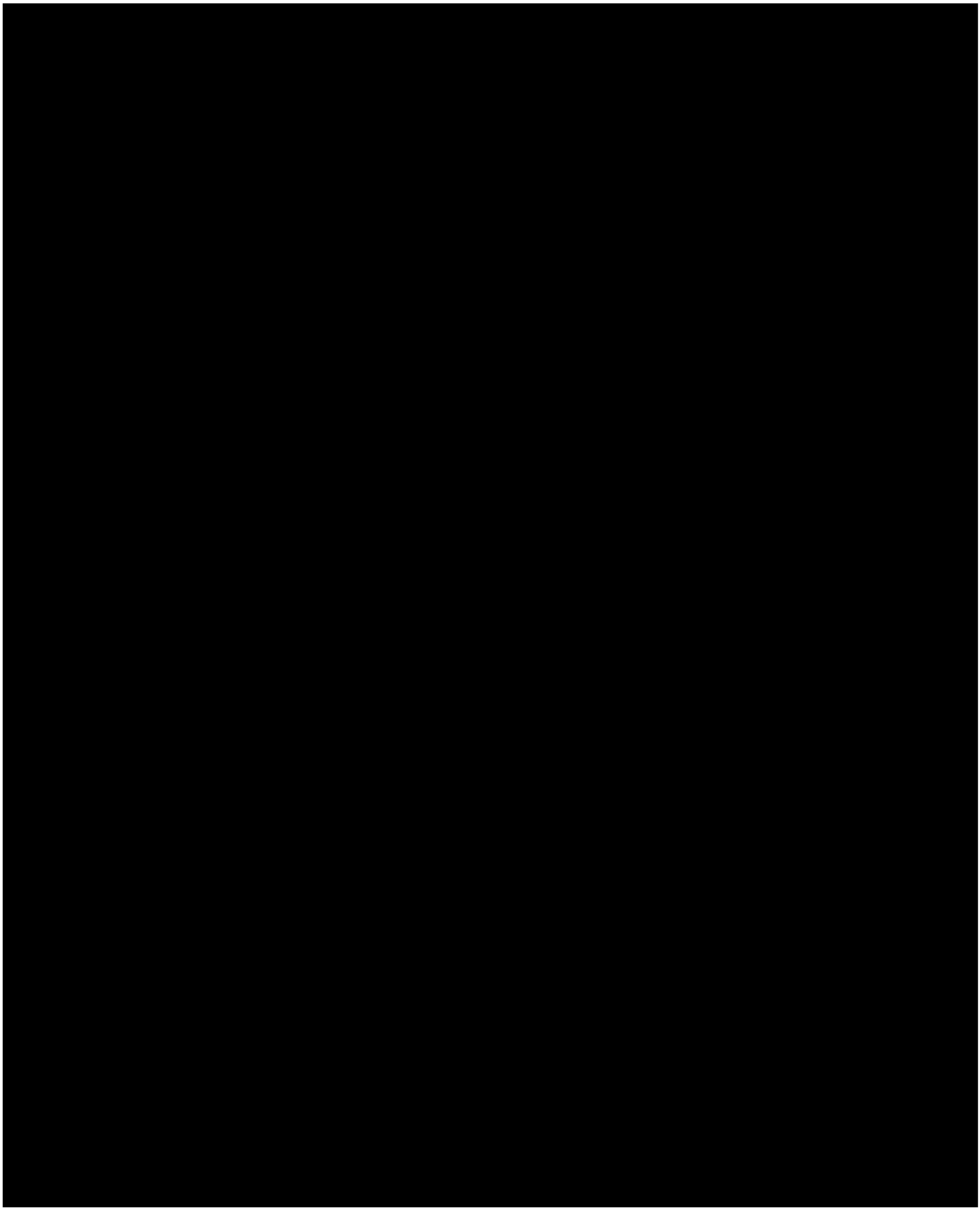


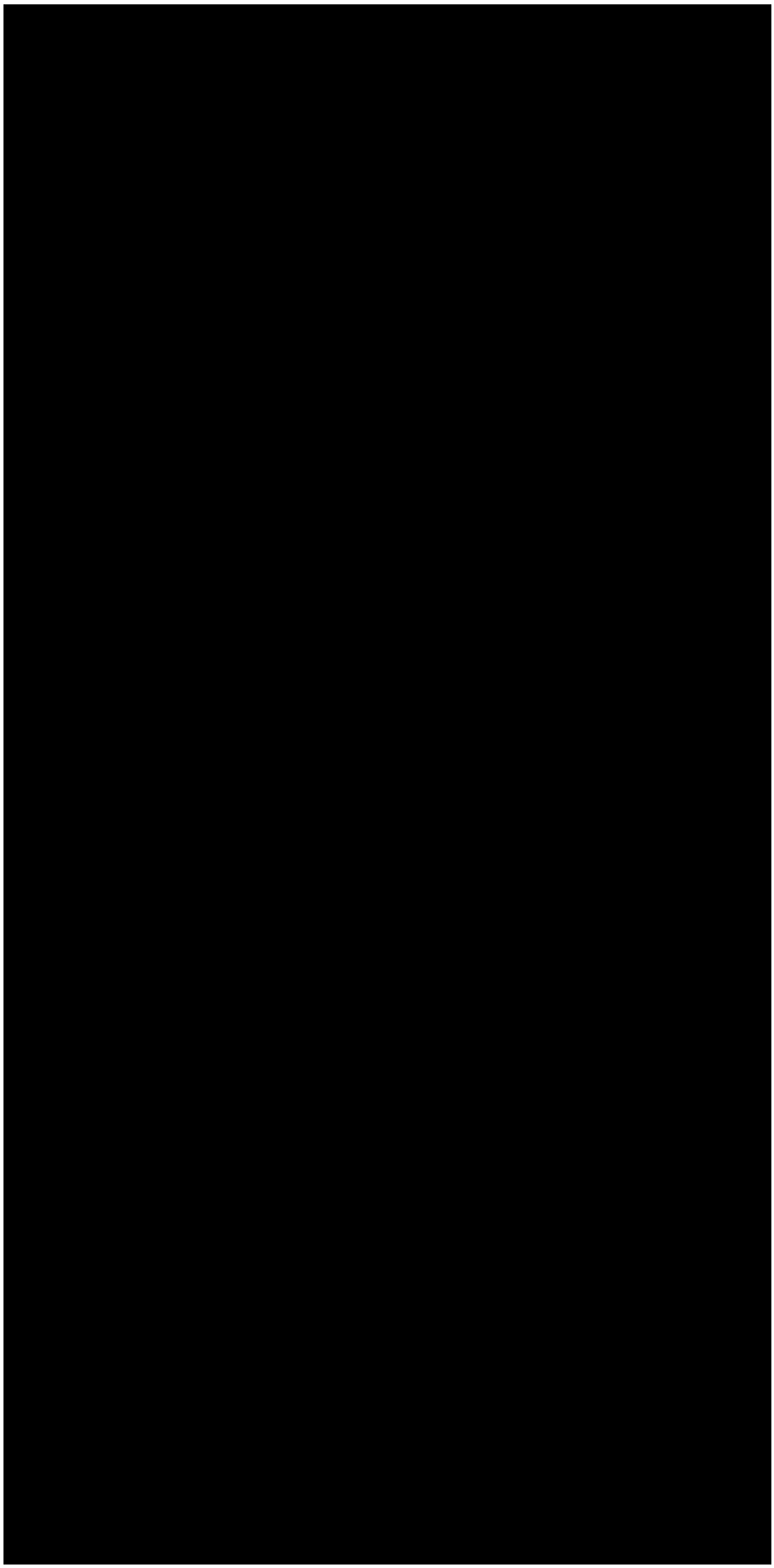


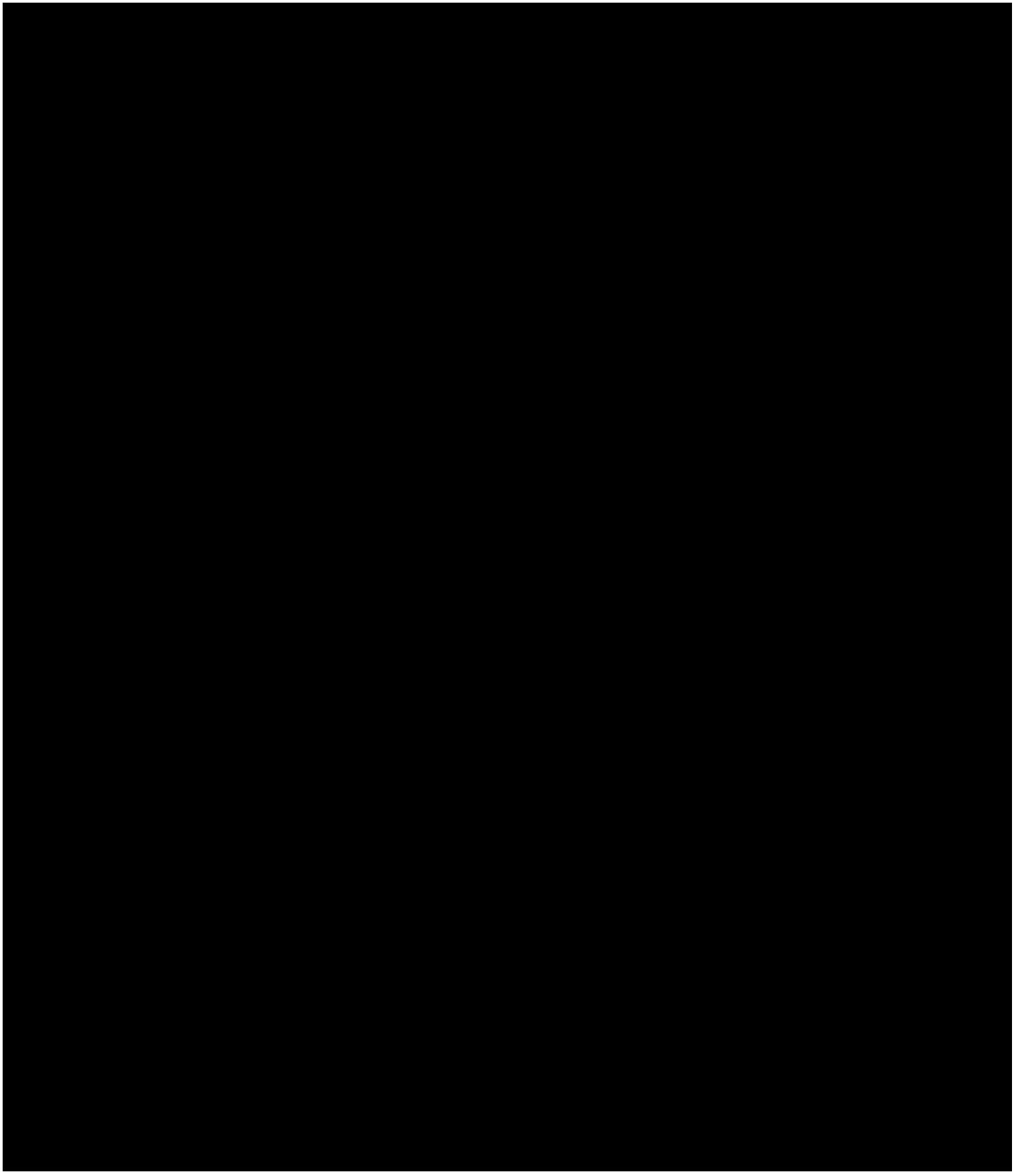


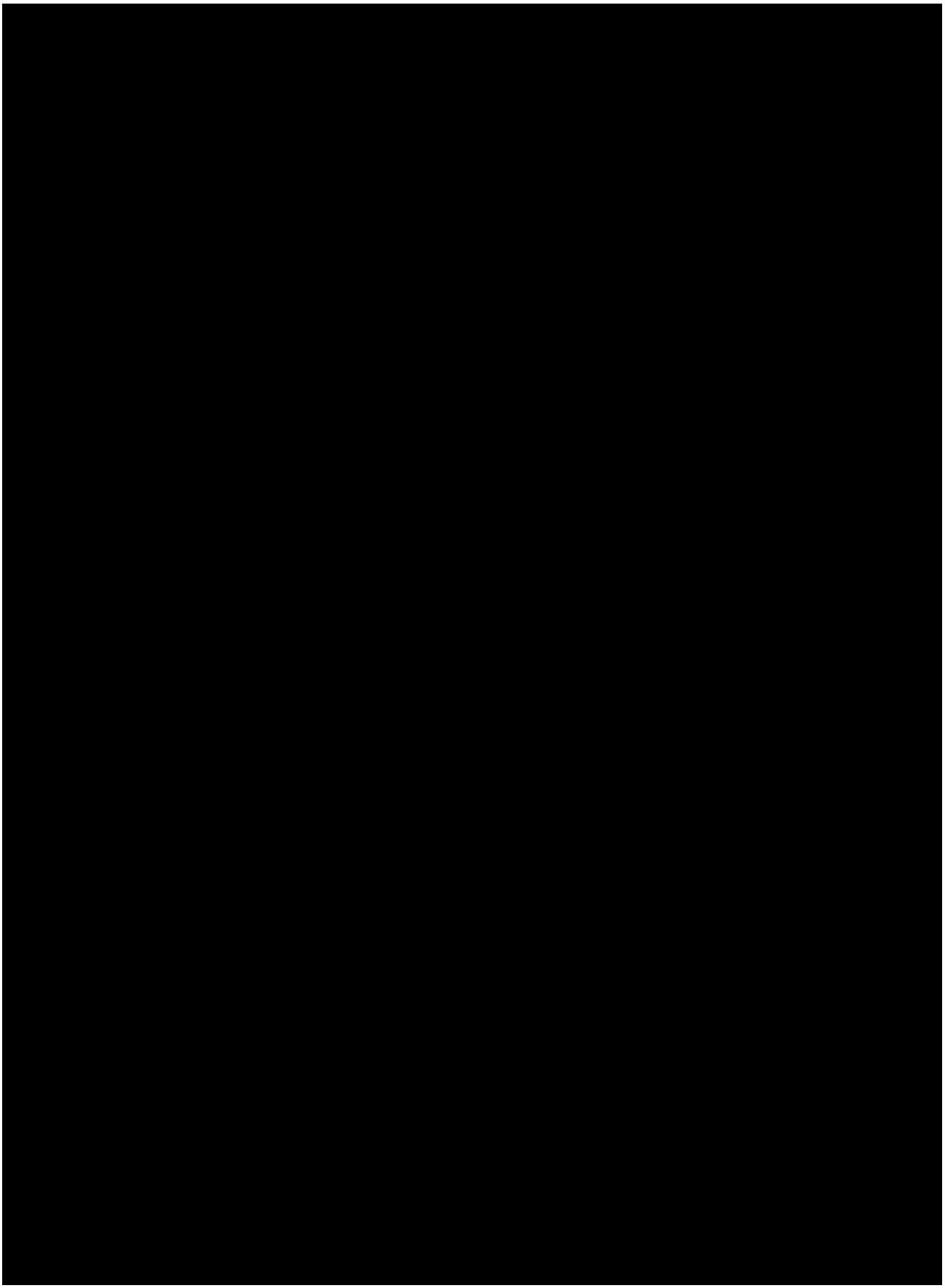
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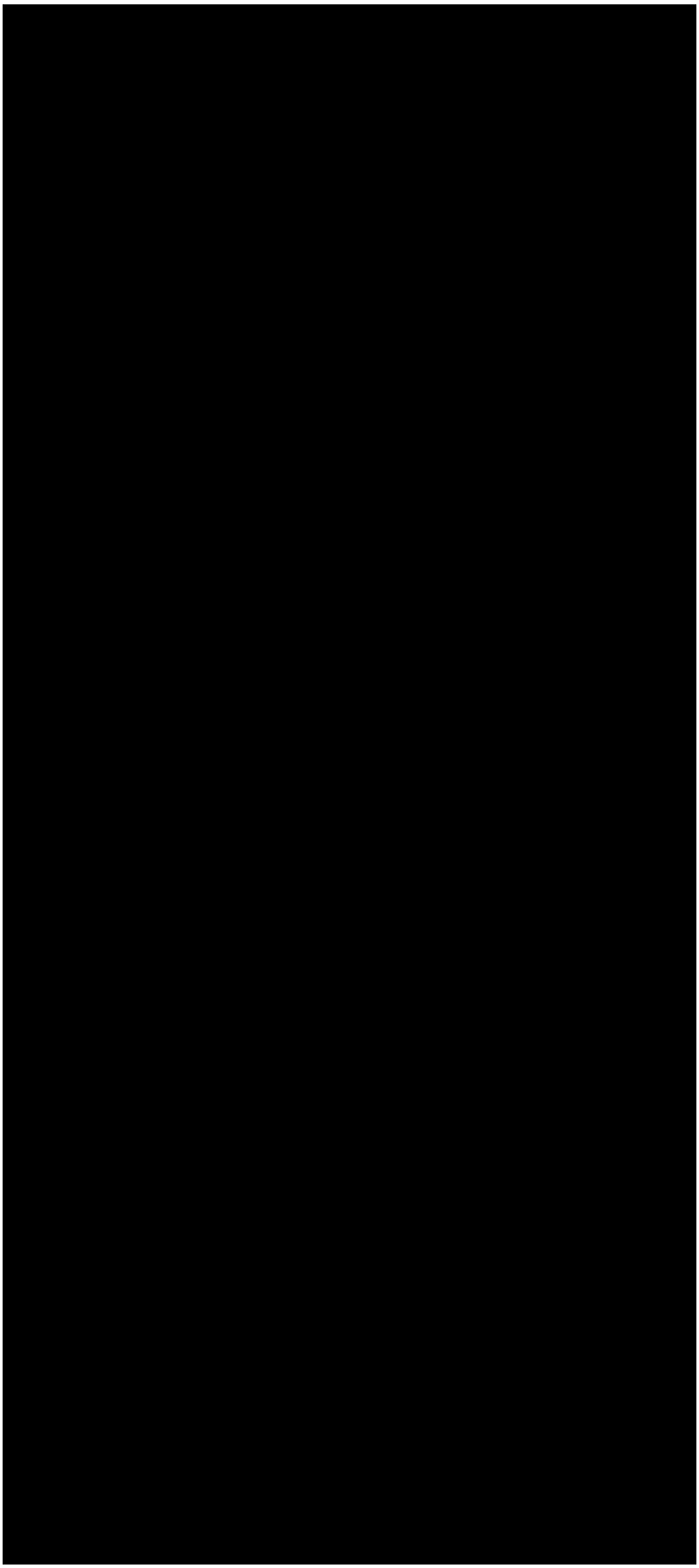














Appendix: Database Descriptions

Environmental Risk Information Services (ERIS) can search the following databases. The extent of historical information varies with each database and current information is determined by what is publicly available to ERIS at the time of update. ***Note:*** *Databases denoted with " * " indicates that the database will no longer be updated. See the individual database description for more information.*

Abandoned Aggregate Inventory: Provincial AAGR

The MAAP Program maintains a database of abandoned pits and quarries. Please note that the database is only referenced by lot and concession and city/town location. The database provides information regarding the location, type, size, land use, status and general comments.*

Government Publication Date: Sept 2002*

Aggregate Inventory: Provincial AGR

The Ontario Ministry of Northern Development, Mines, Natural Resources and Forestry (ONDMNRF) maintains this database of pits and quarries. The database provides information regarding the registered owner/operator, location name, operation type, approval type, and maximum annual tonnage.

Government Publication Date: Up to Oct 2022

Abandoned Mine Information System: Provincial AMIS

The Abandoned Mines Information System contains data on known abandoned and inactive mines located on both Crown and privately held lands. The information was provided by the Ministry of Northern Development and Mines (MNDM), with the following disclaimer: "the database provided has been compiled from various sources, and the Ministry of Northern Development and Mines makes no representation and takes no responsibility that such information is accurate, current or complete". Reported information includes official mine name, status, background information, mine start/end date, primary commodity, mine features, hazards and remediation.

Government Publication Date: 1800-Mar 2022

Anderson's Waste Disposal Sites: Private ANDR

The information provided in this database was collected by examining various historical documents which aimed to characterize the likely position of former waste disposal sites from 1860 to present. The research initiative behind the creation of this database was to identify those sites that are missing from the Ontario MOE Waste Disposal Site Inventory, as well as to provide revisions and corrections to the positions and descriptions of sites currently listed in the MOE inventory. In addition to historic waste disposal facilities, the database also identifies certain auto wreckers and scrap yards that have been extrapolated from documentary sources. Please note that the data is not warranted to be complete, exhaustive or authoritative. The information was collected for research purposes only.

Government Publication Date: 1860s-Present

Aboveground Storage Tanks: Provincial AST

Historical listing of aboveground storage tanks made available by the Department of Natural Resources and Forestry. Includes tanks used to hold water or petroleum. This dataset has been retired as of September 25, 2014 and will no longer be updated.

Government Publication Date: May 31, 2014

Automobile Wrecking & Supplies: Private AUWR

This database provides an inventory of known locations that are involved in the scrap metal, automobile wrecking/recycling, and automobile parts & supplies industry. Information is provided on the company name, location and business type.

Government Publication Date: 1999-Feb 28, 2022

Borehole: Provincial BORE

A borehole is the generalized term for any narrow shaft drilled in the ground, either vertically or horizontally. The information here includes geotechnical investigations or environmental site assessments, mineral exploration, or as a pilot hole for installing piers or underground utilities. Information is from many sources such as the Ministry of Transportation (MTO) boreholes from engineering reports and projects from the 1950 to 1990's in Southern Ontario. Boreholes from the Ontario Geological Survey (OGS) including The Urban Geology Analysis Information System (UGAIS) and the York Peel Durham Toronto (YPDT) database of the Conservation Authority Moraine Coalition. This database will include fields such as location, stratigraphy, depth, elevation, year drilled, etc. For all water well data or oil and gas well data for Ontario please refer to WWIS and OOGW.

Government Publication Date: 1875-Jul 2018

Certificates of Approval: Provincial CA

This database contains the following types of approvals: Air & Noise, Industrial Sewage, Municipal & Private Sewage, Waste Management Systems and Renewable Energy Approvals. The MOE in Ontario states that any facility that releases emissions to the atmosphere, discharges contaminants to ground or surface water, provides potable water supplies, or stores, transports or disposes of waste, must have a Certificate of Approval before it can operate lawfully. Fields include approval number, business name, address, approval date, approval type and status. This database will no longer be updated, as CofA's have been replaced by either Environmental Activity and Sector Registry (EASR) or Environmental Compliance Approval (ECA). Please refer to those individual databases for any information after Oct.31, 2011.

Government Publication Date: 1985-Oct 30, 2011*

Dry Cleaning Facilities: Federal CDRY

List of dry cleaning facilities made available by Environment and Climate Change Canada. Environment and Climate Change Canada's Tetrachloroethylene (Use in Dry Cleaning and Reporting Requirements) Regulations (SOR/2003-79) are intended to reduce releases of tetrachloroethylene to the environment from dry cleaning facilities.

Government Publication Date: Jan 2004-Dec 2021

Commercial Fuel Oil Tanks: Provincial CFOT

Locations of commercial underground fuel oil tanks. This is not a comprehensive or complete inventory of commercial fuel tanks in the province; this listing is a copy of records of registered commercial underground fuel oil tanks obtained under Access to Public Information.
Note that the following types of tanks do not require registration: waste oil tanks in apartments, office buildings, residences, etc.; aboveground gas or diesel tanks. Records are not verified for accuracy or completeness.

Government Publication Date: Feb 28, 2022

Chemical Manufacturers and Distributors: Private CHEM

This database includes information from both a one time study conducted in 1992 and private source and is a listing of facilities that manufacture or distribute chemicals. The production of these chemical substances may involve one or more chemical reactions and/or chemical separation processes (i.e. fractionation, solvent extraction, crystallization, etc.).

Government Publication Date: 1999-Jan 31, 2020

Chemical Register: Private CHM

This database includes a listing of locations of facilities within the Province or Territory that either manufacture and/or distributes chemicals.

Government Publication Date: 1999-Feb 28, 2023

Compressed Natural Gas Stations: Private CNG

Canada has a network of public access compressed natural gas (CNG) refuelling stations. These stations dispense natural gas in compressed form at 3,000 pounds per square inch (psi), the pressure which is allowed within the current Canadian codes and standards. The majority of natural gas refuelling is located at existing retail gasoline that have a separate refuelling island for natural gas. This list of stations is made available by the Canadian Natural Gas Vehicle Alliance.

Government Publication Date: Dec 2012 -Aug 2023

Inventory of Coal Gasification Plants and Coal Tar Sites: Provincial COAL

This inventory includes both the "Inventory of Coal Gasification Plant Waste Sites in Ontario-April 1987" and the Inventory of Industrial Sites Producing or Using Coal Tar and Related Tars in Ontario-November 1988) collected by the MOE. It identifies industrial sites that produced and continue to produce or use coal tar and other related tars. Detailed information is available and includes: facility type, size, land use, information on adjoining properties, soil condition, site operators/occupants, site description, potential environmental impacts and historic maps available. This was a one-time inventory.*

Government Publication Date: Apr 1987 and Nov 1988*

Compliance and Convictions: Provincial CONV

This database summarizes the fines and convictions handed down by the Ontario courts beginning in 1989. Companies and individuals named here have been found guilty of environmental offenses in Ontario courts of law.

Government Publication Date: 1989-Jun 2023

Certificates of Property Use: Provincial CPU

This is a subset taken from Ontario's Environmental Registry (EBR) database. It will include CPU's on the registry such as (EPA s. 168.6) - Certificate of Property Use.

Government Publication Date: 1994 - Aug 31, 2023

Drill Hole Database: Provincial DRL

The Ontario Drill Hole Database contains information on more than 113,000 percussion, overburden, sonic and diamond drill holes from assessment files on record with the department of Mines and Minerals. Please note that limited data is available for southern Ontario, as it was the last area to be completed. The database was created when surveys submitted to the Ministry were converted in the Assessment File Research Image Database (AFRI) project. However, the degree of accuracy (coordinates) as to the exact location of drill holes is dependent upon the source document submitted to the MNDM. Levels of accuracy used to locate holes are: centering on the mining claim; a sketch of the mining claim; a 1:50,000 map; a detailed company map; or from submitted a "Report of Work".

Government Publication Date: 1886 - Oct 2022

Delisted Fuel Tanks: Provincial DTNK

List of fuel storage tank sites that were once found in - and have since been removed from - the list of fuel storage tanks made available by the regulatory agency under Access to Public Information.

Government Publication Date: Feb 28, 2022

Environmental Activity and Sector Registry: Provincial EASR

On October 31, 2011, a smarter, faster environmental approvals system came into effect in Ontario. The EASR allows businesses to register certain activities with the ministry, rather than apply for an approval. The registry is available for common systems and processes, to which preset rules of operation can be applied. The EASR is currently available for: heating systems, standby power systems and automotive refinishing. Businesses whose activities aren't subject to the EASR may apply for an ECA (Environmental Compliance Approval), Please see our ECA database.

Government Publication Date: Oct 2011- Aug 31, 2023

Environmental Registry: Provincial EBR

The Environmental Registry lists proposals, decisions and exceptions regarding policies, Acts, instruments, or regulations that could significantly affect the environment. Through the Registry, thirteen provincial ministries notify the public of upcoming proposals and invite their comments. For example, if a local business is requesting a permit, license, or certificate of approval to release substances into the air or water; these are notified on the registry. Data includes: Approval for discharge into the natural environment other than water (i.e. Air) - EPA s. 9, Approval for sewage works - OWRA s. 53(1), and EPA s. 27 - Approval for a waste disposal site. For information regarding Permit to Take Water (PTTW), Certificate of Property Use (CPU) and (ORD) Orders please refer to those individual databases.

Government Publication Date: 1994 - Aug 31, 2023

Environmental Compliance Approval: Provincial ECA

On October 31, 2011, a smarter, faster environmental approvals system came into effect in Ontario. In the past, a business had to apply for multiple approvals (known as certificates of approval) for individual processes and pieces of equipment. Today, a business either registers itself, or applies for a single approval, depending on the types of activities it conducts. Businesses whose activities aren't subject to the EASR may apply for an ECA. A single ECA addresses all of a business's emissions, discharges and wastes. Separate approvals for air, noise and waste are no longer required. This database will also include Renewable Energy Approvals. For certificates of approval prior to Nov 1st, 2011, please refer to the CA database. For all Waste Disposal Sites please refer to the WDS database.

Government Publication Date: Oct 2011- Aug 31, 2023

Environmental Effects Monitoring: Federal EEM

The Environmental Effects Monitoring program assesses the effects of effluent from industrial or other sources on fish, fish habitat and human usage of fisheries resources. Since 1992, pulp and paper mills have been required to conduct EEM studies under the Pulp and Paper Effluent Regulations. This database provides information on the mill name, geographical location and sub-lethal toxicity data.

Government Publication Date: 1992-2007*

ERIS Historical Searches: Private EHS

ERIS has compiled a database of all environmental risk reports completed since March 1999. Available fields for this database include: site location, date of report, type of report, and search radius. As per all other databases, the ERIS database can be referenced on both the map and "Statistical Profile" page.

Government Publication Date: 1999-Jun 30, 2023

Environmental Issues Inventory System: Federal EIIS

The Environmental Issues Inventory System was developed through the implementation of the Environmental Issues and Remediation Plan. This plan was established to determine the location and severity of contaminated sites on inhabited First Nation reserves, and where necessary, to remediate those that posed a risk to health and safety; and to prevent future environmental problems. The EIIS provides information on the reserve under investigation, inventory number, name of site, environmental issue, site action (Remediation, Site Assessment), and date investigation completed.

Government Publication Date: 1992-2001*

Emergency Management Historical Event: Provincial EMHE

List of locations of historical occurrences of emergency events, including those assigned to the Ministry of Natural Resources by Order-In-Council (OIC) under the Emergency Management and Civil Protection Act, as well as events where MNR provided requested emergency response assistance. Many of these events will have involved community evacuations, significant structural loss, and/or involvement of MNR emergency response staff. These events fall into one of ten (10) type categories: Dam Failure; Drought / Low Water; Erosion; Flood; Forest Fire; Soil and Bedrock Instability; Petroleum Resource Center Event, EMO Requested Assistance, Continuity of Operations Event, Other Requested Assistance. EMHE record details are reproduced by ERIS under License with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2017.

Government Publication Date: Apr 30, 2022

Environmental Penalty Annual Report: Provincial EPAR

This database contains data from Ontario's annual environmental penalty report published by the Ministry of the Environment and Climate Change. These reports provide information on environmental penalties for land or water violations issued to companies in one of the nine industrial sectors covered by the Municipal Industrial Strategy for Abatement (MISA) regulations.

Government Publication Date: Jan 1, 2011 - Dec 31, 2022

List of Expired Fuels Safety Facilities: Provincial EXP

List of facilities and tanks for which there was once a fuel registration. This is not a comprehensive or complete inventory of expired tanks/tank facilities in the province; this listing is a copy of previously registered tanks and facilities obtained under Access to Public Information. Includes private fuel outlets, bulk plants, fuel oil tanks, gasoline stations, marinas, propane filling stations, liquid fuel tanks, piping systems, etc; includes tanks which have been removed from the ground.
Notes: registration was not required for private fuel underground/aboveground storage tanks prior to January 1990, nor for furnace oil tanks prior to May 1, 2002; registration is not required for waste oil tanks in apartments, office buildings, residences, etc., or aboveground gas or diesel tanks. Records are not verified for accuracy or completeness.

Government Publication Date: Feb 28, 2022

Federal Convictions: Federal FCON

Environment Canada maintains a database referred to as the "Environmental Registry" that details prosecutions under the Canadian Environmental Protection Act (CEPA) and the Fisheries Act (FA). Information is provided on the company name, location, charge date, offence and penalty.

Government Publication Date: 1988-Jun 2007*

Contaminated Sites on Federal Land: Federal FCS

The Federal Contaminated Sites Inventory includes information on known federal contaminated sites under the custodianship of departments, agencies and consolidated Crown corporations as well as those that are being or have been investigated to determine whether they have contamination arising from past use that could pose a risk to human health or the environment. The inventory also includes non-federal contaminated sites for which the Government of Canada has accepted some or all financial responsibility. It does not include sites where contamination has been caused by, and which are under the control of, enterprise Crown corporations, private individuals, firms or other levels of government. Includes fire training sites and sites at which Per- and Polyfluoroalkyl Substances (PFAS) are a concern.

Government Publication Date: Jun 2000-Jun 2023

Fisheries & Oceans Fuel Tanks: Federal FOFT

Fisheries & Oceans Canada maintains an inventory of aboveground & underground fuel storage tanks located on Fisheries & Oceans property or controlled by DFO. Our inventory provides information on the site name, location, tank owner, tank operator, facility type, storage tank location, tank contents & capacity, and date of tank installation.

Government Publication Date: 1964-Sep 2019

Federal Identification Registry for Storage Tank Systems (FIRSTS): Federal FRST

A list of federally regulated Storage tanks from the Federal Identification Registry for Storage Tank Systems (FIRSTS). FIRSTS is Environment and Climate Change Canada's database of storage tank systems subject to the Storage Tank for Petroleum Products and Allied Petroleum Products Regulations. The main objective of the Regulations is to prevent soil and groundwater contamination from storage tank systems located on federal and aboriginal lands. Storage tank systems that do not have a valid identification number displayed in a readily visible location on or near the storage tank system may be refused product delivery.

Government Publication Date: May 31, 2018

Fuel Storage Tank: Provincial FST

List of registered private and retail fuel storage tanks. This is not a comprehensive or complete inventory of private and retail fuel storage tanks in the province; this listing is a copy of registered private and retail fuel storage tanks, obtained under Access to Public Information.
Notes: registration was not required for private fuel underground/aboveground storage tanks prior to January 1990, nor for furnace oil tanks prior to May 1, 2002; registration is not required for waste oil tanks in apartments, office buildings, residences, etc., or aboveground gas or diesel tanks. Records are not verified for accuracy or completeness.

Government Publication Date: Feb 28, 2022

Fuel Storage Tank - Historic: Provincial FSTH

The Fuels Safety Branch of the Ontario Ministry of Consumer and Commercial Relations maintained a database of all registered private fuel storage tanks. Public records of private fuel storage tanks are only available since the registration became effective in September 1989. This information is now collected by the Technical Standards and Safety Authority.

Government Publication Date: Pre-Jan 2010*

Ontario Regulation 347 Waste Generators Summary: Provincial GEN

Regulation 347 of the Ontario EPA defines a waste generation site as any site, equipment and/or operation involved in the production, collection, handling and/or storage of regulated wastes. A generator of regulated waste is required to register the waste generation site and each waste produced, collected, handled, or stored at the site. This database contains the registration number, company name and address of registered generators including the types of hazardous wastes generated. It includes data on waste generating facilities such as: drycleaners, waste treatment and disposal facilities, machine shops, electric power distribution etc. This information is a summary of all years from 1986 including the most currently available data. Some records may contain, within the company name, the phrase "See & Use..." followed by a series of letters and numbers. This occurs when one company is amalgamated with or taken over by another registered company. The number listed as "See & Use", refers to the new ownership and the other identification number refers to the original ownership. This phrase serves as a link between the 2 companies until operations have been fully transferred.

Government Publication Date: 1986-Oct 31, 2022

Greenhouse Gas Emissions from Large Facilities: Federal GHG

List of greenhouse gas emissions from large facilities made available by Environment Canada. Greenhouse gas emissions in kilotonnes of carbon dioxide equivalents (kt CO2 eq).

Government Publication Date: 2013-Dec 2019

TSSA Historic Incidents: Provincial HINC

List of historic incidences of spills and leaks of diesel, fuel oil, gasoline, natural gas, propane, and hydrogen recorded by the TSSA in their previous incident tracking system. The TSSA's Fuels Safety Program administers the Technical Standards & Safety Act 2000, providing fuel-related safety services associated with the safe transportation, storage, handling and use of fuels such as gasoline, diesel, propane, natural gas and hydrogen. Under this Act, the TSSA regulates fuel suppliers, storage facilities, transport trucks, pipelines, contractors and equipment or appliances that use fuels. Records are not verified for accuracy or completeness. This is not a comprehensive or complete inventory of historical fuel spills and leaks in the province. This listing is a copy of the data captured at one moment in time and is hence limited by the record date provided here.

Government Publication Date: 2006-June 2009*

Indian & Northern Affairs Fuel Tanks: Federal IAFT

The Department of Indian & Northern Affairs Canada (INAC) maintains an inventory of aboveground & underground fuel storage tanks located on both federal and crown land. Our inventory provides information on the reserve name, location, facility type, site/facility name, tank type, material & ID number, tank contents & capacity, and date of tank installation.

Government Publication Date: 1950-Aug 2003*

Fuel Oil Spills and Leaks: Provincial INC

Listing of spills and leaks of diesel, fuel oil, gasoline, natural gas, propane, and hydrogen reported to the Spills Action Centre (SAC). This is not a comprehensive or complete inventory of fuel-related leaks, spills, and incidents in the province; this listing in a copy of incidents reported to the SAC, obtained under Access to Public Information. Includes incidents from fuel-related hazards such as spills, fires, and explosions. Records are not verified for accuracy or completeness.

Government Publication Date: Feb 28, 2022

Landfill Inventory Management Ontario: Provincial LIMO

The Landfill Inventory Management Ontario (LIMO) database is updated every year, as the Ministry of the Environment, Conservation and Parks compiles new and updated information. Includes small and large landfills currently operating as well as those which are closed and historic. Operators of larger landfills provide landfill information for the previous operating year to the ministry for LIMO including: estimated amount of total waste received, landfill capacity, estimated total remaining landfill capacity, fill rates, engineering designs, reporting and monitoring details, size of location, service area, approved waste types, leachate of site treatment, contaminant attenuation zone and more. The small landfills include information such as site owner, site location and certificate of approval # and status.

Government Publication Date: Mar 21, 2022

Canadian Mine Locations: Private MINE

This information is collected from the Canadian & American Mines Handbook. The Mines database is a national database that provides over 290 listings on mines (listed as public companies) dealing primarily with precious metals and hard rocks. Listed are mines that are currently in operation, closed, suspended, or are still being developed (advanced projects). Their locations are provided as geographic coordinates (x, y and/or longitude, latitude). As of 2002, data pertaining to Canadian smelters and refineries has been appended to this database.

Government Publication Date: 1998-2009*

Mineral Occurrences: Provincial MNR

In the early 70's, the Ministry of Northern Development and Mines created an inventory of approximately 19,000 mineral occurrences in Ontario, in regard to metallic and industrial minerals, as well as some information on building stones and aggregate deposits. Please note that the "Horizontal Positional Accuracy" is approximately +/- 200 m. Many reference elements for each record were derived from field sketches using pace or chain/tape measurements against claim posts or topographic features in the area. The primary limiting factor for the level of positional accuracy is the scale of the source material. The testing of horizontal accuracy of the source materials was accomplished by comparing the plan metric (X and Y) coordinates of that point with the coordinates of the same point as defined from a source of higher accuracy.

Government Publication Date: 1846-Feb 2023

National Analysis of Trends in Emergencies System (NATES): Federal NATE

In 1974 Environment Canada established the National Analysis of Trends in Emergencies System (NATES) database, for the voluntary reporting of significant spill incidents. The data was to be used to assist in directing the work of the emergencies program. NATES ran from 1974 to 1994. Extensive information is available within this database including company names, place where the spill occurred, date of spill, cause, reason and source of spill, damage incurred, and amount, concentration, and volume of materials released.

Government Publication Date: 1974-1994*

Non-Compliance Reports: Provincial NCPL

The Ministry of the Environment provides information about non-compliant discharges of contaminants to air and water that exceed legal allowable limits, from regulated industrial and municipal facilities. A reported non-compliance failure may be in regard to a Control Order, Certificate of Approval, Sectoral Regulation or specific regulation/act.

Government Publication Date: Dec 31, 2021

National Defense & Canadian Forces Fuel Tanks: Federal NDFT

The Department of National Defense and the Canadian Forces maintains an inventory of all aboveground & underground fuel storage tanks located on DND lands. Our inventory provides information on the base name, location, tank type & capacity, tank contents, tank class, date of tank installation, date tank last used, and status of tank as of May 2001. This database will no longer be updated due to the new National Security protocols which have prohibited any release of this database.

Government Publication Date: Up to May 2001*

National Defense & Canadian Forces Spills: Federal NDSP

The Department of National Defense and the Canadian Forces maintains an inventory of spills to land and water. All spill sites have been classified under the "Transportation of Dangerous Goods Act - 1992". Our inventory provides information on the facility name, location, spill ID #, spill date, type of spill, as well as the quantity of substance spilled & recovered.

Government Publication Date: Mar 1999-Oct 2022

National Defence & Canadian Forces Waste Disposal Sites: Federal NDWD

The Department of National Defence and the Canadian Forces maintains an inventory of waste disposal sites located on DND lands. Where available, our inventory provides information on the base name, location, type of waste received, area of site, depth of site, year site opened/closed and status.

Government Publication Date: 2001-Apr 2007*

National Energy Board Pipeline Incidents: Federal NEBI

Locations of pipeline incidents from 2008 to present, made available by the Canada Energy Regulator (CER) - previously the National Energy Board (NEB). Includes incidents reported under the Onshore Pipeline Regulations and the Processing Plant Regulations related to pipelines under federal jurisdiction, does not include incident data related to pipelines under provincial or territorial jurisdiction.

Government Publication Date: 2008-Jun 30, 2021

National Energy Board Wells: Federal NEBP

The NEBW database contains information on onshore & offshore oil and gas wells that are outside provincial jurisdiction(s) and are thereby regulated by the National Energy Board. Data is provided regarding the operator, well name, well ID No./UWI, status, classification, well depth, spud and release date.

Government Publication Date: 1920-Feb 2003*

National Environmental Emergencies System (NEES): Federal NEES

In 2000, the Emergencies program implemented NEES, a reporting system for spills of hazardous substances. For the most part, this system only captured data from the Atlantic Provinces, some from Quebec and Ontario and a portion from British Columbia. Data for Alberta, Saskatchewan, Manitoba and the Territories was not captured. However, NEES is also a repository for previous Environment Canada spill datasets. NEES is composed of the historic datasets ' or Trends ' which dates from approximately 1974 to present. NEES Trends is a compilation of historic databases, which were merged and includes data from NATES (National Analysis of Trends in Emergencies System), ARTS (Atlantic Regional Trends System), and NEES. In 2001, the Emergencies Program determined that variations in reporting regimes and requirements between federal and provincial agencies made national spill reporting and trend analysis difficult to achieve. As a consequence, the department has focused efforts on capturing data on spills of substances which fall under its legislative authority only (CEPA and FA). As such, the NEES database will be decommissioned in December 2004.

Government Publication Date: 1974-2003*

National PCB Inventory: Federal NPCB

Environment Canada's National PCB inventory includes information on in-use PCB containing equipment in Canada including federal, provincial and private facilities. Federal out-of-service PCB containing equipment and PCB waste owned by the federal government or by federally regulated industries such as airlines, railway companies, broadcasting companies, telephone and telecommunications companies, pipeline companies, etc. are also listed. Although it is not Environment Canada's mandate to collect data on non-federal PCB waste, the National PCB inventory includes some information on provincial and private PCB waste and storage sites. Some addresses provided may be Head Office addresses and are not necessarily the location of where the waste is being used or stored.

Government Publication Date: 1988-2008*

National Pollutant Release Inventory 1993-2020: Federal NPR2

The National Pollutant Release Inventory (NPRI) is Canada's public inventory of pollutant releases (to air, water and land), disposals, and transfers for recycling. The inventory, managed by Environment and Climate Change Canada, tracks over 300 substances. Under the authority of the Canadian Environmental Protection Act (CEPA), owners or operators of facilities that meet published reporting requirements are required to report to the NPRI.

Government Publication Date: Sep 2020

National Pollutant Release Inventory - Historic: Federal NPRI

Environment Canada has defined the National Pollutant Release Inventory ("NPRI") as a federal government initiative designed to collect comprehensive national data regarding releases to air, water, or land, and waste transfers for recycling for more than 300 listed substances. This data holds historic records; current records are found in NPR2.

Government Publication Date: 1993-May 2017

Oil and Gas Wells: Private OGWE

The Nickle's Energy Group (publisher of the Daily Oil Bulletin) collects information on drilling activity including operator and well statistics. The well information database includes name, location, class, status and depth. The main Nickle's database is updated on a daily basis, however, this database is updated on a monthly basis. More information is available at www.nickles.com.

Government Publication Date: 1988-Aug 31, 2023

Ontario Oil and Gas Wells: Provincial OOGW

In 1998, the MNR handed over to the Ontario Oil, Gas and Salt Resources Corporation, the responsibility of maintaining a database of oil and gas wells drilled in Ontario. The OGSR Library has over 20,000+ wells in their database. Information available for all wells in the ERIS database include well owner/operator, location, permit issue date, and well cap date, license No., status, depth and the primary target (rock unit) of the well being drilled. All geology/stratigraphy table information, plus all water table information is also provide for each well record.

Government Publication Date: 1800-Aug 2023

Inventory of PCB Storage Sites: Provincial OPCB

The Ontario Ministry of Environment, Waste Management Branch, maintains an inventory of PCB storage sites within the province. Ontario Regulation 11/82 (Waste Management - PCB) and Regulation 347 (Generator Waste Management) under the Ontario EPA requires the registration of inactive PCB storage equipment and/or disposal sites of PCB waste with the Ontario Ministry of Environment. This database contains information on: 1) waste quantities; 2) major and minor sites storing liquid or solid waste; and 3) a waste storage inventory.

Government Publication Date: 1987-Oct 2004; 2012-Dec 2013

Orders: Provincial ORD

This is a subset taken from Ontario's Environmental Registry (EBR) database. It will include Orders on the registry such as (EPA s. 17) - Order for remedial work, (EPA s. 18) - Order for preventative measures, (EPA s. 43) - Order for removal of waste and restoration of site, (EPA s. 44) - Order for conformity with Act for waste disposal sites, (EPA s. 136) - Order for performance of environmental measures.

Government Publication Date: 1994 - Aug 31, 2023

Canadian Pulp and Paper: Private PAP

This information is part of the Pulp and Paper Canada Directory. The Directory provides a comprehensive listing of the locations of pulp and paper mills and the products that they produce.

Government Publication Date: 1999, 2002, 2004, 2005, 2009-2014

Parks Canada Fuel Storage Tanks: Federal PCFT

Canadian Heritage maintains an inventory of known fuel storage tanks operated by Parks Canada, in both National Parks and at National Historic Sites. The database details information on site name, location, tank install/removal date, capacity, fuel type, facility type, tank design and owner/operator.

Government Publication Date: 1920-Jan 2005*

Pesticide Register: Provincial PES

The Ontario Ministry of the Environment and Climate Change maintains a database of licensed operators and vendors of registered pesticides.

Government Publication Date: Oct 2011- Aug 31, 2023

NPRI Reporters - PFAS Substances: Federal PFCH

The National Pollutant Release Inventory (NPRI) is Canada's public inventory of releases, disposals, and transfers, tracking over 320 pollutants. Per - and polyfluoroalkyl substances (PFAS) are a group of over 4,700 human-made substances for which adverse environmental and health effects have been observed. This listing of PFAS substance reporters includes those NPRI facilities that reported substances that are found in either: a) the Comprehensive Global Database of PFASs compiled by the Organisation for Economic Co-operation and Development (OECD), b) the US Environmental Protection Agency (US EPA) Master List of PFAS Substances, c) the US EPA list of PFAS chemicals without explicit structures, or d) the US EPA list of PFAS structures (encompassing the largest set of structures having sufficient levels of fluorination to potentially impart PFAS-type properties).

Government Publication Date: Sep 2020

Potential PFAS Handers from NPRI: Federal PFHA

The National Pollutant Release Inventory (NPRI) is Canada's public inventory of releases, disposals, and transfers, tracking over 320 pollutants. Per - and polyfluoroalkyl substances (PFAS) are a group of over 4,700 human-made substances for which adverse environmental and health effects have been observed. This list of potential PFAS handlers includes those NPRI facilities that reported business activity (NAICS code) included in the US Environmental Protection Agency (US EPA) list of Potential PFAS-Handling Industry Sectors, further described as operating in industry sectors where literature reviews indicate that PFAS may be handled and/or released. Inclusion of a facility in this listing does not indicate that PFAS are being manufactured, processed, used, or released by the facility - these are facilities that potentially handle PFAS based on their industrial profile.

Government Publication Date: Sep 2020

Pipeline Incidents: Provincial PINC

List of pipeline incidents (strikes, leaks, spills). This is not a comprehensive or complete inventory of pipeline incidents in the province; this listing in an historical copy of records previously obtained under Access to Public Information. Records are not verified for accuracy or completeness.

Government Publication Date: Feb 28, 2021

Private and Retail Fuel Storage Tanks: Provincial PRT

The Fuels Safety Branch of the Ontario Ministry of Consumer and Commercial Relations maintained a database of all registered private fuel storage tanks and licensed retail fuel outlets. This database includes an inventory of locations that have gasoline, oil, waste oil, natural gas and/or propane storage tanks on their property. The MCCR no longer collects this information. This information is now collected by the Technical Standards and Safety Authority (TSSA).

Government Publication Date: 1989-1996*

Permit to Take Water: Provincial PTTW

This is a subset taken from Ontario's Environmental Registry (EBR) database. It will include PTTW's on the registry such as OWRA s. 34 - Permit to take water.

Government Publication Date: 1994 - Aug 31, 2023

Ontario Regulation 347 Waste Receivers Summary: Provincial REC

Part V of the Ontario Environmental Protection Act ("EPA") regulates the disposal of regulated waste through an operating waste management system or a waste disposal site operated or used pursuant to the terms and conditions of a Certificate of Approval or a Provisional Certificate of Approval. Regulation 347 of the Ontario EPA defines a waste receiving site as any site or facility to which waste is transferred by a waste carrier. A receiver of regulated waste is required to register the waste receiving facility. This database represents registered receivers of regulated wastes, identified by registration number, company name and address, and includes receivers of waste such as: landfills, incinerators, transfer stations, PCB storage sites, sludge farms and water pollution control plants. This information is a summary of all years from 1986 including the most currently available data.

Government Publication Date: 1986-1990, 1992-2021

Record of Site Condition: Provincial RSC

The Record of Site Condition (RSC) is part of the Ministry of the Environment's Brownfields Environmental Site Registry. Protection from environmental cleanup orders for property owners is contingent upon documentation known as a record of site condition (RSC) being filed in the Environmental Site Registry. In order to file an RSC, the property must have been properly assessed and shown to meet the soil, sediment and groundwater standards appropriate for the use (such as residential) proposed to take place on the property. The Record of Site Condition Regulation (O. Reg. 153/04) details requirements related to site assessment and clean up.
RSCs filed after July 1, 2011 will also be included as part of the new (O.Reg. 511/09).

Government Publication Date: 1997-Sept 2001, Oct 2004-Aug 2023

Retail Fuel Storage Tanks: Private RST

This database includes an inventory of retail fuel outlet locations (including marinas) that have on their property gasoline, oil, waste oil, natural gas and / or propane storage tanks.

Government Publication Date: 1999-Feb 28, 2023

Scott's Manufacturing Directory: Private SCT

Scott's Directories is a data bank containing information on over 200,000 manufacturers across Canada. Even though Scott's listings are voluntary, it is the most comprehensive database of Canadian manufacturers available. Information concerning a company's address, plant size, and main products are included in this database.

Government Publication Date: 1992-Mar 2011*

Ontario Spills: Provincial SPL

List of spills and incidents made available by the Ministry of the Environment, Conservation and Parks. This database identifies information such as location (approximate), type and quantity of contaminant, date of spill, environmental impact, cause, nature of impact, etc. Information from 1988-2002 was part of the ORIS (Occurrence Reporting Information System). The SAC (Spills Action Centre) handles all spills reported in Ontario. Regulations for spills in Ontario are part of the MOE's Environmental Protection Act, Part X. The Ministry of the Environment, Conservation and Parks cites the coronavirus pandemic as an explanation for delays in releasing data pursuant to requests. This database includes spill incidents that occurred in March, May, July, and August 2022, and January 2023 in addition to those listed in the Government Publication Date.

Government Publication Date: 1988-Oct 2021; see description

Wastewater Discharger Registration Database: Provincial SRDS

Facilities that report either municipal treated wastewater effluent or industrial wastewater discharges under the Effluent Monitoring and Effluent Limits (EMEL) and Municipal/Industrial Strategy for Abatement Regulations. The Municipal/Industrial Strategy for Abatement (MISA) division of the Ontario Ministry of Environment keeps record of direct dischargers of toxic pollutants within nine sectors including: Electric Power Generation, Mining, Petroleum Refining, Organic Chemicals, Inorganic Chemicals, Pulp & Paper, Metal Casting, Iron & Steel, and Quarries.

Government Publication Date: 1990-Dec 31, 2020

Anderson's Storage Tanks: Private TANK

The information provided in this database was collected by examining various historical documents, which identified the location of former storage tanks, containing substances such as fuel, water, gas, oil, and other various types of miscellaneous products. Information is available in regard to business operating at tank site, tank location, permit year, permit & installation type, no. of tanks installed & configuration and tank capacity. Data contained within this database pertains only to the city of Toronto and is not warranted to be complete, exhaustive or authoritative. The information was collected for research purposes only.

Government Publication Date: 1915-1953*

Transport Canada Fuel Storage Tanks: Federal TCFT

List of fuel storage tanks currently or previously owned or operated by Transport Canada. This inventory also includes tanks on The Pickering Lands, which refers to 7,530 hectares (18,600 acres) of land in Pickering, Markham, and Uxbridge owned by the Government of Canada since 1972; properties on this land has been leased by the government since 1975, and falls under the Site Management Policy of Transport Canada, but is administered by Public Works and Government Services Canada. This inventory provides information on the site name, location, tank age, capacity and fuel type.

Government Publication Date: 1970 - Apr 2023

Variances for Abandonment of Underground Storage Tanks: Provincial VAR

Listing of variances granted for storage tank abandonment. This is not a comprehensive or complete inventory of tank abandonment variances in the province; this listing is a copy of tank abandonment variance records previously obtained under Access to Public Information. In Ontario, registered underground storage tanks must be removed within two years of disuse; if removal of a tank is not feasible, an application may be sought for a variance from this code requirement.
Records are not verified for accuracy or completeness.

Government Publication Date: Feb 28, 2022

Waste Disposal Sites - MOE CA Inventory: Provincial WDS

The Ontario Ministry of Environment, Waste Management Branch, maintains an inventory of known open (active or inactive) and closed disposal sites in the Province of Ontario. Active sites maintain a Certificate of Approval, are approved to receive and are receiving waste. Inactive sites maintain Certificate(s) of Approval but are not receiving waste. Closed sites are not receiving waste. The data contained within this database was compiled from the MOE's Certificate of Approval database. Locations of these sites may be cross-referenced to the Anderson database described under ERIS's Private Source Database section, by the CA number. All new Environmental Compliance Approvals handed out after Oct 31, 2011 for Waste Disposal Sites will still be found in this database.

Government Publication Date: Oct 2011- Aug 31, 2023

Waste Disposal Sites - MOE 1991 Historical Approval Inventory: Provincial WDSH

In June 1991, the Ontario Ministry of Environment, Waste Management Branch, published the "June 1991 Waste Disposal Site Inventory", of all known active and closed waste disposal sites as of October 30st, 1990. For each "active" site as of October 31st 1990, information is provided on site location, site/CA number, waste type, site status and site classification. For each "closed" site as of October 31st 1990, information is provided on site location, site/CA number, closure date and site classification. Locations of these sites may be cross-referenced to the Anderson database described under ERIS's Private Source Database section, by the CA number.

Government Publication Date: Up to Oct 1990*

Water Well Information System: Provincial WWIS

This database describes locations and characteristics of water wells found within Ontario in accordance with Regulation 903. It includes such information as coordinates, construction date, well depth, primary and secondary use, pump rate, static water level, well status, etc. Also included are detailed stratigraphy information, approximate depth to bedrock and the approximate depth to the water table.

Government Publication Date: Mar 31 2023

Definitions

Database Descriptions: This section provides a detailed explanation for each database including: source, information available, time coverage, and acronyms used. They are listed in alphabetic order.

Detail Report: This is the section of the report which provides the most detail for each individual record. Records are summarized by location, starting with the project property followed by records in closest proximity.

Distance: The distance value is the distance between plotted points, not necessarily the distance between the sites' boundaries. All values are an approximation.

Direction: The direction value is the compass direction of the site in respect to the project property and/or center point of the report.

Elevation: The elevation value is taken from the location at which the records for the site address have been plotted. All values are an approximation. Source: Google Elevation API.

Executive Summary: This portion of the report is divided into 3 sections:

'Report Summary'- Displays a chart indicating how many records fall on the project property and, within the report search radii.

'Site Report Summary'-Project Property'- This section lists all the records which fall on the project property. For more details, see the 'Detail Report' section.

'Site Report Summary-Surrounding Properties'- This section summarizes all records on adjacent properties, listing them in order of proximity from the project property. For more details, see the 'Detail Report' section.

Map Key: The map key number is assigned according to closest proximity from the project property. Map Key numbers always start at #1. The project property will always have a map key of '1' if records are available. If there is a number in brackets beside the main number, this will indicate the number of records on that specific property. If there is no number in brackets, there is only one record for that property.

The symbol and colour used indicates 'elevation': the red inverted triangle will dictate 'ERIS Sites with Lower Elevation', the yellow triangle will dictate 'ERIS Sites with Higher Elevation' and the orange square will dictate 'ERIS Sites with Same Elevation.'

Unplottables: These are records that could not be mapped due to various reasons, including limited geographic information. These records may or may not be in your study area, and are included as reference.

HISTORICAL AERIALS

Project Property: 300 Pine Street
300 Pine Street
Bracebridge ON P1L 1Z5

Project No: 140022038

Requested By: Stantec Consulting Ltd.

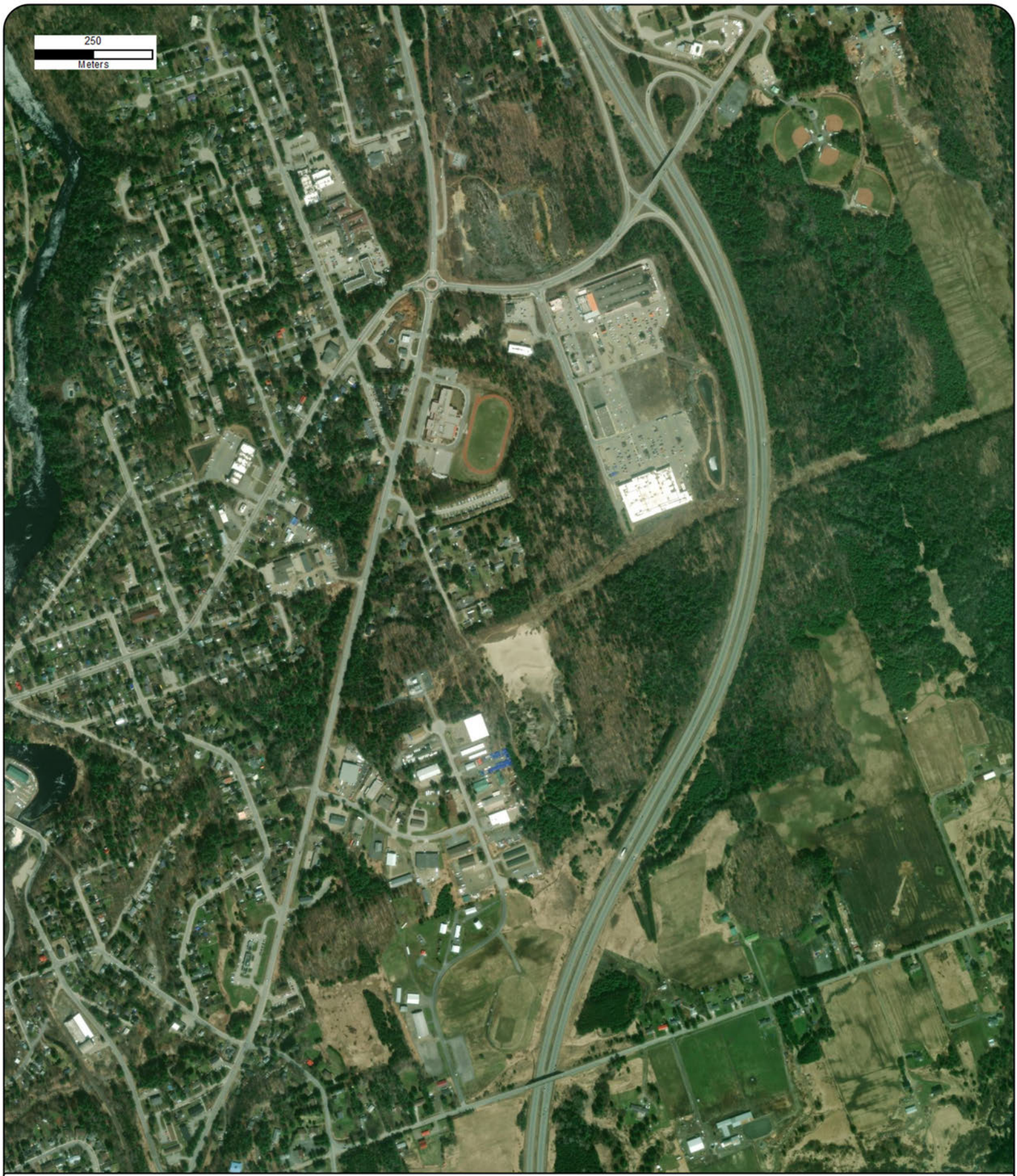
Order No: 23092700374

Date Completed: September 29,2023

Aerial Maps included in this report are produced by the sources listed above and are to be used for research purposes including a phase I report. Maps are not to be resold as commercial property. ERIS provides no warranty of accuracy or liability. The information contained in this report has been produced using aerial photos listed in above sources by ERIS Information Inc. (in the US) and ERIS Information Limited Partnership (in Canada), both doing business as 'ERIS'. The maps contained in this report do not purport to be and do not constitute a guarantee of the accuracy of the information contained herein. Although ERIS has endeavored to present information that is accurate, ERIS disclaims, any and all liability for any errors, omissions, or inaccuracies in such information and data, whether attributable to inadvertence, negligence or otherwise, and for any consequences arising therefrom. Liability on the part of ERIS is limited to the monetary value paid for this report.

Environmental Risk Information Services
A division of Glacier Media Inc.
1.866.517.5204 | info@erisinfo.com | erisinfo.com

Date	Source	Scale	Comments
2022	MAXAR TECHNOLOGIES	10,000	
1993	National Air Photo Library	10,000	
1951	National Air Photo Library	10,000	



Year: 2022
Source: MAXAR
Scale: 10,000
Comment:

Address: 300 Pine Street, Bracebridge, ON
Approx Center: -79.2936835,45.0433905

Order No: 23092700374

ERIS



Year: 1993
Source: NAPL
Scale: 10,000
Comment:

Address: 300 Pine Street, Bracebridge, ON
Approx Center: -79.2936835,45.0433905

Order No: 23092700374

ERIS

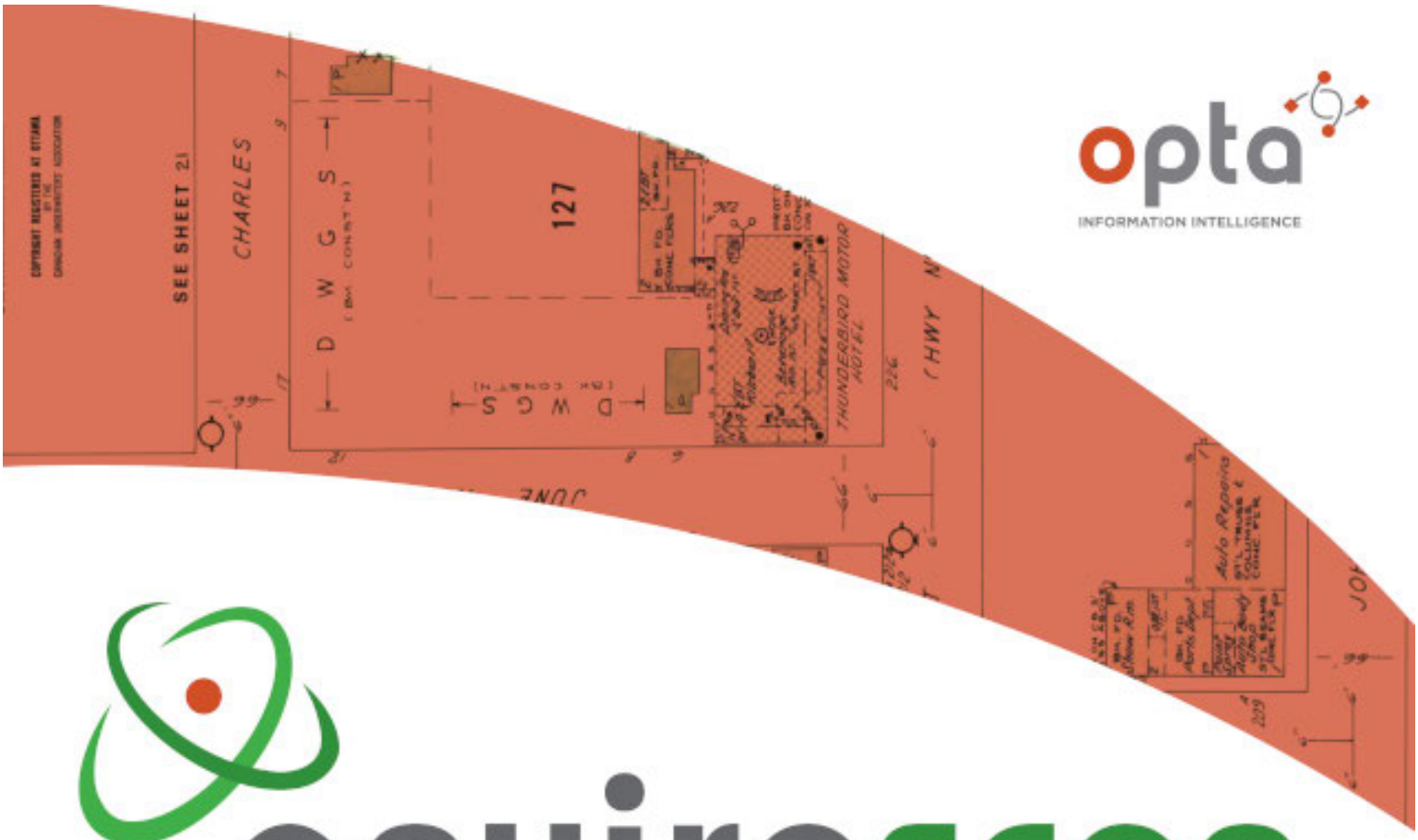


Year: 1951
Source: NAPL
Scale: 10,000
Comment:

Address: 300 Pine Street, Bracebridge, ON
Approx Center: -79.2936835,45.0433905

Order No: 23092700374

ERIS



opta
INFORMATION INTELLIGENCE

enviroscan







175 Commerce Valley Drive W
Markham, Ontario L3T 7Z3

T: 1 877 244 9437
W: optaintel.ca

Nate

Site Address:
300 and 500 Pine Street, Bracebridge, Ontario

Project No:
23092700374

Opta Order ID:
135136

Requested by:
Eleanor Goolab
ERIS

Date Completed:
10/3/2023 8:06:38 AM

Project Name: 300 Pine Street

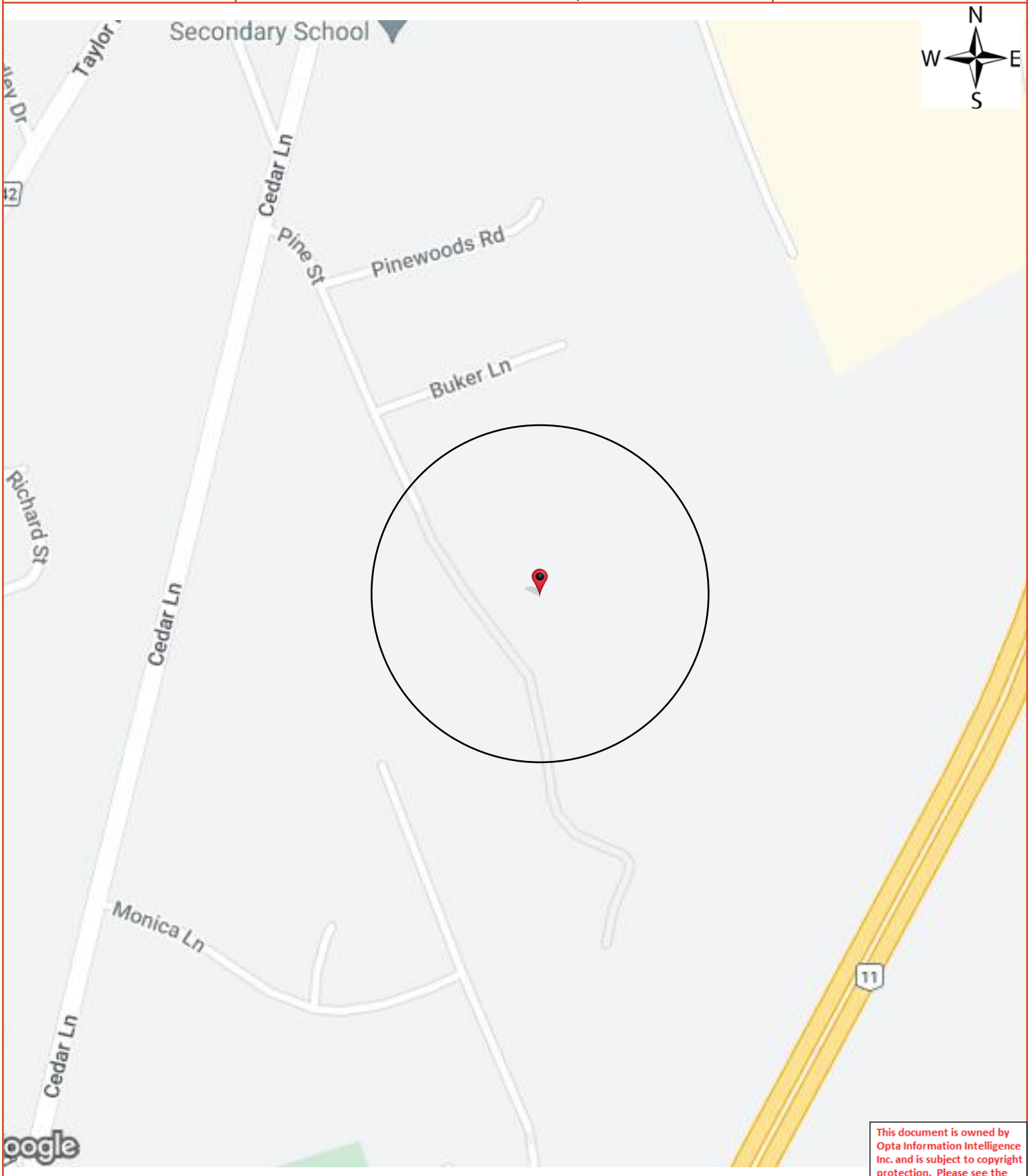
Project #: 23092700374
P.O. #: 140022038

ENVIROSCAN Report

Search Area: 300 and 500 Pine Street, Bracebridge, Ontario

Requested by:
Eleanor Goolab
Date Completed: 10/03/2023 08:06:38

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Report

The documents (hereinafter referred to as the "Documents") to be released as part of the report (hereinafter referred to as the "Report") to be delivered to the purchaser as set out above are documents in Opta's records relating to the described property (hereinafter referred to as the "Property"). Opta makes no representations or warranties respecting the Documents whatsoever, including, without limitation, with respect to the completeness, accuracy or usefulness of the Documents, and does not represent or warrant that these are the only plans and reports prepared in association with the Property or in Opta's possession at the time of Report delivery to the purchaser. The Documents are current as of the date(s) indicated on them. Interpretation of the Documents, if any, is by inference based upon the information which is apparent and obvious on the face of the Documents only. Opta does not represent, warrant or guarantee that interpretations other than those referred to do not exist from other sources. The Report will be prepared for use by the purchaser of the services as shown above hereof only.

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Entire Agreement

The parties hereto acknowledge and agree to be bound by the terms and conditions hereof. The request form constitutes the entire agreement between the parties pertaining to the subject matter hereof and supersedes all prior and contemporaneous agreements, negotiations and discussions, whether oral or written, and there are no representations or warranties, or other agreements between the parties in connection with the subject matter hereof except as specifically set forth herein. No supplement, modification, waiver, or termination of the request shall be binding, unless confirmed in writing by the parties hereto.

Governing Document

In the event of any conflicts or inconsistencies between the provisions hereof and the Reports, the rights and obligations of the parties shall be deemed to be governed by the request form, which shall be the paramount document.

Law

This agreement shall be governed by and construed in accordance with the laws of the Province of Ontario and the laws of Canada applicable therein.

ENVIROSCAN Report

No Records Found

Requested by:
Eleanor Goolab
Date Completed: 10/03/2023 08:06:38

OPTA INFORMATION INTELLIGENCE

No Records Found

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CITY DIRECTORY

Project Property:	*MHAC* *300 Pine Street* *Bracebridge,ON P1L 1Z5*
Project No:	*140022038*
Requested By:	*Stantec Consulting Ltd.*
Order No:	*23100200574*
Date Completed:	*October 04, 2023*

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Environmental Risk Information Services
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Search Results Summary

[redacted]

[redacted]





NO LISTING FOUND

Ministry of the Environment, Conservation and Parks

Emergency Management and Access Branch

40 St. Clair Avenue West
Toronto ON M4V 1M2

Ministère de l'Environnement, de la Protection de la nature et des Parcs

Direction de la gestion des situations d'urgence et de l'accès à l'information

40, avenue St. Clair ouest
Toronto ON M4V 1M2

Ontario

October 31, 2023

Marissa Lusito
Stantec Consulting Ltd.
675 Cochrane Avenue, Suite 300W
Markham, Ontario L3R 0B8
marissa.lusito@stantec.com

Dear Marissa Lusito:

RE: **MECP FOI A-2023-06066, Your Reference – Decision Letter**

This letter is in response to your request made pursuant to the Freedom of Information and Protection of Privacy Act (the Act) relating to 300 Pine Street, Bracebridge.

After a thorough search through the ministry files, no records were located responsive to your request. The official responsible for making the access decision on your request is the undersigned.

You may request a review of my decision within 30 days from the date of this letter by contacting the Information and Privacy Commissioner/Ontario at http://www.ipc.on.ca. Please note there may be a fee associated with submitting the appeal.

If you have any questions, please contact Tolani Abraham at Tolani.Abraham2@ontario.ca.

Yours truly,

Tolani Abraham

for
Josephine DeSouza
Manager (A), Access and Privacy Office

345 Carlingview Drive
Toronto, Ontario M9W 6N9
Tel.: 416.734.3300
Fax: 416.231.1626
Toll Free: 1.877.682.8772

www.tssa.org

15 November 2023

Marissa Lusito
Stantec Consulting Ltd.
150 – 1555 Wentworth Street
Whitby, ON L1N 9T6

Subject: **300 Pine Street, Bracebridge, Ontario**
Your File No.: **140022038.800.200**
WO No.: **14150163**

Dear Madam/Sir:

We are in receipt of your correspondence wherein you requested the release of information regarding the above noted address.

A search of TSSA public records **did not** locate any records relating to the following Program(s):

Program	No Record
Fuels Safety	☒
Boiler/Pressure Vessel	☐
Elevating & Amusement Devices	☐

**For BPV, if it has been indicated that records have been located but are not attached, it is likely that TSSA may not be the keeper of the records you are looking for, see note below.

TSSA does not make any representations or warranties with respect to the accuracy or completeness of any records released. The requestor assumes all risk in using or relying on the information provided.

Should you have any questions, please contact Public Information at publicinformationservices@tssa.org.

Yours truly,

C. Hill

Connie Hill
Public Information Services Agent

Limitations and Notices:

General:

TSSA, as a safety regulator, uses inspection resources to address the greatest harm posed to the public. Thus, inspection only follows-up on safety orders it issues based on the degree of risk posed by the non-compliance identified in the order(s). All high-risk orders will result in a follow-up inspection by TSSA until the non-compliance is resolved. TSSA no longer follows-up on low or medium risk orders referred to as safety tasks, therefore, TSSA can no longer provide you with a report indicating the safety tasks (low and medium-risk orders) have been resolved. This information should be obtained from the device/facility owner or their contractor. One can also engage a third-party contractor to confirm device/facility compliance.

The Public Information Department, (PID), can only provide ***existing*** records for a specific location, facility, or device. If an inspection or any other type of record does not exist, PID cannot instruct TSSA to do work, such as an inspection, to create a record. TSSA, as an outcome-based regulator, deploys all of its resources, including, inspections to address the greatest harm posed to the public; and as such, cannot deploy resources to create records to satisfy an inquiry.

Please Note: *While the PID provides existing records for a specific location, facility, or device; it does not interpret or provide further explanations of the content contained in the document.*

TSSA Fuels Safety:

If you have environmental concerns regarding this property, you should consider hiring an environmental consultant to conduct an environmental assessment of the property in question.

- Sites that have not been licensed since 1987 may not be in TSSA records.

- Be advised, TSSA Fuels Safety Division did not register:
  - private fuel underground/ aboveground storage tanks prior to January of 1990; and
  - furnace oil tanks prior to May 1, 2002.

- Fuels Safety Division does not register
  - private waste oil tanks in apartments, office buildings, residences etc.; and
  - aboveground gas or diesel tanks.

- The *Technical Standards and Safety Act* and associated regulations do not require the registration of private fuel outlets, nor does it require that any documentation on these facilities be submitted to or reviewed or approved by TSSA. As a result, TSSA has limited information on these facilities. TSSA cautions that any information provided may be inaccurate, incomplete or out of date.

TSSA Elevating & Amusement Devices Program Notice:

- All orders and/or directions issued by the TSSA Inspector have a compliance date and the owner or designated contractor are required to comply within the specified time limit. Compliance is the responsibility of the owner or operator of the device.

- All written declarations of compliance (where eligible) should be sent to TSSA. Once a declaration of compliance has been received, the outstanding order will be resolved.

- Each report shows the details and date of the inspection conducted by TSSA at the requested location.

- The Ontario Amusement Devices Regulation (O. Reg. 221/01) was adopted in 2001. Since that time, TSSA retains copies of technical dossiers of new amusement devices in Ontario (as per TSSA's retention policy). However, for rides that existed prior to the adoption of the Regulation, which were subject to a "grandfathering-in" clause, technical dossiers were not required to be filed with the TSSA.

However, if the amusement ride remains in operation, as per ASTM requirements, the owner/licensee must possess an operations document for the device in question.

Federal Elevators

- Please be advised that without the express written consent of the owner, the TSSA does not release any information with respect to federal elevators or federal elevating equipment. The TSSA is a provincial regulator for the province of Ontario and federal elevators do not fall within the scope of TSSA's provincial mandate and the *Technical Standards and Safety Act* and associated Regulations. Further, the TSSA's Access and Privacy Code only applies to information collected, used, or disclosed by the TSSA in the course of TSSA's administration of the *Act*. Therefore, information with respect to federal elevators or federal elevator equipment is outside of the administration of the *Act,* and outside of the scope of the TSSA's Access and Privacy Codes.

Indigenous Lands

- Please be advised that the TSSA does not release any information with respect to indigenous lands, which are outside of the TSSA's mandate, without the express written permission from the Band. The *Technical Standards and Safety Act*, associated regulations, and TSSA's Access and Privacy Code does not apply to indigenous lands.

TSSA Boilers and Pressure Vessels (BPVs) Program Notice:

- Be advised, TSSA does not typically periodically inspect BPVs. These inspections are usually performed by insurance companies.

- **Inspection reports may not be submitted to TSSA by insurance companies; therefore, while TSSA may have some evidence of a BPV at a location on file, there may be no inspection records pertaining to BPVs located at the address provided.

- As of July 1, 2018, BPVs in Ontario may not be operated unless the Director has issued a current certificate of inspection (COI) to the owner or operator. A COI will be issued to the owner or operator of the BPV by TSSA after TSSA has received a Record of Inspection (ROI) from the insurer/third-party inspector, the associated fees have been paid and the BPV has passed a periodic inspection.

- Please note that if the BPV in question is insured, the insurance company may have additional inspection records. Please contact the insurer directly should you wish to obtain further information.

Stantec

Memo

To:	Tim Miller, Director of Facilities and Operations Project Management Muskoka Algonquin Healthcare	From:	Eric Veska, PhD., P.Geo., C.Chem., QPESA Stantec Consulting Ltd.
File:	140022038.800.200	Date:	December 18, 2023

Reference: Environmental Sampling, 300 Pine Street, Bracebridge, Ontario

Muskoka Algonquin Healthcare retained Stantec Consulting Ltd. (Stantec) to complete a Phase I Environmental Site Assessment (ESA) and subsequent environmental sampling and analysis to support the proposed development of the property at the above-mentioned address (the "Site"). The Site is proposed to be developed as a hospital.

The purpose of the environmental sampling and analysis program was to assess baseline soil and groundwater conditions at the Site prior to development. Stantec completed a Phase I ESA at the Site in November 2023 to identify areas of potential environmental contamination based on the current and historical activities at the Site and surrounding properties. Based on Stantec's findings from the Phase I ESA, no potential environmental concerns were identified at the Site.

As part of the concurrent geotechnical and hydrogeological investigations at the Site, ten boreholes were advanced to termination depths of 0.2 meters (m) to 9.8 m at locations across the Site with monitoring wells installed in three of the boreholes (BH1, BH3, and BH9).

The sampling locations are provided on **Figure No.1**, attached.

METHODS

Soil samples were collected from nine of ten borehole locations. A soil sample could not be collected from one borehole (BH6), as bedrock was encountered at 0.2 m below ground surface (BGS). One sample from each of the nine boreholes was analyzed for metals and inorganics, petroleum hydrocarbon fractions 1 to 4 (PHCs F1 to F4) and benzene, toluene, ethylbenzene, and xylenes parameters (BTEX), volatile organic compounds (VOCs), and polycyclic aromatic hydrocarbons (PAHs). Soil samples recovered from approximately 0.5 m intervals from each borehole were screened visually for soil texture, moisture content and presence or absence of indicators of contamination (e.g., odours, deleterious materials or staining).

Each soil sample was split into two portions. One portion was placed into a sealable plastic bag for use in screening headspace soil vapour concentrations. The second portion of each sample was placed into laboratory-supplied jars and temporarily stored in a cooler on ice prior to transport to Bureau Veritas (BV) Labs Canada Ltd., an accredited environmental laboratory.

Field duplicate soil samples QC-2, QC-3_A, and QC-4 were collected for quality assurance/quality control (QA/QC) purposes at sample locations BH3 SS2 (QC-2), BH3 SS1 (QC-3_A), and BH2 SS3 (QC-4).

A groundwater sample was collected from BH9 on November 22, 2023, using low-flow sampling methods. The groundwater sample was analyzed for metals and inorganics, PHCs, PAHs, and VOCs. During groundwater monitoring, it was noted that wells MW1 and MW3 were dry.

Reference: Environmental Sampling, 300 Pine Street, Bracebridge, Ontario

RESULTS

Stratigraphy encountered during drilling was described as 0.1 to 0.2 m of topsoil underlain by silty sand. The silty sand in some boreholes was followed by gravel, clay, or silt. One borehole was comprised of sandy silt to the maximum depth (9.8 m). Bedrock (gneiss rock) was encountered from 0.2 m to 9.3 m BGS during this investigation.

Headspace soil vapour concentrations were <5 parts per million by volume (ppmv) for combustible vapour and <0.02 ppmv for total organic vapours (TOV) at all sampling locations.

The soil and groundwater analytical results of the analysis of metals and inorganics, PHCs F1 to F4, PAHs, and VOCs are presented in **Tables 1** and **2**, respectively, both attached. Laboratory certificates of analysis are included as Attachment 3.

The analytical results were compared to the Ontario Ministry of the Environment, Conservation and Parks (MECP) document *Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act*, for sites in a potable groundwater condition with residential/parkland/institutional (RPI) land use and coarse textured soil (the Table 2 RPI SCS), which were considered to be the applicable SCS for the Site's intended future land use (hospital).

The results indicated that the concentrations of analyzed parameters in the submitted soil and groundwater samples were less than the Table 2 RPI SCS, except for pH results in BH5 SS2, BH7 SS1, and BH10 SS1. A total of 7 out of 10 soil samples (including one field duplicate sample) analyzed for pH were within acceptable range for surface (5 to 9) and sub-surface (5 to 11) soil. The average pH value of all ten soil samples is pH 5.1 which is above the lower acceptable pH criteria of pH 5.0. For the purpose of this assessment, it is assumed that the three identified low pH values at BH5, BH7 and BH10 are localized, and it is not an indication of environmental sensitivity across the Phase Two Property.

CONCLUSIONS

The results indicated that all tested parameters in the submitted soil and groundwater samples were less than the MECP Table 2 RPI SCS.

CLOSURE

This report documents work that was performed in accordance with generally accepted professional standards at the time and location in which the services were provided. No other representations, warranties or guarantees are made concerning the accuracy or completeness of the data or conclusions contained within this report, including no assurance that this work has uncovered all potential liabilities associated with the identified property.

This report provides an evaluation of selected environmental conditions associated with the identified portions of the property that were assessed at the time the work was conducted and is based on information obtained by and/or provided to Stantec at that time. There are no assurances regarding the accuracy and completeness of this information. All information received from the client or third parties in the preparation of this report has been assumed by Stantec to be correct. Stantec assumes no responsibility for any deficiency or inaccuracy in information received from others.

Reference: Environmental Sampling, 300 Pine Street, Bracebridge, Ontario

The opinions in this report can only be relied upon as they relate to the condition of the portion of the identified property that was assessed at the time the work was conducted. Activities at the property subsequent to Stantec's assessment may have significantly altered the property's condition. Stantec cannot comment on other areas of the property that were not assessed.

Conclusions made within this report consist of Stantec's professional opinion as of the time of the writing of this report and are based solely on the scope of work described in the report, the limited data available and the results of the work. They are not a certification of the property's environmental condition. This report should not be construed as legal advice.

This report has been prepared for the exclusive use of the client identified herein and any use by any third party is prohibited. Stantec assumes no responsibility for losses, damages, liabilities or claims, howsoever arising, from third party use of this report.

This report is limited by the following:

- Results pertain only to the borehole and monitoring well sampling locations shown on **Figure No.1** and analytical parameters listed in **Tables 1** and **2**.

The locations of any utilities, buildings and structures, and property boundaries illustrated in or described within this report, if any, including pole lines, conduits, water mains, sewers and other surface or sub-surface utilities and structures are not guaranteed. Before starting work, the exact location of all such utilities and structures should be confirmed and Stantec assumes no liability for damage to them.

The conclusions are based on the site conditions encountered by Stantec at the time the work was performed at the specific testing and/or sampling locations, and conditions may vary among sampling locations. Factors such as areas of potential concern identified in previous studies, site conditions (e.g., utilities) and cost may have constrained the sampling locations used in this assessment. In addition, analysis has been carried out for only a limited number of chemical parameters, and it should not be inferred that other chemical species are not present. Due to the nature of the investigation and the limited data available, Stantec does not warrant against undiscovered environmental liabilities nor that the sampling results are indicative of the condition of the entire site.

As the purpose of this report is to identify site conditions which may pose an environmental risk; the identification of non-environmental risks to structures or people on the site is beyond the scope of this assessment.

Should additional information become available which differs significantly from our understanding of conditions presented in this report, Stantec specifically disclaims any responsibility to update the conclusions in this report.

This report was prepared by Marissa Lusito, M.Env.Sc., B.Sc.H., and was reviewed by Eric Veska, PhD., P.Geo., C.Chem., QP_{ESA}.

Reference: **Environmental Sampling, 300 Pine Street, Bracebridge, Ontario**

Should you require additional information, please contact the undersigned.

Sincerely,

Stantec Consulting Ltd.

Digitally signed by Resendes, Philip
Date: 2024.11.19 09:48:11 -05'00'

Digitally signed by Veska, Eric
Date: 2024.11.19 09:51:51 -05'00'

FOR

Marissa Lusito M.Env.Sc., B.Sc.H.
Environmental Assessor
Phone: 905 489 0543
Mobile: 437 388 4832
Marissa.Lusito@Stantec.com

Eric Veska PhD., P.Geo., C.Chem., QP_{ESA}
Principal
Phone: 905 415 6419
Mobile: 416 729 2370
Eric.Veska@stantec.com

EV/ml/vb

Attachments:
Attachment 1: Figure 1
Attachment 2: Table 1 and Table 2
Attachment 3: Laboratory Certificate of Analysis

ATTACHMENT 1:

Figure No.1



Stantec

Legend

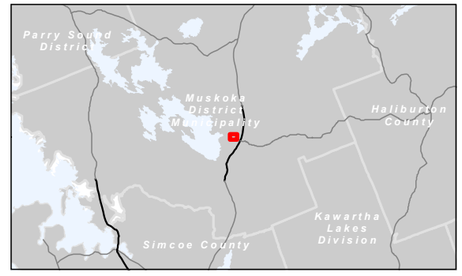
- Approximate Borehole Location
- Approximate Monitoring Well Location
- Site Boundary (Approximate)
- Railway - Operational
- Waterbody
- Provincially Significant Wetland

0 100 200 m

1:5,500 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2023.
3. Orthoimagery © First Base Solutions, 2023. Imagery Date, unknown.



Project Location
Bracebridge, ON

140022038 REV1
Prepared by GB on 2023-12-11
Technical Review by DH on 2023-08-09

Client/Project
MUSKOKA ALQONQUIN HEALTHCARE
ENVIRONMENTAL INVESTIGATION
1975 MUSKOKA BEACH ROAD, BRACEBRIDGE, ON

Figure No.
1

Title
Site Plan Showing Sampling Locations

V:\1609\Active\140022038\03 - data\gis_cad\gis\mxd\vemediation\report_figures\esapr20\Muskoka\140022038_esa1_Fig01_1975MBR_siteplan.mxd Revised: 2023-12-11 By: svandamme

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ATTACHMENT 2:

Tables

Table 2
Summary of Soil Analytical Results
1975 Muskoka Beach Road, Bracebridge, Ontario
Muskoka Alqonquin Healthcare

Sample Location			BH1				BH2A2						BH3A2				
Sample Date			24-Oct-23	24-Oct-23		24-Oct-23	23-Oct-23	23-Oct-23		23-Oct-23		24-Oct-23	23-Oct-23	23-Oct-23	23-Oct-23	23-Oct-23	
Sample ID			BH1 SS2	BH1 SS2 Lab-Dup		BH1 SS3	BH2A2 SS2	H2A2 SS2 Lab-Dup		QC-01		BH2A2 SS7	BH3A2 SS1	BH3A2 SS2	BH3A2 SS5	H3A2 SS5 Lab-Dup	
Sample Depth			0.76 - 1.37 m	0.76 - 1.37 m		1.52 - 2.13 m	0.76 - 1.37 m	0.76 - 1.37 m		0.76 - 1.37 m		6.1 - 6.71 m	0 - 0.61 m	0.76 - 1.37 m	3.05 - 3.66 m	3.05 - 3.66 m	
Sampling Company			STANTEC	STANTEC		STANTEC	STANTEC	STANTEC		STANTEC		STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	
Laboratory			BV	BV		BV	BV	BV		BV		BV	BV	BV	BV	BV	
Laboratory Work Order			C3X8689	C3X8689		C3X8689	C3X8689	C3X8689		C3X8689		C3X8689	C3X8689	C3X8689	C3X8689	C3X8689	
Laboratory Sample ID			XLG746	XLG746		XLG747	XLG748	XLG748		XLG767		XLG749	XLG750	XLG766	XLG751	XLG751	
Sample Type	Units	Ontario SCS		Lab Replicate	RPD (%)			Lab Replicate	RPD (%)	Field Duplicate	RPD (%)					Lab Replicate	RPD (%)
General Chemistry																	
Available (CaCl2) pH	S.U.	5-9/5-11$_{\leq 12}$[A]	5.96	-	-	-	6.03	-	-	5.37	nc	-	-	-	-	-	-
Cyanide (Free)	µg/g	0.051[A]	<0.01	-	-	-	<0.01	-	-	<0.01	nc	-	-	-	-	-	-
Electrical Conductivity, Lab	mS/cm	0.7[A]	0.019	-	-	-	0.020	-	-	0.015	29%	-	-	-	-	-	-
Moisture Content	%	n/v	8.9	9.7	9%	22	16	-	-	6.3	**87%**	7.2	13	7.6	2.8	2.8	nc
Sodium Adsorption Ratio (SAR)	none	5[A]	0.99 SDC	-	-	-	SDCNC	-	-	1.0 SDC	nc	-	-	-	-	-	-
Metals																	
Antimony	µg/g	7.5[A]	<0.20	-	-	-	<0.20	<0.20	nc	<0.20	nc	-	-	-	-	-	-
Arsenic	µg/g	18[A]	<1.0	-	-	-	<1.0	<1.0	nc	<1.0	nc	-	-	-	-	-	-
Barium	µg/g	390[A]	15	-	-	-	37	37	0%	6.6	**139%**	-	-	-	-	-	-
Beryllium	µg/g	4[A]	<0.20	-	-	-	<0.20	<0.20	nc	<0.20	nc	-	-	-	-	-	-
Boron	µg/g	120$_{\leq 16}$[A]	<5.0	-	-	-	<5.0	<5.0	nc	<5.0	nc	-	-	-	-	-	-
Boron (Available)	µg/g	1.5$_{\leq 16}$[A]	<0.050	-	-	-	<0.050	-	-	<0.050	nc	-	-	-	-	-	-
Cadmium	µg/g	1.2[A]	<0.10	-	-	-	<0.10	<0.10	nc	<0.10	nc	-	-	-	-	-	-
Chromium	µg/g	160[A]	6.3	-	-	-	9.5	9.7	2%	8.5	11%	-	-	-	-	-	-
Chromium (Hexavalent)	µg/g	8[A]	<0.18	-	-	-	<0.18	-	-	<0.18	nc	-	-	-	-	-	-
Cobalt	µg/g	22[A]	2.0	-	-	-	2.4	2.3	4%	1.9	23%	-	-	-	-	-	-
Copper	µg/g	140[A]	3.9	-	-	-	4.3	4.2	2%	2.4	nc	-	-	-	-	-	-
Lead	µg/g	120[A]	1.1	-	-	-	1.3	1.4	nc	<1.0	nc	-	-	-	-	-	-
Mercury	µg/g	0.27[A]	<0.050	-	-	-	<0.050	<0.050	nc	<0.050	nc	-	-	-	-	-	-
Molybdenum	µg/g	6.9[A]	<0.50	-	-	-	<0.50	<0.50	nc	<0.50	nc	-	-	-	-	-	-
Nickel	µg/g	100[A]	3.7	-	-	-	4.7	4.6	2%	3.9	19%	-	-	-	-	-	-
Selenium	µg/g	2.4[A]	<0.50	-	-	-	<0.50	<0.50	nc	<0.50	nc	-	-	-	-	-	-
Silver	µg/g	20[A]	<0.20	-	-	-	<0.20	<0.20	nc	<0.20	nc	-	-	-	-	-	-
Thallium	µg/g	1[A]	<0.050	-	-	-	<0.050	<0.050	nc	<0.050	nc	-	-	-	-	-	-
Uranium	µg/g	23[A]	0.30	-	-	-	0.35	0.39	11%	0.25	33%	-	-	-	-	-	-
Vanadium	µg/g	86[A]	18	-	-	-	25	27	8%	31	21%	-	-	-	-	-	-
Zinc	µg/g	340[A]	8.4	-	-	-	11	11	nc	13	nc	-	-	-	-	-	-
Polycyclic Aromatic Hydrocarbons																	
Acenaphthene	µg/g	7.9[A]	-	-	-	-	<0.0050	-	-	-	-	-	<0.0050	<0.0050	-	-	-
Acenaphthylene	µg/g	0.15[A]	-	-	-	-	<0.0050	-	-	-	-	-	<0.0050	<0.0050	-	-	-
Anthracene	µg/g	0.67[A]	-	-	-	-	<0.0050	-	-	-	-	-	<0.0050	<0.0050	-	-	-
Benzo(a)anthracene	µg/g	0.5[A]	-	-	-	-	<0.0050	-	-	-	-	-	<0.0050	<0.0050	-	-	-
Benzo(a)pyrene	µg/g	0.3[A]	-	-	-	-	<0.0050	-	-	-	-	-	<0.0050	<0.0050	-	-	-
Benzo(b/j)fluoranthene	µg/g	0.78$_{\leq 0}$[A]	-	-	-	-	<0.0050	-	-	-	-	-	<0.0050	<0.0050	-	-	-
Benzo(g,h,i)perylene	µg/g	6.6[A]	-	-	-	-	<0.0050	-	-	-	-	-	<0.0050	<0.0050	-	-	-
Benzo(k)fluoranthene	µg/g	0.78[A]	-	-	-	-	<0.0050	-	-	-	-	-	<0.0050	<0.0050	-	-	-
Chrysene	µg/g	7[A]	-	-	-	-	<0.0050	-	-	-	-	-	<0.0050	<0.0050	-	-	-
Dibenzo(a,h)anthracene	µg/g	0.1[A]	-	-	-	-	<0.0050	-	-	-	-	-	<0.0050	<0.0050	-	-	-
Fluoranthene	µg/g	0.69[A]	-	-	-	-	<0.0050	-	-	-	-	-	<0.0050	<0.0050	-	-	-
Fluorene	µg/g	62[A]	-	-	-	-	<0.0050	-	-	-	-	-	<0.0050	<0.0050	-	-	-
Indeno(1,2,3-cd)pyrene	µg/g	0.38[A]	-	-	-	-	<0.0050	-	-	-	-	-	<0.0050	<0.0050	-	-	-
Methylnaphthalene (Total)	µg/g	0.99$_{\leq 3}$[A]	-	-	-	-	<0.0071	-	-	-	-	-	<0.0071	<0.0071	-	-	-
Methylnaphthalene, 1-	µg/g	s3[A]	-	-	-	-	<0.0050	-	-	-	-	-	<0.0050	<0.0050	-	-	-
Methylnaphthalene, 2-	µg/g	$\leq$3[A]	-	-	-	-	<0.0050	-	-	-	-	-	<0.0050	<0.0050	-	-	-
Naphthalene	µg/g	0.6[A]	-	-	-	-	<0.0050	-	-	-	-	-	<0.0050	<0.0050	-	-	-
Phenanthrene	µg/g	6.2[A]	-	-	-	-	<0.0050	-	-	-	-	-	<0.0050	<0.0050	-	-	-
Pyrene	µg/g	78[A]	-	-	-	-	<0.0050	-	-	-	-	-	<0.0050	<0.0050	-	-	-

See notes on last page

Table 2
Summary of Soil Analytical Results
1975 Muskoka Beach Road, Bracebridge, Ontario
Muskoka Alqonquin Healthcare

Sample Location			BH1				BH2A2						BH3A2				
Sample Date			24-Oct-23	24-Oct-23		24-Oct-23	23-Oct-23	23-Oct-23		23-Oct-23		24-Oct-23	23-Oct-23	23-Oct-23	23-Oct-23	23-Oct-23	
Sample ID			BH1 SS2	BH1 SS2 Lab-Dup		BH1 SS3	BH2A2 SS2	H2A2 SS2 Lab-Dup		QC-01		BH2A2 SS7	BH3A2 SS1	BH3A2 SS2	BH3A2 SS5	H3A2 SS5 Lab-Dup	
Sample Depth			0.76 - 1.37 m	0.76 - 1.37 m		1.52 - 2.13 m	0.76 - 1.37 m	0.76 - 1.37 m		0.76 - 1.37 m		6.1 - 6.71 m	0 - 0.61 m	0.76 - 1.37 m	3.05 - 3.66 m	3.05 - 3.66 m	
Sampling Company			STANTEC	STANTEC		STANTEC	STANTEC	STANTEC		STANTEC		STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	
Laboratory			BV	BV		BV	BV	BV		BV		BV	BV	BV	BV	BV	
Laboratory Work Order			C3X8689	C3X8689		C3X8689	C3X8689	C3X8689		C3X8689		C3X8689	C3X8689	C3X8689	C3X8689	C3X8689	
Laboratory Sample ID			XLG746	XLG746		XLG747	XLG748	XLG748		XLG767		XLG749	XLG750	XLG766	XLG751	XLG751	
Sample Type	Units	Ontario SCS		Lab Replicate	RPD (%)			Lab Replicate	RPD (%)	Field Duplicate	RPD (%)					Lab Replicate	RPD (%)
BTEX and Petroleum Hydrocarbons																	
Benzene	µg/g	0.21[A]	-	-	-	<0.0060	<0.020	-	-	-	-	<0.0060	-	-	<0.0060	-	-
Toluene	µg/g	2.3[A]	-	-	-	<0.020	<0.020	-	-	-	-	<0.020	-	-	<0.020	-	-
Ethylbenzene	µg/g	1.1[A]	-	-	-	<0.010	<0.020	-	-	-	-	<0.010	-	-	<0.010	-	-
Xylene, m & p-	µg/g	[A]	-	-	-	<0.020	<0.040	-	-	-	-	<0.020	-	-	<0.020	-	-
Xylene, o-	µg/g	[A]	-	-	-	<0.020	<0.020	-	-	-	-	<0.020	-	-	<0.020	-	-
Xylenes, Total	µg/g	3.1[A]	-	-	-	<0.020	<0.040	-	-	-	-	<0.020	-	-	<0.020	-	-
PHC F1 (C6-C10 range)	µg/g	[A]	-	-	-	<10	<10	-	-	-	-	<10	-	-	-	-	-
PHC F1 (C6-C10 range) minus BTEX	µg/g	[A]	-	-	-	<10	<10	-	-	-	-	<10	-	-	-	-	-
PHC F2 (>C10-C16 range)	µg/g	[A]	-	-	-	<10	<10	-	-	-	-	<10	-	-	-	-	-
PHC F3 (>C16-C34 range)	µg/g	[A]	-	-	-	<50	<50	-	-	-	-	<50	-	-	-	-	-
PHC F4 (>C34-C50 range)	µg/g	[A]	-	-	-	<50	<50	-	-	-	-	<50	-	-	-	-	-
Chromatogram to baseline at C50	none	n/v	-	-	-	YES	YES	-	-	-	-	YES	-	-	-	-	-
Volatile Organic Compounds																	
Acetone	µg/g	16[A]	-	-	-	<0.49	-	-	-	-	-	<0.49	-	-	<0.49	-	-
Bromodichloromethane	µg/g	1.5[A]	-	-	-	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	-
Bromoform (Tribromomethane)	µg/g	0.27[A]	-	-	-	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	-
Bromomethane (Methyl bromide)	µg/g	0.05[A]	-	-	-	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	-
Carbon Tetrachloride (Tetrachloromethane)	µg/g	0.05[A]	-	-	-	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	-
Chlorobenzene (Monochlorobenzene)	µg/g	2.4[A]	-	-	-	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	-
Chloroform (Trichloromethane)	µg/g	0.05[A]	-	-	-	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	-
Dibromochloromethane	µg/g	2.3[A]	-	-	-	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	-
Dichlorobenzene, 1,2-	µg/g	1.2[A]	-	-	-	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	-
Dichlorobenzene, 1,3-	µg/g	4.8[A]	-	-	-	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	-
Dichlorobenzene, 1,4-	µg/g	0.083[A]	-	-	-	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	-
Dichlorodifluoromethane (Freon 12)	µg/g	16[A]	-	-	-	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	-
Dichloroethane, 1,1-	µg/g	0.47[A]	-	-	-	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	-
Dichloroethane, 1,2-	µg/g	0.05[A]	-	-	-	<0.049	-	-	-	-	-	<0.049	-	-	<0.049	-	-
Dichloroethene, 1,1-	µg/g	0.05[A]	-	-	-	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	-
Dichloroethene, cis-1,2-	µg/g	1.9[A]	-	-	-	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	-
Dichloroethene, trans-1,2-	µg/g	0.084[A]	-	-	-	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	-
Dichloropropane, 1,2-	µg/g	0.05[A]	-	-	-	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	-
Dichloropropene, 1,3- (sum of isomers cis + trans)	µg/g	0.05[A]	-	-	-	<0.050	-	-	-	-	-	<0.050	-	-	<0.050	-	-
Dichloropropene, cis-1,3-	µg/g	[A]	-	-	-	<0.030	-	-	-	-	-	<0.030	-	-	<0.030	-	-
Dichloropropene, trans-1,3-	µg/g	[A]	-	-	-	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	-
Ethylene Dibromide (Dibromoethane, 1,2-)	µg/g	0.05[A]	-	-	-	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	-
Hexane (n-Hexane)	µg/g	2.8[A]	-	-	-	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	-
Methyl Ethyl Ketone (MEK) (2-Butanone)	µg/g	16[A]	-	-	-	<0.40	-	-	-	-	-	<0.40	-	-	<0.40	-	-
Methyl Isobutyl Ketone (MIBK)	µg/g	1.7[A]	-	-	-	<0.40	-	-	-	-	-	<0.40	-	-	<0.40	-	-
Methyl tert-butyl ether (MTBE)	µg/g	0.75[A]	-	-	-	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	-
Methylene Chloride (Dichloromethane)	µg/g	0.1[A]	-	-	-	<0.049	-	-	-	-	-	<0.049	-	-	<0.049	-	-
Styrene	µg/g	0.7[A]	-	-	-	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	-
Tetrachloroethane, 1,1,1,2-	µg/g	0.058[A]	-	-	-	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	-
Tetrachloroethane, 1,1,2,2-	µg/g	0.05[A]	-	-	-	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	-
Tetrachloroethene (PCE)	µg/g	0.28[A]	-	-	-	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	-
Trichloroethane, 1,1,1-	µg/g	0.38[A]	-	-	-	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	-
Trichloroethane, 1,1,2-	µg/g	0.05[A]	-	-	-	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	-
Trichloroethene (TCE)	µg/g	0.061[A]	-	-	-	<0.010	-	-	-	-	-	<0.010	-	-	<0.010	-	-
Trichlorofluoromethane (Freon 11)	µg/g	4[A]	-	-	-	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	-
Vinyl Chloride	µg/g	0.02[A]	-	-	-	<0.019	-	-	-	-	-	<0.019	-	-	<0.019	-	-

See notes on last page

Table 2
Summary of Soil Analytical Results
1975 Muskoka Beach Road, Bracebridge, Ontario
Muskoka Alqonquin Healthcare

Sample Location			BH5		BH6			BH7						BH8	BH9		BH10	
Sample Date			26-Oct-23	26-Oct-23	31-Oct-23	31-Oct-23		26-Oct-23	26-Oct-23		26-Oct-23	26-Oct-23		2-Nov-23	2-Nov-23	2-Nov-23	24-Oct-23	24-Oct-23
Sample ID			BH5 SS2	BH5 SS5	BH6 SS1	BH6 SS1 Lab-Dup		BH7 SS2	BH7 SS2 Lab-Dup		BH7 SS6	BH7 SS6 Lab-Dup		BH8 SS1	BH9 SS2	BH9 SS5	BH10 SS1	BH10 SS3
Sample Depth			0.76 - 1.37 m	3.05 - 3.66 m	0 - 0.61 m	0 - 0.61 m		0.76 - 1.37 m	0.76 - 1.37 m		4.57 - 5.18 m	4.57 - 5.18 m		0 - 0.61 m	0.76 - 1.37 m	3.05 - 3.66 m	0 - 0.61 m	1.52 - 2.13 m
Sampling Company			STANTEC	STANTEC	STANTEC	STANTEC		STANTEC	STANTEC		STANTEC	STANTEC		STANTEC	STANTEC	STANTEC	STANTEC	STANTEC
Laboratory			BV	BV	BV	BV		BV	BV		BV	BV		BV	BV	BV	BV	BV
Laboratory Work Order			C3X8689	C3X8689	C3Y9296	C3Y9296		C3X8689	C3X8689		C3X8689	C3X8689		C3Y9296	C3Y9296	C3Y9296	C3X8689	C3X8689
Laboratory Sample ID			XLG752	XLG753	XNN664	XNN664		XLG754	XLG754		XLG755	XLG755		XNN665	XNN666	XNN667	XLG756	XLG757
Sample Type	Units	Ontario SCS				Lab Replicate	RPD (%)		Lab Replicate	RPD (%)		Lab Replicate	RPD (%)					
General Chemistry																		
Available (CaCl2) pH	S.U.	5-9/5-11$_{\leq 12}$[A]	6.19	-	5.49	-	-	6.67	-	-	-	-	-	5.56	6.19	-	6.12	-
Cyanide (Free)	µg/g	0.051[A]	<0.01	-	<0.01	<0.01	nc	<0.01	-	-	-	-	-	<0.01	<0.01	-	<0.01	-
Electrical Conductivity, Lab	mS/cm	0.7[A]	0.013	-	0.022	-	-	0.043	-	-	-	-	-	0.020	0.038	-	0.012	-
Moisture Content	%	n/v	6.1	20	9.8	-	-	9.8	-	-	16	16	0%	12	24	25	6.7	19
Sodium Adsorption Ratio (SAR)	none	5[A]	1.6 SDC	-	0.87 SDC	-	-	0.41 SDC	-	-	-	-	-	1.4 SDC	0.73 SDC	-	1.2 SDC	-
Metals																		
Antimony	µg/g	7.5[A]	<0.20	-	<0.20	-	-	<0.20	-	-	-	-	-	<0.20	<0.20	-	<0.20	-
Arsenic	µg/g	18[A]	<1.0	-	2.7	-	-	<1.0	-	-	-	-	-	<1.0	1.6	-	<1.0	-
Barium	µg/g	390[A]	7.6	-	6.7	-	-	19	-	-	-	-	-	15	270	-	7.5	-
Beryllium	µg/g	4[A]	<0.20	-	<0.20	-	-	<0.20	-	-	-	-	-	<0.20	0.94	-	<0.20	-
Boron	µg/g	120$_{\leq 16}$[A]	<5.0	-	<5.0	-	-	<5.0	-	-	-	-	-	<5.0	6.6	-	<5.0	-
Boron (Available)	µg/g	1.5$_{\leq 16}$[A]	<0.050	-	<0.050	-	-	<0.050	-	-	-	-	-	<0.050	<0.050	-	<0.050	-
Cadmium	µg/g	1.2[A]	<0.10	-	<0.10	-	-	<0.10	-	-	-	-	-	<0.10	<0.10	-	<0.10	-
Chromium	µg/g	160[A]	6.8	-	4.9	-	-	6.7	-	-	-	-	-	10	52	-	6.9	-
Chromium (Hexavalent)	µg/g	8[A]	<0.18	-	<0.18	<0.18	nc	<0.18	-	-	-	-	-	<0.18	0.82	-	<0.18	-
Cobalt	µg/g	22[A]	1.5	-	1.7	-	-	2.1	-	-	-	-	-	2.2	16	-	1.8	-
Copper	µg/g	140[A]	2.5	-	2.2	-	-	3.6	-	-	-	-	-	3.6	31	-	2.7	-
Lead	µg/g	120[A]	<1.0	-	1.0	-	-	1.2	-	-	-	-	-	1.1	6.6	-	<1.0	-
Mercury	µg/g	0.27[A]	<0.050	-	<0.050	-	-	<0.050	-	-	-	-	-	<0.050	<0.050	-	<0.050	-
Molybdenum	µg/g	6.9[A]	<0.50	-	<0.50	-	-	<0.50	-	-	-	-	-	<0.50	<0.50	-	<0.50	-
Nickel	µg/g	100[A]	3.1	-	3.3	-	-	3.9	-	-	-	-	-	3.6	33	-	3.7	-
Selenium	µg/g	2.4[A]	<0.50	-	<0.50	-	-	<0.50	-	-	-	-	-	<0.50	<0.50	-	<0.50	-
Silver	µg/g	20[A]	<0.20	-	<0.20	-	-	<0.20	-	-	-	-	-	<0.20	<0.20	-	<0.20	-
Thallium	µg/g	1[A]	<0.050	-	<0.050	-	-	<0.050	-	-	-	-	-	<0.050	0.30	-	<0.050	-
Uranium	µg/g	23[A]	0.27	-	0.19	-	-	0.22	-	-	-	-	-	0.43	0.91	-	0.27	-
Vanadium	µg/g	86[A]	26	-	15	-	-	18	-	-	-	-	-	34	70	-	24	-
Zinc	µg/g	340[A]	7.1	-	19	-	-	10	-	-	-	-	-	16	85	-	12	-
Polycyclic Aromatic Hydrocarbons																		
Acenaphthene	µg/g	7.9[A]	<0.0050	-	<0.0050	-	-	-	-	-	-	-	-	<0.0050	<0.0050	-	-	-
Acenaphthylene	µg/g	0.15[A]	<0.0050	-	<0.0050	-	-	-	-	-	-	-	-	<0.0050	<0.0050	-	-	-
Anthracene	µg/g	0.67[A]	<0.0050	-	<0.0050	-	-	-	-	-	-	-	-	<0.0050	<0.0050	-	-	-
Benzo(a)anthracene	µg/g	0.5[A]	<0.0050	-	<0.0050	-	-	-	-	-	-	-	-	<0.0050	<0.0050	-	-	-
Benzo(a)pyrene	µg/g	0.3[A]	<0.0050	-	<0.0050	-	-	-	-	-	-	-	-	<0.0050	<0.0050	-	-	-
Benzo(b/j)fluoranthene	µg/g	0.78$_{\leq 0}$[A]	<0.0050	-	<0.0050	-	-	-	-	-	-	-	-	<0.0050	<0.0050	-	-	-
Benzo(g,h,i)perylene	µg/g	6.6[A]	<0.0050	-	<0.0050	-	-	-	-	-	-	-	-	<0.0050	<0.0050	-	-	-
Benzo(k)fluoranthene	µg/g	0.78[A]	<0.0050	-	<0.0050	-	-	-	-	-	-	-	-	<0.0050	<0.0050	-	-	-
Chrysene	µg/g	7[A]	<0.0050	-	<0.0050	-	-	-	-	-	-	-	-	<0.0050	<0.0050	-	-	-
Dibenzo(a,h)anthracene	µg/g	0.1[A]	<0.0050	-	<0.0050	-	-	-	-	-	-	-	-	<0.0050	<0.0050	-	-	-
Fluoranthene	µg/g	0.69[A]	<0.0050	-	<0.0050	-	-	-	-	-	-	-	-	<0.0050	<0.0050	-	-	-
Fluorene	µg/g	62[A]	<0.0050	-	<0.0050	-	-	-	-	-	-	-	-	<0.0050	<0.0050	-	-	-
Indeno(1,2,3-cd)pyrene	µg/g	0.38[A]	<0.0050	-	<0.0050	-	-	-	-	-	-	-	-	<0.0050	<0.0050	-	-	-
Methylnaphthalene (Total)	µg/g	0.99$_{\leq 3}$[A]	<0.0071	-	<0.0071	-	-	-	-	-	-	-	-	<0.0071	<0.0071	-	-	-
Methylnaphthalene, 1-	µg/g	$_{\leq 3}$[A]	<0.0050	-	<0.0050	-	-	-	-	-	-	-	-	<0.0050	<0.0050	-	-	-
Methylnaphthalene, 2-	µg/g	$_{\leq 3}$[A]	<0.0050	-	<0.0050	-	-	-	-	-	-	-	-	<0.0050	<0.0050	-	-	-
Naphthalene	µg/g	0.6[A]	<0.0050	-	<0.0050	-	-	-	-	-	-	-	-	<0.0050	<0.0050	-	-	-
Phenanthrene	µg/g	6.2[A]	<0.0050	-	<0.0050	-	-	-	-	-	-	-	-	<0.0050	<0.0050	-	-	-
Pyrene	µg/g	78[A]	<0.0050	-	<0.0050	-	-	-	-	-	-	-	-	<0.0050	<0.0050	-	-	-

See notes on last page

Table 2
Summary of Soil Analytical Results
1975 Muskoka Beach Road, Bracebridge, Ontario
Muskoka Alqonquin Healthcare

Sample Location			BH5		BH6			BH7						BH8	BH9		BH10	
Sample Date			26-Oct-23	26-Oct-23	31-Oct-23	31-Oct-23		26-Oct-23	26-Oct-23		26-Oct-23	26-Oct-23		2-Nov-23	2-Nov-23	2-Nov-23	24-Oct-23	24-Oct-23
Sample ID			BH5 SS2	BH5 SS5	BH6 SS1	BH6 SS1 Lab-Dup		BH7 SS2	BH7 SS2 Lab-Dup		BH7 SS6	BH7 SS6 Lab-Dup		BH8 SS1	BH9 SS2	BH9 SS5	BH10 SS1	BH10 SS3
Sample Depth			0.76 - 1.37 m	3.05 - 3.66 m	0 - 0.61 m	0 - 0.61 m		0.76 - 1.37 m	0.76 - 1.37 m		4.57 - 5.18 m	4.57 - 5.18 m		0 - 0.61 m	0.76 - 1.37 m	3.05 - 3.66 m	0 - 0.61 m	1.52 - 2.13 m
Sampling Company			STANTEC	STANTEC	STANTEC	STANTEC		STANTEC	STANTEC		STANTEC	STANTEC		STANTEC	STANTEC	STANTEC	STANTEC	STANTEC
Laboratory			BV	BV	BV	BV		BV	BV		BV	BV		BV	BV	BV	BV	BV
Laboratory Work Order			C3X8689	C3X8689	C3Y9296	C3Y9296		C3X8689	C3X8689		C3X8689	C3X8689		C3Y9296	C3Y9296	C3Y9296	C3X8689	C3X8689
Laboratory Sample ID			XLG752	XLG753	XNN664	XNN664		XLG754	XLG754		XLG755	XLG755		XNN665	XNN666	XNN667	XLG756	XLG757
Sample Type	Units	Ontario SCS				Lab Replicate	RPD (%)		Lab Replicate	RPD (%)		Lab Replicate	RPD (%)					
BTEX and Petroleum Hydrocarbons																		
Benzene	µg/g	0.21[A]	-	<0.0060	<0.0060	-	-	-	-	-	<0.0060	-	-	<0.0060	-	<0.0060	-	<0.0060
Toluene	µg/g	2.3[A]	-	<0.020	<0.020	-	-	-	-	-	<0.020	-	-	<0.020	-	<0.020	-	<0.020
Ethylbenzene	µg/g	1.1[A]	-	<0.010	<0.010	-	-	-	-	-	<0.010	-	-	<0.010	-	<0.010	-	<0.010
Xylene, m & p-	µg/g	[A]	-	<0.020	<0.020	-	-	-	-	-	<0.020	-	-	<0.020	-	<0.020	-	<0.020
Xylene, o-	µg/g	[A]	-	<0.020	<0.020	-	-	-	-	-	<0.020	-	-	<0.020	-	<0.020	-	<0.020
Xylenes, Total	µg/g	3.1[A]	-	<0.020	<0.020	-	-	-	-	-	<0.020	-	-	<0.020	-	<0.020	-	<0.020
PHC F1 (C6-C10 range)	µg/g	[A]	-	<10	<10	-	-	-	-	-	-	-	-	<10	-	<10	-	<10
PHC F1 (C6-C10 range) minus BTEX	µg/g	55[A]	-	<10	<10	-	-	-	-	-	-	-	-	<10	-	<10	-	<10
PHC F2 (>C10-C16 range)	µg/g	98[A]	-	<10	<10	-	-	<10	<10	nc	-	-	-	<10	-	<10	-	<10
PHC F3 (>C16-C34 range)	µg/g	300[A]	-	<50	<50	-	-	<50	<50	nc	-	-	-	<50	-	<50	-	<50
PHC F4 (>C34-C50 range)	µg/g	2,800[A]	-	<50	<50	-	-	<50	<50	nc	-	-	-	<50	-	<50	-	<50
Chromatogram to baseline at C50	none	n/v	-	YES	YES	-	-	YES	YES	nc	-	-	-	YES	-	YES	-	YES
Volatile Organic Compounds																		
Acetone	µg/g	16[A]	-	<0.49	<0.49	-	-	-	-	-	<0.49	-	-	<0.49	-	<0.49	-	<0.49
Bromodichloromethane	µg/g	1.5[A]	-	<0.040	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	<0.040	-	<0.040
Bromoform (Tribromomethane)	µg/g	0.27[A]	-	<0.040	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	<0.040	-	<0.040
Bromomethane (Methyl bromide)	µg/g	0.05[A]	-	<0.040	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	<0.040	-	<0.040
Carbon Tetrachloride (Tetrachloromethane)	µg/g	0.05[A]	-	<0.040	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	<0.040	-	<0.040
Chlorobenzene (Monochlorobenzene)	µg/g	2.4[A]	-	<0.040	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	<0.040	-	<0.040
Chloroform (Trichloromethane)	µg/g	0.05[A]	-	<0.040	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	<0.040	-	<0.040
Dibromochloromethane	µg/g	2.3[A]	-	<0.040	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	<0.040	-	<0.040
Dichlorobenzene, 1,2-	µg/g	1.2[A]	-	<0.040	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	<0.040	-	<0.040
Dichlorobenzene, 1,3-	µg/g	4.8[A]	-	<0.040	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	<0.040	-	<0.040
Dichlorobenzene, 1,4-	µg/g	0.083[A]	-	<0.040	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	<0.040	-	<0.040
Dichlorodifluoromethane (Freon 12)	µg/g	16[A]	-	<0.040	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	<0.040	-	<0.040
Dichloroethane, 1,1-	µg/g	0.47[A]	-	<0.040	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	<0.040	-	<0.040
Dichloroethane, 1,2-	µg/g	0.05[A]	-	<0.049	<0.049	-	-	-	-	-	<0.049	-	-	<0.049	-	<0.049	-	<0.049
Dichloroethene, 1,1-	µg/g	0.05[A]	-	<0.040	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	<0.040	-	<0.040
Dichloroethene, cis-1,2-	µg/g	1.9[A]	-	<0.040	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	<0.040	-	<0.040
Dichloroethene, trans-1,2-	µg/g	0.084[A]	-	<0.040	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	<0.040	-	<0.040
Dichloropropane, 1,2-	µg/g	0.05[A]	-	<0.040	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	<0.040	-	<0.040
Dichloropropene, 1,3- (sum of isomers cis + trans)	µg/g	0.05[A]	-	<0.050	<0.050	-	-	-	-	-	<0.050	-	-	<0.050	-	<0.050	-	<0.050
Dichloropropene, cis-1,3-	µg/g	[A]	-	<0.030	<0.030	-	-	-	-	-	<0.030	-	-	<0.030	-	<0.030	-	<0.030
Dichloropropene, trans-1,3-	µg/g	[A]	-	<0.040	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	<0.040	-	<0.040
Ethylene Dibromide (Dibromoethane, 1,2-)	µg/g	0.05[A]	-	<0.040	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	<0.040	-	<0.040
Hexane (n-Hexane)	µg/g	2.8[A]	-	<0.040	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	<0.040	-	<0.040
Methyl Ethyl Ketone (MEK) (2-Butanone)	µg/g	16[A]	-	<0.40	<0.40	-	-	-	-	-	<0.40	-	-	<0.40	-	<0.40	-	<0.40
Methyl Isobutyl Ketone (MIBK)	µg/g	1.7[A]	-	<0.40	<0.40	-	-	-	-	-	<0.40	-	-	<0.40	-	<0.40	-	<0.40
Methyl tert-butyl ether (MTBE)	µg/g	0.75[A]	-	<0.040	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	<0.040	-	<0.040
Methylene Chloride (Dichloromethane)	µg/g	0.1[A]	-	<0.049	<0.049	-	-	-	-	-	<0.049	-	-	<0.049	-	<0.049	-	<0.049
Styrene	µg/g	0.7[A]	-	<0.040	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	<0.040	-	<0.040
Tetrachloroethane, 1,1,1,2-	µg/g	0.058[A]	-	<0.040	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	<0.040	-	<0.040
Tetrachloroethane, 1,1,2,2-	µg/g	0.05[A]	-	<0.040	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	<0.040	-	<0.040
Tetrachloroethene (PCE)	µg/g	0.28[A]	-	<0.040	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	<0.040	-	<0.040
Trichloroethane, 1,1,1-	µg/g	0.38[A]	-	<0.040	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	<0.040	-	<0.040
Trichloroethane, 1,1,2-	µg/g	0.05[A]	-	<0.040	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	<0.040	-	<0.040
Trichloroethene (TCE)	µg/g	0.061[A]	-	<0.010	<0.010	-	-	-	-	-	<0.010	-	-	<0.010	-	<0.010	-	<0.010
Trichlorofluoromethane (Freon 11)	µg/g	4[A]	-	<0.040	<0.040	-	-	-	-	-	<0.040	-	-	<0.040	-	<0.040	-	<0.040
Vinyl Chloride	µg/g	0.02[A]	-	<0.019	<0.019	-	-	-	-	-	<0.019	-	-	<0.019	-	<0.019	-	<0.019

See notes on last page

Table 1
Summary of Soil Analytical Results
1975 Muskoka Beach Road, Bracebridge, Ontario
Muskoka Alqonquin Healthcare

Notes:
Ontario SCS Soil, Ground Water and Sediment Standards for Use under Part XV.I of the Environmental Protection Act (MOE, 2011) Site Condition Standards (SCS)

A	Table 2 - Residential / Parkland / Institutional Property Use - Coarse Textured Soils
6.5[A]	Concentration exceeds the indicated standard.
15.2	Measured concentration did not exceed the indicated standard.
<0.50	Laboratory reporting limit was greater than the applicable standard.
<0.03	Analyte was not detected at a concentration greater than the laboratory reporting limit.
n/v	No standard/guideline value.
-	Parameter not analyzed / not available.
s1	Standard is applicable to total xylenes, and m & p-xylenes and o-xylenes should be summed for comparison.
s2	Standard is for benzo(b)fluoranthene; however, the analytical laboratory can not distinguish between benzo(b)fluoranthene and benzo(j)fluoranthene, and therefore, the result is a combination of the two isomers, against which the standard has been compared.
s3	Standard is applicable to both 1-methylnaphthalene and 2-methylnaphthalene, with the provision that if both are detected the sum of the two must not exceed the standard.
s7	Standard is applicable to PHC in the F1 range minus BTEX.
s8	Standard is applicable to PHC in the F3 range, minus PAHs (other than naphthalene). If PAHs were not analyzed, the standard is applied to F3.
s10	If baseline is not reached during F4 analysis, then gravimetric analysis is to be performed, and the standard is applied to the higher of the two results.
s11	Standard is applicable to 1,3-Dichloropropene, and the individual isomers (cis + trans) should be added for comparison.
s12	The criteria for pH in surface soils (0 to 1.5 m) is 5 - 9, whereas the criteria for pH in sub-surface soils (> 1.5 m depth) is 5 - 11.
s15	Standard is applicable to PHC in the F2 range minus naphthalene. If naphthalene was not analyzed, the standard is applied to F2.
s16	For surface soil, the boron standard is for hot water soluble extract. For subsurface soil, the standard is for total boron (mixed strong acid digest), as ecological criteria are not considered.
SDC	Sodium was not detected. To report SAR the sodium detection limit was used in the calculation. This value represents a maximum ratio.
RPD	Relative Percent Difference.
61%	RPD exceeds data quality objective of 50%.
nc	RPD is not calculated if one or more values is non detect or if one or more values is less than five times the reportable detection limit.

ATTACHMENT 3:

Laboratory Certificates of Analysis

Your Project #: 140022038.801.200
Site#: MAHC,SITE B
Site Location: 1975 MUSKOKA BEACG RD,BRACEBRIDGE
Your C.O.C. #: n/a

Attention: Philip Resendes

Stantec Consulting Ltd
300 Hagey Blvd
Suite 100
Waterloo, ON
CANADA N2L 0A4

Report Date: 2023/11/07
Report #: R7900491
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C3X8689
Received: 2023/10/30, 14:00

Sample Matrix: Soil
Samples Received: 14

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Methylnaphthalene Sum	4	N/A	2023/11/06	CAM SOP-00301	EPA 8270D m
Hot Water Extractable Boron	6	2023/11/02	2023/11/03	CAM SOP-00408	R153 Ana. Prot. 2011
1,3-Dichloropropene Sum	6	N/A	2023/11/04		EPA 8260C m
Free (WAD) Cyanide	3	2023/11/02	2023/11/02	CAM SOP-00457	OMOE E3015 m
Free (WAD) Cyanide	2	2023/11/02	2023/11/03	CAM SOP-00457	OMOE E3015 m
Free (WAD) Cyanide	1	2023/11/03	2023/11/03	CAM SOP-00457	OMOE E3015 m
Conductivity	2	2023/11/02	2023/11/02	CAM SOP-00414	OMOE E3530 v1 m
Conductivity	4	2023/11/03	2023/11/03	CAM SOP-00414	OMOE E3530 v1 m
Hexavalent Chromium in Soil by IC (1)	1	2023/11/02	2023/11/03	CAM SOP-00436	EPA 3060A/7199 m
Hexavalent Chromium in Soil by IC (1)	2	2023/11/03	2023/11/04	CAM SOP-00436	EPA 3060A/7199 m
Hexavalent Chromium in Soil by IC (1)	3	2023/11/03	2023/11/06	CAM SOP-00436	EPA 3060A/7199 m
Petroleum Hydro. CCME F1 & BTEX in Soil (2)	1	N/A	2023/11/01	CAM SOP-00315	CCME PHC-CWS m
Petroleum Hydrocarbons F2-F4 in Soil (3)	2	2023/11/03	2023/11/05	CAM SOP-00316	CCME CWS m
Petroleum Hydrocarbons F2-F4 in Soil (3)	4	2023/11/03	2023/11/06	CAM SOP-00316	CCME CWS m
Acid Extractable Metals by ICPMS	6	2023/11/02	2023/11/03	CAM SOP-00447	EPA 6020B m
Moisture	1	N/A	2023/10/31	CAM SOP-00445	Carter 2nd ed 51.2 m
Moisture	13	N/A	2023/11/01	CAM SOP-00445	Carter 2nd ed 51.2 m
PAH Compounds in Soil by GC/MS (SIM)	4	2023/11/03	2023/11/04	CAM SOP-00318	EPA 8270E
pH CaCl2 EXTRACT	3	2023/11/02	2023/11/02	CAM SOP-00413	EPA 9045 D m
pH CaCl2 EXTRACT	3	2023/11/03	2023/11/03	CAM SOP-00413	EPA 9045 D m
Sodium Adsorption Ratio (SAR)	2	N/A	2023/11/02	CAM SOP-00102	EPA 6010C
Sodium Adsorption Ratio (SAR)	4	N/A	2023/11/06	CAM SOP-00102	EPA 6010C
Volatile Organic Compounds and F1 PHCs	4	N/A	2023/11/04	CAM SOP-00230	EPA 8260C m
Volatile Organic Compounds in Soil	2	N/A	2023/11/03	CAM SOP-00228	EPA 8260D

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCCFP, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in

Your Project #: 140022038.801.200
Site#: MAHC,SITE B
Site Location: 1975 MUSKOKA BEACG RD,BRACEBRIDGE
Your C.O.C. #: n/a

Attention: Philip Resendes

Stantec Consulting Ltd
300 Hagey Blvd
Suite 100
Waterloo, ON
CANADA N2L 0A4

Report Date: 2023/11/07
Report #: R7900491
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C3X8689

Received: 2023/10/30, 14:00

writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) Soils are reported on a dry weight basis unless otherwise specified.
(2) No lab extraction date is given for F1BTEX & VOC samples that are field preserved with methanol. Extraction date is the date sampled unless otherwise stated.
(3) All CCME PHC results met required criteria unless otherwise stated in the report. The CWS PHC methods employed by Bureau Veritas conform to all prescribed elements of the reference method and performance based elements have been validated. All modifications have been validated and proven equivalent following “Alberta Environment’s Interpretation of the Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil Validation of Performance-Based Alternative Methods September 2003”. Documentation is available upon request. Modifications from Reference Method for the Canada-wide Standard for Petroleum Hydrocarbons in Soil-Tier 1 Method: F2/F3/F4 data reported using validated cold solvent extraction instead of Soxhlet extraction.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to:
Julie Clement, Technical Account Manager
Email: Julie.CLEMENT@bureauveritas.com
Phone# (613)868-6079

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O.REG 153 METALS & INORGANICS PKG (SOIL)

Bureau Veritas ID		XLG746		XLG748			XLG748		
Sampling Date		2023/10/24 15:00		2023/10/23 15:50			2023/10/23 15:50		
COC Number		n/a		n/a			n/a		
	UNITS	BH1 SS2	QC Batch	BH2A2 SS2	RDL	QC Batch	BH2A2 SS2 Lab-Dup	RDL	QC Batch
Calculated Parameters									
Sodium Adsorption Ratio	N/A	0.99 (1)	9018931	NC (1)		9018931			
Inorganics									
Conductivity	mS/cm	0.019	9023381	0.020	0.002	9023381			
Available (CaCl2) pH	pH	5.96	9024090	6.03		9024624			
WAD Cyanide (Free)	ug/g	<0.01	9026168	<0.01	0.01	9023313			
Chromium (VI)	ug/g	<0.18	9024558	<0.18	0.18	9026382			
Metals									
Hot Water Ext. Boron (B)	ug/g	<0.050	9025089	<0.050	0.050	9025089			
Acid Extractable Antimony (Sb)	ug/g	<0.20	9024596	<0.20	0.20	9024596	<0.20	0.20	9024596
Acid Extractable Arsenic (As)	ug/g	<1.0	9024596	<1.0	1.0	9024596	<1.0	1.0	9024596
Acid Extractable Barium (Ba)	ug/g	15	9024596	37	0.50	9024596	37	0.50	9024596
Acid Extractable Beryllium (Be)	ug/g	<0.20	9024596	<0.20	0.20	9024596	<0.20	0.20	9024596
Acid Extractable Boron (B)	ug/g	<5.0	9024596	<5.0	5.0	9024596	<5.0	5.0	9024596
Acid Extractable Cadmium (Cd)	ug/g	<0.10	9024596	<0.10	0.10	9024596	<0.10	0.10	9024596
Acid Extractable Chromium (Cr)	ug/g	6.3	9024596	9.5	1.0	9024596	9.7	1.0	9024596
Acid Extractable Cobalt (Co)	ug/g	2.0	9024596	2.4	0.10	9024596	2.3	0.10	9024596
Acid Extractable Copper (Cu)	ug/g	3.9	9024596	4.3	0.50	9024596	4.2	0.50	9024596
Acid Extractable Lead (Pb)	ug/g	1.1	9024596	1.3	1.0	9024596	1.4	1.0	9024596
Acid Extractable Molybdenum (Mo)	ug/g	<0.50	9024596	<0.50	0.50	9024596	<0.50	0.50	9024596
Acid Extractable Nickel (Ni)	ug/g	3.7	9024596	4.7	0.50	9024596	4.6	0.50	9024596
Acid Extractable Selenium (Se)	ug/g	<0.50	9024596	<0.50	0.50	9024596	<0.50	0.50	9024596
Acid Extractable Silver (Ag)	ug/g	<0.20	9024596	<0.20	0.20	9024596	<0.20	0.20	9024596
Acid Extractable Thallium (Tl)	ug/g	<0.050	9024596	<0.050	0.050	9024596	<0.050	0.050	9024596
Acid Extractable Uranium (U)	ug/g	0.30	9024596	0.35	0.050	9024596	0.39	0.050	9024596
Acid Extractable Vanadium (V)	ug/g	18	9024596	25	5.0	9024596	27	5.0	9024596
Acid Extractable Zinc (Zn)	ug/g	8.4	9024596	11	5.0	9024596	11	5.0	9024596
Acid Extractable Mercury (Hg)	ug/g	<0.050	9024596	<0.050	0.050	9024596	<0.050	0.050	9024596

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
(1) Sodium was not detected. To report SAR the sodium detection limit was used in the calculation. This value represents a maximum ratio.

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

Bureau Veritas Job #: C3X8689
Report Date: 2023/11/07

Stantec Consulting Ltd
Client Project #: 140022038.801.200
Site Location: 1975 MUSKOKA BEACG RD,BRACEBRIDGE
Sampler Initials: MK

O.REG 153 METALS & INORGANICS PKG (SOIL)

Bureau Veritas ID		XLG752		XLG754		XLG756		XLG767		
Sampling Date		2023/10/26 11:00		2023/10/26 13:45		2023/10/24 12:10		2023/10/23		
COC Number		n/a		n/a		n/a		n/a		
	UNITS	BH5 SS2	QC Batch	BH7 SS2	QC Batch	BH10 SS1	QC Batch	QC-01	RDL	QC Batch
Calculated Parameters										
Sodium Adsorption Ratio	N/A	1.6 (1)	9018931	0.41 (1)	9019077	1.2 (1)	9018931	1.0 (1)		9018931
Inorganics										
Conductivity	mS/cm	0.013	9026931	0.043	9026931	0.012	9026931	0.015	0.002	9026931
Available (CaCl2) pH	pH	6.19	9026654	6.67	9026654	6.12	9026694	5.37		9024624
WAD Cyanide (Free)	ug/g	<0.01	9023744	<0.01	9023744	<0.01	9023313	<0.01	0.01	9023313
Chromium (VI)	ug/g	<0.18	9026403	<0.18	9026403	<0.18	9026382	<0.18	0.18	9026382
Metals										
Hot Water Ext. Boron (B)	ug/g	<0.050	9024986	<0.050	9024986	<0.050	9024986	<0.050	0.050	9024986
Acid Extractable Antimony (Sb)	ug/g	<0.20	9023984	<0.20	9023984	<0.20	9023984	<0.20	0.20	9023984
Acid Extractable Arsenic (As)	ug/g	<1.0	9023984	<1.0	9023984	<1.0	9023984	<1.0	1.0	9023984
Acid Extractable Barium (Ba)	ug/g	7.6	9023984	19	9023984	7.5	9023984	6.6	0.50	9023984
Acid Extractable Beryllium (Be)	ug/g	<0.20	9023984	<0.20	9023984	<0.20	9023984	<0.20	0.20	9023984
Acid Extractable Boron (B)	ug/g	<5.0	9023984	<5.0	9023984	<5.0	9023984	<5.0	5.0	9023984
Acid Extractable Cadmium (Cd)	ug/g	<0.10	9023984	<0.10	9023984	<0.10	9023984	<0.10	0.10	9023984
Acid Extractable Chromium (Cr)	ug/g	6.8	9023984	6.7	9023984	6.9	9023984	8.5	1.0	9023984
Acid Extractable Cobalt (Co)	ug/g	1.5	9023984	2.1	9023984	1.8	9023984	1.9	0.10	9023984
Acid Extractable Copper (Cu)	ug/g	2.5	9023984	3.6	9023984	2.7	9023984	2.4	0.50	9023984
Acid Extractable Lead (Pb)	ug/g	<1.0	9023984	1.2	9023984	<1.0	9023984	<1.0	1.0	9023984
Acid Extractable Molybdenum (Mo)	ug/g	<0.50	9023984	<0.50	9023984	<0.50	9023984	<0.50	0.50	9023984
Acid Extractable Nickel (Ni)	ug/g	3.1	9023984	3.9	9023984	3.7	9023984	3.9	0.50	9023984
Acid Extractable Selenium (Se)	ug/g	<0.50	9023984	<0.50	9023984	<0.50	9023984	<0.50	0.50	9023984
Acid Extractable Silver (Ag)	ug/g	<0.20	9023984	<0.20	9023984	<0.20	9023984	<0.20	0.20	9023984
Acid Extractable Thallium (Tl)	ug/g	<0.050	9023984	<0.050	9023984	<0.050	9023984	<0.050	0.050	9023984
Acid Extractable Uranium (U)	ug/g	0.27	9023984	0.22	9023984	0.27	9023984	0.25	0.050	9023984
Acid Extractable Vanadium (V)	ug/g	26	9023984	18	9023984	24	9023984	31	5.0	9023984
Acid Extractable Zinc (Zn)	ug/g	7.1	9023984	10	9023984	12	9023984	13	5.0	9023984
Acid Extractable Mercury (Hg)	ug/g	<0.050	9023984	<0.050	9023984	<0.050	9023984	<0.050	0.050	9023984

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) Sodium was not detected. To report SAR the sodium detection limit was used in the calculation. This value represents a maximum ratio.

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

O.REG 153 PAHS (SOIL)

Bureau Veritas ID		XLG748	XLG750	XLG752	XLG766		
Sampling Date		2023/10/23 15:50	2023/10/23 11:15	2023/10/26 11:00	2023/10/23 11:35		
COC Number		n/a	n/a	n/a	n/a		
	UNITS	BH2A2 SS2	BH3A2 SS1	BH5 SS2	BH3A2 SS2	RDL	QC Batch
Calculated Parameters							
Methylnaphthalene, 2-(1-)	ug/g	<0.0071	<0.0071	<0.0071	<0.0071	0.0071	9017101
Polyaromatic Hydrocarbons							
Acenaphthene	ug/g	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	9027312
Acenaphthylene	ug/g	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	9027312
Anthracene	ug/g	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	9027312
Benzo(a)anthracene	ug/g	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	9027312
Benzo(a)pyrene	ug/g	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	9027312
Benzo(b/j)fluoranthene	ug/g	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	9027312
Benzo(g,h,i)perylene	ug/g	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	9027312
Benzo(k)fluoranthene	ug/g	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	9027312
Chrysene	ug/g	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	9027312
Dibenzo(a,h)anthracene	ug/g	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	9027312
Fluoranthene	ug/g	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	9027312
Fluorene	ug/g	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	9027312
Indeno(1,2,3-cd)pyrene	ug/g	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	9027312
1-Methylnaphthalene	ug/g	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	9027312
2-Methylnaphthalene	ug/g	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	9027312
Naphthalene	ug/g	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	9027312
Phenanthrene	ug/g	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	9027312
Pyrene	ug/g	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	9027312
Surrogate Recovery (%)							
D10-Anthracene	%	115	111	122	111		9027312
D14-Terphenyl (FS)	%	102	111	105	100		9027312
D8-Acenaphthylene	%	86	93	82	74		9027312

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

O.REG 153 PHCS, BTEX/F1-F4 (SOIL)

Bureau Veritas ID		XLG748			XLG754	XLG754		
Sampling Date		2023/10/23 15:50			2023/10/26 13:45	2023/10/26 13:45		
COC Number		n/a			n/a	n/a		
	UNITS	BH2A2 SS2	RDL	QC Batch	BH7 SS2	BH7 SS2 Lab-Dup	RDL	QC Batch
BTEX & F1 Hydrocarbons								
Benzene	ug/g	<0.020	0.020	9020343				
Toluene	ug/g	<0.020	0.020	9020343				
Ethylbenzene	ug/g	<0.020	0.020	9020343				
o-Xylene	ug/g	<0.020	0.020	9020343				
p+m-Xylene	ug/g	<0.040	0.040	9020343				
Total Xylenes	ug/g	<0.040	0.040	9020343				
F1 (C6-C10)	ug/g	<10	10	9020343				
F1 (C6-C10) - BTEX	ug/g	<10	10	9020343				
F2-F4 Hydrocarbons								
F2 (C10-C16 Hydrocarbons)	ug/g	<10	10	9027211	<10	<10	10	9027211
F3 (C16-C34 Hydrocarbons)	ug/g	<50	50	9027211	<50	<50	50	9027211
F4 (C34-C50 Hydrocarbons)	ug/g	<50	50	9027211	<50	<50	50	9027211
Reached Baseline at C50	ug/g	Yes		9027211	Yes	Yes		9027211
Surrogate Recovery (%)								
1,4-Difluorobenzene	%	98		9020343				
4-Bromofluorobenzene	%	104		9020343				
D10-o-Xylene	%	97		9020343				
D4-1,2-Dichloroethane	%	87		9020343				
o-Terphenyl	%	88		9027211	89	87		9027211

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

O.REG 153 VOCS BY HS & F1-F4 (SOIL)

Bureau Veritas ID		XLG747	XLG749	XLG753	XLG757		
Sampling Date		2023/10/24 15:45	2023/10/24 08:55	2023/10/26 11:35	2023/10/24 13:20		
COC Number		n/a	n/a	n/a	n/a		
	UNITS	BH1 SS3	BH2A2 SS7	BH5 SS5	BH10 SS3	RDL	QC Batch
Calculated Parameters							
1,3-Dichloropropene (cis+trans)	ug/g	<0.050	<0.050	<0.050	<0.050	0.050	9019122
Volatile Organics							
Acetone (2-Propanone)	ug/g	<0.49	<0.49	<0.49	<0.49	0.49	9021193
Benzene	ug/g	<0.0060	<0.0060	<0.0060	<0.0060	0.0060	9021193
Bromodichloromethane	ug/g	<0.040	<0.040	<0.040	<0.040	0.040	9021193
Bromoform	ug/g	<0.040	<0.040	<0.040	<0.040	0.040	9021193
Bromomethane	ug/g	<0.040	<0.040	<0.040	<0.040	0.040	9021193
Carbon Tetrachloride	ug/g	<0.040	<0.040	<0.040	<0.040	0.040	9021193
Chlorobenzene	ug/g	<0.040	<0.040	<0.040	<0.040	0.040	9021193
Chloroform	ug/g	<0.040	<0.040	<0.040	<0.040	0.040	9021193
Dibromochloromethane	ug/g	<0.040	<0.040	<0.040	<0.040	0.040	9021193
1,2-Dichlorobenzene	ug/g	<0.040	<0.040	<0.040	<0.040	0.040	9021193
1,3-Dichlorobenzene	ug/g	<0.040	<0.040	<0.040	<0.040	0.040	9021193
1,4-Dichlorobenzene	ug/g	<0.040	<0.040	<0.040	<0.040	0.040	9021193
Dichlorodifluoromethane (FREON 12)	ug/g	<0.040	<0.040	<0.040	<0.040	0.040	9021193
1,1-Dichloroethane	ug/g	<0.040	<0.040	<0.040	<0.040	0.040	9021193
1,2-Dichloroethane	ug/g	<0.049	<0.049	<0.049	<0.049	0.049	9021193
1,1-Dichloroethylene	ug/g	<0.040	<0.040	<0.040	<0.040	0.040	9021193
cis-1,2-Dichloroethylene	ug/g	<0.040	<0.040	<0.040	<0.040	0.040	9021193
trans-1,2-Dichloroethylene	ug/g	<0.040	<0.040	<0.040	<0.040	0.040	9021193
1,2-Dichloropropane	ug/g	<0.040	<0.040	<0.040	<0.040	0.040	9021193
cis-1,3-Dichloropropene	ug/g	<0.030	<0.030	<0.030	<0.030	0.030	9021193
trans-1,3-Dichloropropene	ug/g	<0.040	<0.040	<0.040	<0.040	0.040	9021193
Ethylbenzene	ug/g	<0.010	<0.010	<0.010	<0.010	0.010	9021193
Ethylene Dibromide	ug/g	<0.040	<0.040	<0.040	<0.040	0.040	9021193
Hexane	ug/g	<0.040	<0.040	<0.040	<0.040	0.040	9021193
Methylene Chloride(Dichloromethane)	ug/g	<0.049	<0.049	<0.049	<0.049	0.049	9021193
Methyl Ethyl Ketone (2-Butanone)	ug/g	<0.40	<0.40	<0.40	<0.40	0.40	9021193
Methyl Isobutyl Ketone	ug/g	<0.40	<0.40	<0.40	<0.40	0.40	9021193
Methyl t-butyl ether (MTBE)	ug/g	<0.040	<0.040	<0.040	<0.040	0.040	9021193
Styrene	ug/g	<0.040	<0.040	<0.040	<0.040	0.040	9021193

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

O.REG 153 VOCS BY HS & F1-F4 (SOIL)

Bureau Veritas ID		XLG747	XLG749	XLG753	XLG757		
Sampling Date		2023/10/24 15:45	2023/10/24 08:55	2023/10/26 11:35	2023/10/24 13:20		
COC Number		n/a	n/a	n/a	n/a		
	UNITS	BH1 SS3	BH2A2 SS7	BH5 SS5	BH10 SS3	RDL	QC Batch
1,1,1,2-Tetrachloroethane	ug/g	<0.040	<0.040	<0.040	<0.040	0.040	9021193
1,1,2,2-Tetrachloroethane	ug/g	<0.040	<0.040	<0.040	<0.040	0.040	9021193
Tetrachloroethylene	ug/g	<0.040	<0.040	<0.040	<0.040	0.040	9021193
Toluene	ug/g	<0.020	<0.020	<0.020	<0.020	0.020	9021193
1,1,1-Trichloroethane	ug/g	<0.040	<0.040	<0.040	<0.040	0.040	9021193
1,1,2-Trichloroethane	ug/g	<0.040	<0.040	<0.040	<0.040	0.040	9021193
Trichloroethylene	ug/g	<0.010	<0.010	<0.010	<0.010	0.010	9021193
Trichlorofluoromethane (FREON 11)	ug/g	<0.040	<0.040	<0.040	<0.040	0.040	9021193
Vinyl Chloride	ug/g	<0.019	<0.019	<0.019	<0.019	0.019	9021193
p+m-Xylene	ug/g	<0.020	<0.020	<0.020	<0.020	0.020	9021193
o-Xylene	ug/g	<0.020	<0.020	<0.020	<0.020	0.020	9021193
Total Xylenes	ug/g	<0.020	<0.020	<0.020	<0.020	0.020	9021193
F1 (C6-C10)	ug/g	<10	<10	<10	<10	10	9021193
F1 (C6-C10) - BTEX	ug/g	<10	<10	<10	<10	10	9021193
F2-F4 Hydrocarbons							
F2 (C10-C16 Hydrocarbons)	ug/g	<10	<10	<10	<10	10	9027211
F3 (C16-C34 Hydrocarbons)	ug/g	<50	<50	<50	<50	50	9027211
F4 (C34-C50 Hydrocarbons)	ug/g	<50	<50	<50	<50	50	9027211
Reached Baseline at C50	ug/g	Yes	Yes	Yes	Yes		9027211
Surrogate Recovery (%)							
o-Terphenyl	%	89	89	91	89		9027211
4-Bromofluorobenzene	%	92	92	92	92		9021193
D10-o-Xylene	%	94	90	93	90		9021193
D4-1,2-Dichloroethane	%	103	103	101	103		9021193
D8-Toluene	%	97	97	98	98		9021193

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

O.REG 153 VOCS BY HS (SOIL)

Bureau Veritas ID		XLG751	XLG755		
Sampling Date		2023/10/23 12:45	2023/10/26 14:10		
COC Number		n/a	n/a		
	UNITS	BH3A2 SS5	BH7 SS6	RDL	QC Batch
Calculated Parameters					
1,3-Dichloropropene (cis+trans)	ug/g	<0.050	<0.050	0.050	9019122
Volatile Organics					
Acetone (2-Propanone)	ug/g	<0.49	<0.49	0.49	9020877
Benzene	ug/g	<0.0060	<0.0060	0.0060	9020877
Bromodichloromethane	ug/g	<0.040	<0.040	0.040	9020877
Bromoform	ug/g	<0.040	<0.040	0.040	9020877
Bromomethane	ug/g	<0.040	<0.040	0.040	9020877
Carbon Tetrachloride	ug/g	<0.040	<0.040	0.040	9020877
Chlorobenzene	ug/g	<0.040	<0.040	0.040	9020877
Chloroform	ug/g	<0.040	<0.040	0.040	9020877
Dibromochloromethane	ug/g	<0.040	<0.040	0.040	9020877
1,2-Dichlorobenzene	ug/g	<0.040	<0.040	0.040	9020877
1,3-Dichlorobenzene	ug/g	<0.040	<0.040	0.040	9020877
1,4-Dichlorobenzene	ug/g	<0.040	<0.040	0.040	9020877
Dichlorodifluoromethane (FREON 12)	ug/g	<0.040	<0.040	0.040	9020877
1,1-Dichloroethane	ug/g	<0.040	<0.040	0.040	9020877
1,2-Dichloroethane	ug/g	<0.049	<0.049	0.049	9020877
1,1-Dichloroethylene	ug/g	<0.040	<0.040	0.040	9020877
cis-1,2-Dichloroethylene	ug/g	<0.040	<0.040	0.040	9020877
trans-1,2-Dichloroethylene	ug/g	<0.040	<0.040	0.040	9020877
1,2-Dichloropropane	ug/g	<0.040	<0.040	0.040	9020877
cis-1,3-Dichloropropene	ug/g	<0.030	<0.030	0.030	9020877
trans-1,3-Dichloropropene	ug/g	<0.040	<0.040	0.040	9020877
Ethylbenzene	ug/g	<0.010	<0.010	0.010	9020877
Ethylene Dibromide	ug/g	<0.040	<0.040	0.040	9020877
Hexane	ug/g	<0.040	<0.040	0.040	9020877
Methylene Chloride(Dichloromethane)	ug/g	<0.049	<0.049	0.049	9020877
Methyl Ethyl Ketone (2-Butanone)	ug/g	<0.40	<0.40	0.40	9020877
Methyl Isobutyl Ketone	ug/g	<0.40	<0.40	0.40	9020877
Methyl t-butyl ether (MTBE)	ug/g	<0.040	<0.040	0.040	9020877
Styrene	ug/g	<0.040	<0.040	0.040	9020877

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

O.REG 153 VOCS BY HS (SOIL)

Bureau Veritas ID		XLG751	XLG755		
Sampling Date		2023/10/23 12:45	2023/10/26 14:10		
COC Number		n/a	n/a		
	UNITS	BH3A2 SS5	BH7 SS6	RDL	QC Batch
1,1,1,2-Tetrachloroethane	ug/g	<0.040	<0.040	0.040	9020877
1,1,2,2-Tetrachloroethane	ug/g	<0.040	<0.040	0.040	9020877
Tetrachloroethylene	ug/g	<0.040	<0.040	0.040	9020877
Toluene	ug/g	<0.020	<0.020	0.020	9020877
1,1,1-Trichloroethane	ug/g	<0.040	<0.040	0.040	9020877
1,1,2-Trichloroethane	ug/g	<0.040	<0.040	0.040	9020877
Trichloroethylene	ug/g	<0.010	<0.010	0.010	9020877
Trichlorofluoromethane (FREON 11)	ug/g	<0.040	<0.040	0.040	9020877
Vinyl Chloride	ug/g	<0.019	<0.019	0.019	9020877
p+m-Xylene	ug/g	<0.020	<0.020	0.020	9020877
o-Xylene	ug/g	<0.020	<0.020	0.020	9020877
Total Xylenes	ug/g	<0.020	<0.020	0.020	9020877
Surrogate Recovery (%)					
4-Bromofluorobenzene	%	107	106		9020877
D10-o-Xylene	%	87	86		9020877
D4-1,2-Dichloroethane	%	107	107		9020877
D8-Toluene	%	91	91		9020877

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QC Batch = Quality Control Batch

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

Bureau Veritas Job #: C3X8689
Report Date: 2023/11/07

Stantec Consulting Ltd
Client Project #: 140022038.801.200
Site Location: 1975 MUSKOKA BEACG RD,BRACEBRIDGE
Sampler Initials: MK

RESULTS OF ANALYSES OF SOIL

Bureau Veritas ID		XLG746	XLG746		XLG747	XLG748	XLG749	XLG750		
Sampling Date		2023/10/24 15:00	2023/10/24 15:00		2023/10/24 15:45	2023/10/23 15:50	2023/10/24 08:55	2023/10/23 11:15		
COC Number		n/a	n/a		n/a	n/a	n/a	n/a		
	UNITS	BH1 SS2	BH1 SS2 Lab-Dup	QC Batch	BH1 SS3	BH2A2 SS2	BH2A2 SS7	BH3A2 SS1	RDL	QC Batch
Inorganics										
Moisture	%	8.9	9.7	9020971	22	16	7.2	13	1.0	9020752

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

Bureau Veritas ID		XLG751	XLG751		XLG752	XLG753	XLG754		
Sampling Date		2023/10/23 12:45	2023/10/23 12:45		2023/10/26 11:00	2023/10/26 11:35	2023/10/26 13:45		
COC Number		n/a	n/a		n/a	n/a	n/a		
	UNITS	BH3A2 SS5	BH3A2 SS5 Lab-Dup	QC Batch	BH5 SS2	BH5 SS5	BH7 SS2	RDL	QC Batch
Inorganics									
Moisture	%	2.8	2.8	9021300	6.1	20	9.8	1.0	9020752

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

Bureau Veritas ID		XLG755	XLG755		XLG756		XLG757	XLG766		
Sampling Date		2023/10/26 14:10	2023/10/26 14:10		2023/10/24 12:10		2023/10/24 13:20	2023/10/23 11:35		
COC Number		n/a	n/a		n/a		n/a	n/a		
	UNITS	BH7 SS6	BH7 SS6 Lab-Dup	QC Batch	BH10 SS1	QC Batch	BH10 SS3	BH3A2 SS2	RDL	QC Batch
Inorganics										
Moisture	%	16	16	9020052	6.7	9021574	19	7.6	1.0	9020752

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

Bureau Veritas Job #: C3X8689
Report Date: 2023/11/07

Stantec Consulting Ltd
Client Project #: 140022038.801.200
Site Location: 1975 MUSKOKA BEACG RD,BRACEBRIDGE
Sampler Initials: MK

RESULTS OF ANALYSES OF SOIL

Bureau Veritas ID		XLG767		
Sampling Date		2023/10/23		
COC Number		n/a		
	UNITS	QC-01	RDL	QC Batch
Inorganics				
Moisture	%	6.3	1.0	9021574

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

TEST SUMMARY

Bureau Veritas ID: XLG746
Sample ID: BH1 SS2
Matrix: Soil

Collected: 2023/10/24
Shipped:
Received: 2023/10/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Hot Water Extractable Boron	ICP	9025089	2023/11/02	2023/11/03	Jolly John
Free (WAD) Cyanide	TECH	9026168	2023/11/03	2023/11/03	Prgya Panchal
Conductivity	AT	9023381	2023/11/02	2023/11/02	Leily Karimi
Hexavalent Chromium in Soil by IC	IC/SPEC	9024558	2023/11/02	2023/11/03	Harpuneet Kaur
Acid Extractable Metals by ICPMS	ICP/MS	9024596	2023/11/02	2023/11/03	Prempal Bhatti
Moisture	BAL	9020971	N/A	2023/11/01	Muhammad Chhaidan
pH CaCl2 EXTRACT	AT	9024090	2023/11/02	2023/11/02	Gurparteek KAUR
Sodium Adsorption Ratio (SAR)	CALC/MET	9018931	N/A	2023/11/02	Automated Statchk

Bureau Veritas ID: XLG746 Dup
Sample ID: BH1 SS2
Matrix: Soil

Collected: 2023/10/24
Shipped:
Received: 2023/10/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	9020971	N/A	2023/11/01	Muhammad Chhaidan

Bureau Veritas ID: XLG747
Sample ID: BH1 SS3
Matrix: Soil

Collected: 2023/10/24
Shipped:
Received: 2023/10/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
1,3-Dichloropropene Sum	CALC	9019122	N/A	2023/11/04	Automated Statchk
Petroleum Hydrocarbons F2-F4 in Soil	GC/FID	9027211	2023/11/03	2023/11/05	(Kent) Maolin Li
Moisture	BAL	9020752	N/A	2023/11/01	Joe Thomas
Volatile Organic Compounds and F1 PHCs	GC/MSFD	9021193	N/A	2023/11/04	Dina Wang

Bureau Veritas ID: XLG748
Sample ID: BH2A2 SS2
Matrix: Soil

Collected: 2023/10/23
Shipped:
Received: 2023/10/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Methylnaphthalene Sum	CALC	9017101	N/A	2023/11/06	Automated Statchk
Hot Water Extractable Boron	ICP	9025089	2023/11/02	2023/11/03	Jolly John
Free (WAD) Cyanide	TECH	9023313	2023/11/02	2023/11/02	Jency Sara Johnson
Conductivity	AT	9023381	2023/11/02	2023/11/02	Leily Karimi
Hexavalent Chromium in Soil by IC	IC/SPEC	9026382	2023/11/03	2023/11/06	Lusine Khachatryan
Petroleum Hydro. CCME F1 & BTEX in Soil	HSGC/MSFD	9020343	N/A	2023/11/01	Domnica Andronescu
Petroleum Hydrocarbons F2-F4 in Soil	GC/FID	9027211	2023/11/03	2023/11/05	(Kent) Maolin Li
Acid Extractable Metals by ICPMS	ICP/MS	9024596	2023/11/02	2023/11/03	Prempal Bhatti
Moisture	BAL	9020752	N/A	2023/11/01	Joe Thomas
PAH Compounds in Soil by GC/MS (SIM)	GC/MS	9027312	2023/11/03	2023/11/04	Mitesh Raj
pH CaCl2 EXTRACT	AT	9024624	2023/11/02	2023/11/02	Gurparteek KAUR
Sodium Adsorption Ratio (SAR)	CALC/MET	9018931	N/A	2023/11/02	Automated Statchk

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

TEST SUMMARY

Bureau Veritas ID: XLG748 Dup
Sample ID: BH2A2 SS2
Matrix: Soil
Collected: 2023/10/23
Shipped:
Received: 2023/10/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Acid Extractable Metals by ICPMS	ICP/MS	9024596	2023/11/02	2023/11/03	Prempal Bhatti

Bureau Veritas ID: XLG749
Sample ID: BH2A2 SS7
Matrix: Soil
Collected: 2023/10/24
Shipped:
Received: 2023/10/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
1,3-Dichloropropene Sum	CALC	9019122	N/A	2023/11/04	Automated Statchk
Petroleum Hydrocarbons F2-F4 in Soil	GC/FID	9027211	2023/11/03	2023/11/06	(Kent) Maolin Li
Moisture	BAL	9020752	N/A	2023/11/01	Joe Thomas
Volatile Organic Compounds and F1 PHCs	GC/MSFD	9021193	N/A	2023/11/04	Dina Wang

Bureau Veritas ID: XLG750
Sample ID: BH3A2 SS1
Matrix: Soil
Collected: 2023/10/23
Shipped:
Received: 2023/10/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Methylnaphthalene Sum	CALC	9017101	N/A	2023/11/06	Automated Statchk
Moisture	BAL	9020752	N/A	2023/11/01	Joe Thomas
PAH Compounds in Soil by GC/MS (SIM)	GC/MS	9027312	2023/11/03	2023/11/04	Mitesh Raj

Bureau Veritas ID: XLG751
Sample ID: BH3A2 SS5
Matrix: Soil
Collected: 2023/10/23
Shipped:
Received: 2023/10/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
1,3-Dichloropropene Sum	CALC	9019122	N/A	2023/11/04	Automated Statchk
Moisture	BAL	9021300	N/A	2023/11/01	Joe Thomas
Volatile Organic Compounds in Soil	GC/MS	9020877	N/A	2023/11/03	Manpreet Sarao

Bureau Veritas ID: XLG751 Dup
Sample ID: BH3A2 SS5
Matrix: Soil
Collected: 2023/10/23
Shipped:
Received: 2023/10/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	9021300	N/A	2023/11/01	Joe Thomas

Bureau Veritas ID: XLG752
Sample ID: BH5 SS2
Matrix: Soil
Collected: 2023/10/26
Shipped:
Received: 2023/10/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Methylnaphthalene Sum	CALC	9017101	N/A	2023/11/06	Automated Statchk
Hot Water Extractable Boron	ICP	9024986	2023/11/02	2023/11/03	Jolly John
Free (WAD) Cyanide	TECH	9023744	2023/11/02	2023/11/03	Prgya Panchal

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

TEST SUMMARY

Bureau Veritas ID: XLG752
Sample ID: BH5 SS2
Matrix: Soil
Collected: 2023/10/26
Shipped:
Received: 2023/10/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Conductivity	AT	9026931	2023/11/03	2023/11/03	Leily Karimi
Hexavalent Chromium in Soil by IC	IC/SPEC	9026403	2023/11/03	2023/11/04	Sousan Besharatlou
Acid Extractable Metals by ICPMS	ICP/MS	9023984	2023/11/02	2023/11/03	Prempal Bhatti
Moisture	BAL	9020752	N/A	2023/11/01	Joe Thomas
PAH Compounds in Soil by GC/MS (SIM)	GC/MS	9027312	2023/11/03	2023/11/04	Mitesh Raj
pH CaCl2 EXTRACT	AT	9026654	2023/11/03	2023/11/03	Gurparteek KAUR
Sodium Adsorption Ratio (SAR)	CALC/MET	9018931	N/A	2023/11/06	Automated Statchk

Bureau Veritas ID: XLG753
Sample ID: BH5 SS5
Matrix: Soil
Collected: 2023/10/26
Shipped:
Received: 2023/10/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
1,3-Dichloropropene Sum	CALC	9019122	N/A	2023/11/04	Automated Statchk
Petroleum Hydrocarbons F2-F4 in Soil	GC/FID	9027211	2023/11/03	2023/11/06	(Kent) Maolin Li
Moisture	BAL	9020752	N/A	2023/11/01	Joe Thomas
Volatile Organic Compounds and F1 PHCs	GC/MSFD	9021193	N/A	2023/11/04	Dina Wang

Bureau Veritas ID: XLG754
Sample ID: BH7 SS2
Matrix: Soil
Collected: 2023/10/26
Shipped:
Received: 2023/10/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Hot Water Extractable Boron	ICP	9024986	2023/11/02	2023/11/03	Jolly John
Free (WAD) Cyanide	TECH	9023744	2023/11/02	2023/11/03	Prgya Panchal
Conductivity	AT	9026931	2023/11/03	2023/11/03	Leily Karimi
Hexavalent Chromium in Soil by IC	IC/SPEC	9026403	2023/11/03	2023/11/04	Sousan Besharatlou
Petroleum Hydrocarbons F2-F4 in Soil	GC/FID	9027211	2023/11/03	2023/11/06	(Kent) Maolin Li
Acid Extractable Metals by ICPMS	ICP/MS	9023984	2023/11/02	2023/11/03	Prempal Bhatti
Moisture	BAL	9020752	N/A	2023/11/01	Joe Thomas
pH CaCl2 EXTRACT	AT	9026654	2023/11/03	2023/11/03	Gurparteek KAUR
Sodium Adsorption Ratio (SAR)	CALC/MET	9019077	N/A	2023/11/06	Automated Statchk

Bureau Veritas ID: XLG754 Dup
Sample ID: BH7 SS2
Matrix: Soil
Collected: 2023/10/26
Shipped:
Received: 2023/10/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Petroleum Hydrocarbons F2-F4 in Soil	GC/FID	9027211	2023/11/03	2023/11/06	(Kent) Maolin Li

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

TEST SUMMARY

Bureau Veritas ID: XLG755 **Collected:** 2023/10/26
Sample ID: BH7 SS6 **Shipped:**
Matrix: Soil **Received:** 2023/10/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
1,3-Dichloropropene Sum	CALC	9019122	N/A	2023/11/04	Automated Statchk
Moisture	BAL	9020052	N/A	2023/10/31	Nisargsinh Takhatsinh Parihar
Volatile Organic Compounds in Soil	GC/MS	9020877	N/A	2023/11/03	Manpreet Sarao

Bureau Veritas ID: XLG755 Dup **Collected:** 2023/10/26
Sample ID: BH7 SS6 **Shipped:**
Matrix: Soil **Received:** 2023/10/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Moisture	BAL	9020052	N/A	2023/10/31	Nisargsinh Takhatsinh Parihar

Bureau Veritas ID: XLG756 **Collected:** 2023/10/24
Sample ID: BH10 SS1 **Shipped:**
Matrix: Soil **Received:** 2023/10/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Hot Water Extractable Boron	ICP	9024986	2023/11/02	2023/11/03	Jolly John
Free (WAD) Cyanide	TECH	9023313	2023/11/02	2023/11/02	Jency Sara Johnson
Conductivity	AT	9026931	2023/11/03	2023/11/03	Leily Karimi
Hexavalent Chromium in Soil by IC	IC/SPEC	9026382	2023/11/03	2023/11/06	Lusine Khachatryan
Acid Extractable Metals by ICPMS	ICP/MS	9023984	2023/11/02	2023/11/03	Prempal Bhatti
Moisture	BAL	9021574	N/A	2023/11/01	Joe Thomas
pH CaCl2 EXTRACT	AT	9026694	2023/11/03	2023/11/03	Gurparteek KAUR
Sodium Adsorption Ratio (SAR)	CALC/MET	9018931	N/A	2023/11/06	Automated Statchk

Bureau Veritas ID: XLG757 **Collected:** 2023/10/24
Sample ID: BH10 SS3 **Shipped:**
Matrix: Soil **Received:** 2023/10/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
1,3-Dichloropropene Sum	CALC	9019122	N/A	2023/11/04	Automated Statchk
Petroleum Hydrocarbons F2-F4 in Soil	GC/FID	9027211	2023/11/03	2023/11/06	(Kent) Maolin Li
Moisture	BAL	9020752	N/A	2023/11/01	Joe Thomas
Volatile Organic Compounds and F1 PHCs	GC/MSFD	9021193	N/A	2023/11/04	Dina Wang

Bureau Veritas ID: XLG766 **Collected:** 2023/10/23
Sample ID: BH3A2 SS2 **Shipped:**
Matrix: Soil **Received:** 2023/10/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Methylnaphthalene Sum	CALC	9017101	N/A	2023/11/06	Automated Statchk
Moisture	BAL	9020752	N/A	2023/11/01	Joe Thomas
PAH Compounds in Soil by GC/MS (SIM)	GC/MS	9027312	2023/11/03	2023/11/04	Mitesh Raj

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

Bureau Veritas Job #: C3X8689
Report Date: 2023/11/07

Stantec Consulting Ltd
Client Project #: 140022038.801.200
Site Location: 1975 MUSKOKA BEACG RD,BRACEBRIDGE
Sampler Initials: MK

TEST SUMMARY

Bureau Veritas ID: XLG767
Sample ID: QC-01
Matrix: Soil

Collected: 2023/10/23
Shipped:
Received: 2023/10/30

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Hot Water Extractable Boron	ICP	9024986	2023/11/02	2023/11/03	Jolly John
Free (WAD) Cyanide	TECH	9023313	2023/11/02	2023/11/02	Jency Sara Johnson
Conductivity	AT	9026931	2023/11/03	2023/11/03	Leily Karimi
Hexavalent Chromium in Soil by IC	IC/SPEC	9026382	2023/11/03	2023/11/06	Lusine Khachatryan
Acid Extractable Metals by ICPMS	ICP/MS	9023984	2023/11/02	2023/11/03	Prempal Bhatti
Moisture	BAL	9021574	N/A	2023/11/01	Joe Thomas
pH CaCl2 EXTRACT	AT	9024624	2023/11/02	2023/11/02	Gurparteek KAUR
Sodium Adsorption Ratio (SAR)	CALC/MET	9018931	N/A	2023/11/06	Automated Statchk

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	2.0°C

Sample XLG748 [BH2A2 SS2] : F1/BTEX analysis: Soil weight exceeds the protocol specification of approximately 5g in the field preserved vial. Additional methanol was added to the vial to ensure extraction efficiency
SAR Analysis: NC = Not Calculable as Calcium and Magnesium were not detected.

Sample XLG755 [BH7 SS6] : VOC Analysis: Soil weight exceeds the protocol specification of approximately 5g in the field preserved vial. Additional methanol was added to the vial to ensure extraction efficiency.

Results relate only to the items tested.

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

QUALITY ASSURANCE REPORT

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9020343	1,4-Difluorobenzene	2023/11/01	93	60 - 140	97	60 - 140	96	%		
9020343	4-Bromofluorobenzene	2023/11/01	106	60 - 140	106	60 - 140	111	%		
9020343	D10-o-Xylene	2023/11/01	100	60 - 140	95	60 - 140	97	%		
9020343	D4-1,2-Dichloroethane	2023/11/01	86	60 - 140	87	60 - 140	84	%		
9020877	4-Bromofluorobenzene	2023/11/03	111	60 - 140	109	60 - 140	108	%		
9020877	D10-o-Xylene	2023/11/03	105	60 - 130	88	60 - 130	79	%		
9020877	D4-1,2-Dichloroethane	2023/11/03	98	60 - 140	101	60 - 140	107	%		
9020877	D8-Toluene	2023/11/03	111	60 - 140	101	60 - 140	88	%		
9021193	4-Bromofluorobenzene	2023/11/03	96	60 - 140	96	60 - 140	93	%		
9021193	D10-o-Xylene	2023/11/03	113	60 - 130	96	60 - 130	91	%		
9021193	D4-1,2-Dichloroethane	2023/11/03	97	60 - 140	99	60 - 140	98	%		
9021193	D8-Toluene	2023/11/03	106	60 - 140	106	60 - 140	98	%		
9027211	o-Terphenyl	2023/11/05	84	60 - 130	86	60 - 130	92	%		
9027312	D10-Anthracene	2023/11/04	98	50 - 130	97	50 - 130	122	%		
9027312	D14-Terphenyl (FS)	2023/11/04	102	50 - 130	95	50 - 130	106	%		
9027312	D8-Acenaphthylene	2023/11/04	89	50 - 130	84	50 - 130	85	%		
9020052	Moisture	2023/10/31							5.0	20
9020343	Benzene	2023/11/01	80	50 - 140	85	50 - 140	<0.020	ug/g	NC	50
9020343	Ethylbenzene	2023/11/01	89	50 - 140	95	50 - 140	<0.020	ug/g	NC	50
9020343	F1 (C6-C10) - BTEX	2023/11/01					<10	ug/g	0.77	30
9020343	F1 (C6-C10)	2023/11/01	NC	60 - 140	96	80 - 120	<10	ug/g	0.77	30
9020343	o-Xylene	2023/11/01	88	50 - 140	89	50 - 140	<0.020	ug/g	NC	50
9020343	p+m-Xylene	2023/11/01	83	50 - 140	93	50 - 140	<0.040	ug/g	NC	50
9020343	Toluene	2023/11/01	79	50 - 140	85	50 - 140	<0.020	ug/g	NC	50
9020343	Total Xylenes	2023/11/01					<0.040	ug/g	NC	50
9020752	Moisture	2023/11/01							0	20
9020877	1,1,1,2-Tetrachloroethane	2023/11/03	106	60 - 140	99	60 - 130	<0.040	ug/g	NC	50
9020877	1,1,1-Trichloroethane	2023/11/03	109	60 - 140	101	60 - 130	<0.040	ug/g	NC	50
9020877	1,1,2,2-Tetrachloroethane	2023/11/03	112	60 - 140	92	60 - 130	<0.040	ug/g	NC	50
9020877	1,1,2-Trichloroethane	2023/11/03	90	60 - 140	88	60 - 130	<0.040	ug/g	NC	50
9020877	1,1-Dichloroethane	2023/11/03	87	60 - 140	91	60 - 130	<0.040	ug/g	NC	50

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9020877	1,1-Dichloroethylene	2023/11/03	96	60 - 140	91	60 - 130	<0.040	ug/g	NC	50
9020877	1,2-Dichlorobenzene	2023/11/03	102	60 - 140	93	60 - 130	<0.040	ug/g	NC	50
9020877	1,2-Dichloroethane	2023/11/03	95	60 - 140	92	60 - 130	<0.049	ug/g	NC	50
9020877	1,2-Dichloropropane	2023/11/03	99	60 - 140	86	60 - 130	<0.040	ug/g	NC	50
9020877	1,3-Dichlorobenzene	2023/11/03	107	60 - 140	96	60 - 130	<0.040	ug/g	NC	50
9020877	1,4-Dichlorobenzene	2023/11/03	120	60 - 140	109	60 - 130	<0.040	ug/g	NC	50
9020877	Acetone (2-Propanone)	2023/11/03	80	60 - 140	89	60 - 140	<0.49	ug/g	NC	50
9020877	Benzene	2023/11/03	95	60 - 140	86	60 - 130	<0.0060	ug/g	NC	50
9020877	Bromodichloromethane	2023/11/03	107	60 - 140	102	60 - 130	<0.040	ug/g	NC	50
9020877	Bromoform	2023/11/03	94	60 - 140	93	60 - 130	<0.040	ug/g	NC	50
9020877	Bromomethane	2023/11/03	105	60 - 140	91	60 - 140	<0.040	ug/g	NC	50
9020877	Carbon Tetrachloride	2023/11/03	108	60 - 140	101	60 - 130	<0.040	ug/g	NC	50
9020877	Chlorobenzene	2023/11/03	104	60 - 140	99	60 - 130	<0.040	ug/g	NC	50
9020877	Chloroform	2023/11/03	107	60 - 140	99	60 - 130	<0.040	ug/g	NC	50
9020877	cis-1,2-Dichloroethylene	2023/11/03	104	60 - 140	97	60 - 130	<0.040	ug/g	NC	50
9020877	cis-1,3-Dichloropropene	2023/11/03	90	60 - 140	91	60 - 130	<0.030	ug/g	NC	50
9020877	Dibromochloromethane	2023/11/03	96	60 - 140	95	60 - 130	<0.040	ug/g	NC	50
9020877	Dichlorodifluoromethane (FREON 12)	2023/11/03	108	60 - 140	79	60 - 140	<0.040	ug/g	NC	50
9020877	Ethylbenzene	2023/11/03	92	60 - 140	86	60 - 130	<0.010	ug/g	NC	50
9020877	Ethylene Dibromide	2023/11/03	93	60 - 140	94	60 - 130	<0.040	ug/g	NC	50
9020877	Hexane	2023/11/03	85	60 - 140	86	60 - 130	<0.040	ug/g	NC	50
9020877	Methyl Ethyl Ketone (2-Butanone)	2023/11/03	94	60 - 140	89	60 - 140	<0.40	ug/g	NC	50
9020877	Methyl Isobutyl Ketone	2023/11/03	85	60 - 140	91	60 - 130	<0.40	ug/g	NC	50
9020877	Methyl t-butyl ether (MTBE)	2023/11/03	88	60 - 140	99	60 - 130	<0.040	ug/g	NC	50
9020877	Methylene Chloride(Dichloromethane)	2023/11/03	95	60 - 140	104	60 - 130	<0.049	ug/g	NC	50
9020877	o-Xylene	2023/11/03	88	60 - 140	83	60 - 130	<0.020	ug/g	NC	50
9020877	p+m-Xylene	2023/11/03	106	60 - 140	98	60 - 130	<0.020	ug/g	NC	50
9020877	Styrene	2023/11/03	114	60 - 140	108	60 - 130	<0.040	ug/g	NC	50
9020877	Tetrachloroethylene	2023/11/03	110	60 - 140	100	60 - 130	<0.040	ug/g	NC	50
9020877	Toluene	2023/11/03	95	60 - 140	89	60 - 130	<0.020	ug/g	NC	50
9020877	Total Xylenes	2023/11/03					<0.020	ug/g	NC	50

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9020877	trans-1,2-Dichloroethylene	2023/11/03	91	60 - 140	96	60 - 130	<0.040	ug/g	NC	50
9020877	trans-1,3-Dichloropropene	2023/11/03	90	60 - 140	85	60 - 130	<0.040	ug/g	NC	50
9020877	Trichloroethylene	2023/11/03	107	60 - 140	103	60 - 130	<0.010	ug/g	NC	50
9020877	Trichlorofluoromethane (FREON 11)	2023/11/03	111	60 - 140	100	60 - 130	<0.040	ug/g	NC	50
9020877	Vinyl Chloride	2023/11/03	102	60 - 140	81	60 - 130	<0.019	ug/g	NC	50
9020971	Moisture	2023/11/01							8.6	20
9021193	1,1,1,2-Tetrachloroethane	2023/11/03	96	60 - 140	97	60 - 130	<0.040	ug/g	NC	50
9021193	1,1,1-Trichloroethane	2023/11/03	90	60 - 140	89	60 - 130	<0.040	ug/g	NC	50
9021193	1,1,2,2-Tetrachloroethane	2023/11/03	104	60 - 140	107	60 - 130	<0.040	ug/g	NC	50
9021193	1,1,2-Trichloroethane	2023/11/03	96	60 - 140	99	60 - 130	<0.040	ug/g	NC	50
9021193	1,1-Dichloroethane	2023/11/03	105	60 - 140	104	60 - 130	<0.040	ug/g	NC	50
9021193	1,1-Dichloroethylene	2023/11/03	102	60 - 140	101	60 - 130	<0.040	ug/g	NC	50
9021193	1,2-Dichlorobenzene	2023/11/03	96	60 - 140	98	60 - 130	<0.040	ug/g	NC	50
9021193	1,2-Dichloroethane	2023/11/03	86	60 - 140	86	60 - 130	<0.049	ug/g	NC	50
9021193	1,2-Dichloropropane	2023/11/03	102	60 - 140	102	60 - 130	<0.040	ug/g	NC	50
9021193	1,3-Dichlorobenzene	2023/11/03	99	60 - 140	102	60 - 130	<0.040	ug/g	NC	50
9021193	1,4-Dichlorobenzene	2023/11/03	109	60 - 140	112	60 - 130	<0.040	ug/g	NC	50
9021193	Acetone (2-Propanone)	2023/11/03	91	60 - 140	94	60 - 140	<0.49	ug/g	NC	50
9021193	Benzene	2023/11/03	93	60 - 140	93	60 - 130	<0.0060	ug/g	NC	50
9021193	Bromodichloromethane	2023/11/03	97	60 - 140	97	60 - 130	<0.040	ug/g	NC	50
9021193	Bromoform	2023/11/03	83	60 - 140	85	60 - 130	<0.040	ug/g	NC	50
9021193	Bromomethane	2023/11/03	99	60 - 140	100	60 - 140	<0.040	ug/g	NC	50
9021193	Carbon Tetrachloride	2023/11/03	86	60 - 140	85	60 - 130	<0.040	ug/g	NC	50
9021193	Chlorobenzene	2023/11/03	97	60 - 140	99	60 - 130	<0.040	ug/g	NC	50
9021193	Chloroform	2023/11/03	98	60 - 140	98	60 - 130	<0.040	ug/g	NC	50
9021193	cis-1,2-Dichloroethylene	2023/11/03	96	60 - 140	96	60 - 130	<0.040	ug/g	NC	50
9021193	cis-1,3-Dichloropropene	2023/11/03	89	60 - 140	91	60 - 130	<0.030	ug/g	NC	50
9021193	Dibromochloromethane	2023/11/03	90	60 - 140	91	60 - 130	<0.040	ug/g	NC	50
9021193	Dichlorodifluoromethane (FREON 12)	2023/11/03	85	60 - 140	83	60 - 140	<0.040	ug/g	NC	50
9021193	Ethylbenzene	2023/11/03	86	60 - 140	87	60 - 130	<0.010	ug/g	NC	50
9021193	Ethylene Dibromide	2023/11/03	96	60 - 140	98	60 - 130	<0.040	ug/g	NC	50

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9021193	F1 (C6-C10) - BTEX	2023/11/03					<10	ug/g	NC	30
9021193	F1 (C6-C10)	2023/11/03	105	60 - 140	96	80 - 120	<10	ug/g	NC	30
9021193	Hexane	2023/11/03	103	60 - 140	100	60 - 130	<0.040	ug/g	NC	50
9021193	Methyl Ethyl Ketone (2-Butanone)	2023/11/03	98	60 - 140	101	60 - 140	<0.40	ug/g	NC	50
9021193	Methyl Isobutyl Ketone	2023/11/03	89	60 - 140	93	60 - 130	<0.40	ug/g	NC	50
9021193	Methyl t-butyl ether (MTBE)	2023/11/03	92	60 - 140	94	60 - 130	<0.040	ug/g	NC	50
9021193	Methylene Chloride(Dichloromethane)	2023/11/03	100	60 - 140	100	60 - 130	<0.049	ug/g	NC	50
9021193	o-Xylene	2023/11/03	80	60 - 140	82	60 - 130	<0.020	ug/g	NC	50
9021193	p+m-Xylene	2023/11/03	86	60 - 140	87	60 - 130	<0.020	ug/g	NC	50
9021193	Styrene	2023/11/03	99	60 - 140	102	60 - 130	<0.040	ug/g	NC	50
9021193	Tetrachloroethylene	2023/11/03	94	60 - 140	94	60 - 130	<0.040	ug/g	NC	50
9021193	Toluene	2023/11/03	92	60 - 140	93	60 - 130	<0.020	ug/g	NC	50
9021193	Total Xylenes	2023/11/03					<0.020	ug/g	NC	50
9021193	trans-1,2-Dichloroethylene	2023/11/03	97	60 - 140	96	60 - 130	<0.040	ug/g	NC	50
9021193	trans-1,3-Dichloropropene	2023/11/03	96	60 - 140	99	60 - 130	<0.040	ug/g	NC	50
9021193	Trichloroethylene	2023/11/03	93	60 - 140	93	60 - 130	<0.010	ug/g	0.84	50
9021193	Trichlorofluoromethane (FREON 11)	2023/11/03	92	60 - 140	90	60 - 130	<0.040	ug/g	NC	50
9021193	Vinyl Chloride	2023/11/03	106	60 - 140	105	60 - 130	<0.019	ug/g	NC	50
9021300	Moisture	2023/11/01							0	20
9021574	Moisture	2023/11/01							0	20
9023313	WAD Cyanide (Free)	2023/11/02	98	75 - 125	102	80 - 120	<0.01	ug/g	NC	35
9023381	Conductivity	2023/11/02			101	90 - 110	<0.002	mS/cm	5.7	10
9023744	WAD Cyanide (Free)	2023/11/02	86	75 - 125	95	80 - 120	<0.01	ug/g	NC	35
9023984	Acid Extractable Antimony (Sb)	2023/11/03	80	75 - 125	100	80 - 120	<0.20	ug/g	NC	30
9023984	Acid Extractable Arsenic (As)	2023/11/03	91	75 - 125	100	80 - 120	<1.0	ug/g	1.0	30
9023984	Acid Extractable Barium (Ba)	2023/11/03	NC	75 - 125	102	80 - 120	<0.50	ug/g	1.3	30
9023984	Acid Extractable Beryllium (Be)	2023/11/03	96	75 - 125	101	80 - 120	<0.20	ug/g	3.8	30
9023984	Acid Extractable Boron (B)	2023/11/03	97	75 - 125	102	80 - 120	<5.0	ug/g	8.2	30
9023984	Acid Extractable Cadmium (Cd)	2023/11/03	94	75 - 125	96	80 - 120	<0.10	ug/g	2.6	30
9023984	Acid Extractable Chromium (Cr)	2023/11/03	NC	75 - 125	95	80 - 120	<1.0	ug/g	2.6	30
9023984	Acid Extractable Cobalt (Co)	2023/11/03	88	75 - 125	93	80 - 120	<0.10	ug/g	2.4	30

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9023984	Acid Extractable Copper (Cu)	2023/11/03	91	75 - 125	96	80 - 120	<0.50	ug/g	0.79	30
9023984	Acid Extractable Lead (Pb)	2023/11/03	94	75 - 125	101	80 - 120	<1.0	ug/g	0.87	30
9023984	Acid Extractable Mercury (Hg)	2023/11/03	97	75 - 125	115	80 - 120	<0.050	ug/g	NC	30
9023984	Acid Extractable Molybdenum (Mo)	2023/11/03	89	75 - 125	92	80 - 120	<0.50	ug/g	NC	30
9023984	Acid Extractable Nickel (Ni)	2023/11/03	94	75 - 125	98	80 - 120	<0.50	ug/g	4.4	30
9023984	Acid Extractable Selenium (Se)	2023/11/03	93	75 - 125	99	80 - 120	<0.50	ug/g	NC	30
9023984	Acid Extractable Silver (Ag)	2023/11/03	92	75 - 125	95	80 - 120	<0.20	ug/g	NC	30
9023984	Acid Extractable Thallium (Tl)	2023/11/03	96	75 - 125	105	80 - 120	<0.050	ug/g	1.7	30
9023984	Acid Extractable Uranium (U)	2023/11/03	91	75 - 125	95	80 - 120	<0.050	ug/g	0.35	30
9023984	Acid Extractable Vanadium (V)	2023/11/03	NC	75 - 125	92	80 - 120	<5.0	ug/g	2.1	30
9023984	Acid Extractable Zinc (Zn)	2023/11/03	NC	75 - 125	96	80 - 120	<5.0	ug/g	4.9	30
9024090	Available (CaCl2) pH	2023/11/02			100	97 - 103			0.58	N/A
9024558	Chromium (VI)	2023/11/03	89	70 - 130	90	80 - 120	<0.18	ug/g	NC	35
9024596	Acid Extractable Antimony (Sb)	2023/11/03	95	75 - 125	101	80 - 120	<0.20	ug/g	NC	30
9024596	Acid Extractable Arsenic (As)	2023/11/03	102	75 - 125	101	80 - 120	<1.0	ug/g	NC	30
9024596	Acid Extractable Barium (Ba)	2023/11/03	NC	75 - 125	104	80 - 120	<0.50	ug/g	1.8	30
9024596	Acid Extractable Beryllium (Be)	2023/11/03	102	75 - 125	100	80 - 120	<0.20	ug/g	NC	30
9024596	Acid Extractable Boron (B)	2023/11/03	97	75 - 125	91	80 - 120	<5.0	ug/g	NC	30
9024596	Acid Extractable Cadmium (Cd)	2023/11/03	99	75 - 125	98	80 - 120	<0.10	ug/g	NC	30
9024596	Acid Extractable Chromium (Cr)	2023/11/03	102	75 - 125	97	80 - 120	<1.0	ug/g	2.0	30
9024596	Acid Extractable Cobalt (Co)	2023/11/03	98	75 - 125	96	80 - 120	<0.10	ug/g	4.7	30
9024596	Acid Extractable Copper (Cu)	2023/11/03	99	75 - 125	99	80 - 120	<0.50	ug/g	0.50	30
9024596	Acid Extractable Lead (Pb)	2023/11/03	105	75 - 125	105	80 - 120	<1.0	ug/g	4.5	30
9024596	Acid Extractable Mercury (Hg)	2023/11/03	105	75 - 125	111	80 - 120	<0.050	ug/g	NC	30
9024596	Acid Extractable Molybdenum (Mo)	2023/11/03	95	75 - 125	95	80 - 120	<0.50	ug/g	NC	30
9024596	Acid Extractable Nickel (Ni)	2023/11/03	102	75 - 125	100	80 - 120	<0.50	ug/g	2.5	30
9024596	Acid Extractable Selenium (Se)	2023/11/03	102	75 - 125	102	80 - 120	<0.50	ug/g	NC	30
9024596	Acid Extractable Silver (Ag)	2023/11/03	98	75 - 125	96	80 - 120	<0.20	ug/g	NC	30
9024596	Acid Extractable Thallium (Tl)	2023/11/03	109	75 - 125	110	80 - 120	<0.050	ug/g	NC	30
9024596	Acid Extractable Uranium (U)	2023/11/03	98	75 - 125	98	80 - 120	<0.050	ug/g	11	30
9024596	Acid Extractable Vanadium (V)	2023/11/03	NC	75 - 125	95	80 - 120	<5.0	ug/g	5.2	30

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9024596	Acid Extractable Zinc (Zn)	2023/11/03	103	75 - 125	101	80 - 120	<5.0	ug/g	0.24	30
9024624	Available (CaCl2) pH	2023/11/02			100	97 - 103			0.082	N/A
9024986	Hot Water Ext. Boron (B)	2023/11/03	112	75 - 125	104	75 - 125	<0.050	ug/g	5.0	40
9025089	Hot Water Ext. Boron (B)	2023/11/03	100	75 - 125	95	75 - 125	<0.050	ug/g	0.96	40
9026168	WAD Cyanide (Free)	2023/11/03	92	75 - 125	99	80 - 120	<0.01	ug/g	NC	35
9026382	Chromium (VI)	2023/11/06	92	70 - 130	97	80 - 120	<0.18	ug/g	NC	35
9026403	Chromium (VI)	2023/11/04	88	70 - 130	94	80 - 120	<0.18	ug/g	NC	35
9026654	Available (CaCl2) pH	2023/11/03			100	97 - 103			0.89	N/A
9026694	Available (CaCl2) pH	2023/11/03			100	97 - 103			2.0	N/A
9026931	Conductivity	2023/11/03			102	90 - 110	<0.002	mS/cm	3.1	10
9027211	F2 (C10-C16 Hydrocarbons)	2023/11/06	88	60 - 130	90	80 - 120	<10	ug/g	NC	30
9027211	F3 (C16-C34 Hydrocarbons)	2023/11/06	88	60 - 130	91	80 - 120	<50	ug/g	NC	30
9027211	F4 (C34-C50 Hydrocarbons)	2023/11/06	88	60 - 130	89	80 - 120	<50	ug/g	NC	30
9027312	1-Methylnaphthalene	2023/11/04	101	50 - 130	96	50 - 130	<0.0050	ug/g	30	40
9027312	2-Methylnaphthalene	2023/11/04	95	50 - 130	84	50 - 130	<0.0050	ug/g	NC	40
9027312	Acenaphthene	2023/11/04	94	50 - 130	93	50 - 130	<0.0050	ug/g	21	40
9027312	Acenaphthylene	2023/11/04	96	50 - 130	89	50 - 130	<0.0050	ug/g	NC	40
9027312	Anthracene	2023/11/04	99	50 - 130	99	50 - 130	<0.0050	ug/g	NC	40
9027312	Benzo(a)anthracene	2023/11/04	99	50 - 130	93	50 - 130	<0.0050	ug/g	NC	40
9027312	Benzo(a)pyrene	2023/11/04	86	50 - 130	81	50 - 130	<0.0050	ug/g	NC	40
9027312	Benzo(b/j)fluoranthene	2023/11/04	99	50 - 130	95	50 - 130	<0.0050	ug/g	NC	40
9027312	Benzo(g,h,i)perylene	2023/11/04	90	50 - 130	86	50 - 130	<0.0050	ug/g	31	40
9027312	Benzo(k)fluoranthene	2023/11/04	87	50 - 130	98	50 - 130	<0.0050	ug/g	NC	40
9027312	Chrysene	2023/11/04	95	50 - 130	91	50 - 130	<0.0050	ug/g	24	40
9027312	Dibenzo(a,h)anthracene	2023/11/04	107	50 - 130	90	50 - 130	<0.0050	ug/g	NC	40
9027312	Fluoranthene	2023/11/04	97	50 - 130	95	50 - 130	<0.0050	ug/g	NC	40
9027312	Fluorene	2023/11/04	100	50 - 130	93	50 - 130	<0.0050	ug/g	NC	40
9027312	Indeno(1,2,3-cd)pyrene	2023/11/04	94	50 - 130	87	50 - 130	<0.0050	ug/g	NC	40
9027312	Naphthalene	2023/11/04	95	50 - 130	92	50 - 130	<0.0050	ug/g	NC	40
9027312	Phenanthrene	2023/11/04	94	50 - 130	86	50 - 130	<0.0050	ug/g	33	40

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9027312	Pyrene	2023/11/04	101	50 - 130	100	50 - 130	<0.0050	ug/g	27	40

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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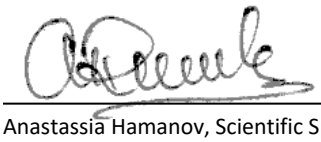
Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

Bureau Veritas Job #: C3X8689
Report Date: 2023/11/07

Stantec Consulting Ltd
Client Project #: 140022038.801.200
Site Location: 1975 MUSKOKA BEACG RD,BRACEBRIDGE
Sampler Initials: MK

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:



Anastassia Hamanov, Scientific Specialist

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Rodney Major, General Manager responsible for Ontario Environmental laboratory operations.

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

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6740 Campobello Road, Mississauga, Ontario L5N 2L8
Phone: 905-817-5700 Fax: 905-817-5779 Toll Free: 800-563-6266

CHAIN OF CUSTODY RECORD

ENV COC - 00014v5

30-Oct-23 14:00
BV Labs - Lake Zurich
C3X8689

RJM ENV-1125

Invoice Information	Invoice to (requires report) ☐	Report Information (if differs from invoice)		Project Information	
Company:	Stantec Consulting Ltd.	Company:		Quotation #:	
Contact Name:	Philip Resendes	Contact Name:		P.O. #/ AFE#:	
Street Address:	100-300 Hagey Blvd.	Street Address:		Project #:	140022038.801.200
City: Waterloo Prov: ON Postal Code:	N2L 0A4	City: Prov: Postal Code:		Site #:	MAHC, Site B
Phone:	226-338-9164	Phone:		Site Location:	1975 Muskoka Beach Rd., Bracebridge
Email:	Philip.Resendes@stantec.com	Email:		Site Location Province:	Ontario
Copies:	SAPInvoices@stantec.com	Copies:		Sampled By:	M. Karanfil

Regulatory Criteria

REG 153: ☐ Table 1 ☑ Table 2 ☐ Table 3 ☐ Table ____ | ☑ Res/Park ☐ Ind/Comm ☐ Agri/other | ☑ Med/Fine ☐ Coarse ☐ For RSC

OTHER: ☐ CCME ☐ Reg 558* ☐ *min 3 day TAT ☐ MISA ☐ PWQO | ☐ Reg 406, Table: ____ ☐ Sanitary Sewer Bylaw ☐ Storm Sewer Bylaw Municipality ____ ☐ Other: ____

Include Criteria on Certificate of Analysis (check if yes): ☐

SAMPLES MUST BE KEPT COOL (<10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

	Sample Identification (Please print or Type)	Date Sampled YYYY	MM	DD	Time (24hr) HH	MM	Matrix	1 FIELD FILTERED	2 FIELD PRESERVED	3 LAB FILTRATION REQUIRED	4 BTEX/ F1	5 F2 - F4	6 VOCs	7 Reg 153 metals and inorganics	8 Reg 153 ICPMS metals	9 Reg 153 metals (Hg, Cr VI, ICPMS metals, HWS - B)	10 PAHs	11	12	13	14	15	16	17	18	19	20	21 # OF CONTAINERS SUBMITTED	22 HOLD - DO NOT ANALYZE
1	✓ BH1 SS2	2023	10	24	15	00	Soil							X														1	
2	✓ BH1 SS3	2023	10	24	15	45	Soil				X	X	X															2	
3	✓ BH2A2 SS2	2023	10	23	15	50	Soil				X	X		X			X											3	
4	✓ BH2A2 SS7	2023	10	24	08	55	Soil				X	X	X															2	
5	✓ BH3A2 SS1	2023	10	23	11	15	Soil				●	●		●			+											2	
6	✓ BH3A2 SS5	2023	10	23	12	45	Soil						X															2	
7	BH5 SS2	2023	10	26	11	00	Soil							X			X											1	
8	✓ BH5 SS5	2023	10	26	11	35	Soil				X	X	X															2	
9	✓ BH7 SS2	2023	10	26	13	45	Soil				X	X		X														1	
10	✓ BH7 SS6	2023	10	26	14	10	Soil						X															2	
11	✓ BH10 SS1	2023	10	24	12	10	Soil							X														2	
12	✓ BH10 SS3	2023	10	24	13	20	Soil				X	X	X															2	

Regular Turnaround Time (TAT)

☑ 5 to 7 Day ☐ 10 Day

Rush Turnaround Time (TAT) Surcharges apply

☐ Same Day ☐ 1 Day ☐ 2 Day ☐ 3 Day ☐ 4 Day

Date Required: YYYY MM DD

Comments

*UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS AND CONDITIONS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/TERMS-AND-CONDITIONS OR BY CALLING THE LABORATORY LISTED ABOVE TO OBTAIN A COPY

LAB USE ONLY	Yes	No	°C	1	2	3
Seal present		✓				
Seal intact		✓				
Cooling media present	✓			2	3	1

LAB USE ONLY	Yes	No	°C	1	2	3
Seal present						
Seal intact						
Cooling media present						

LAB USE ONLY	Yes	No	°C	1	2	3	Temperature reading by:
Seal present							
Seal intact							
Cooling media present							

Relinquished by: (Signature/ Print)	Date YYYY	MM	DD	Time HH	MM	Received by: (Signature/ Print)	Date YYYY	MM	DD	Time HH	MM	Special instructions
1 ML	23	10	30	12	00	1 BUREAU VERITAS	2023	10	30	14	00	
2						2	2023	10/30				

#714374

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Phone: 905-817-5700 Fax: 905-817-5779 Toll Free: 800-563-6266

CHAIN OF CUSTODY RECORD

ENV COC - 00014v5

Invoice Information		Invoice to (requires report) ☐
Company :	Stantec Consulting Ltd.	
Contact Name:	Philip Resendes	
Street Address:	100-300 Hagey Blvd.	
City:	Waterloo	Prov: ON Postal Code: N2L 0A4
Phone:	226-338-9164	
Email:	Philip.Resendes@stantec.com	
Copies:	SAPInvoices@stantec.com	

Report Information (if differs from invoice)	
Company:	
Contact Name:	
Street Address:	
City:	Prov: Postal Code:
Phone:	
Email:	
Copies:	

Project Information	
Quotation #:	
P.O. #/ AFE#:	
Project #:	140022038.801.200
Site #:	MAHC, Site B
Site Location:	1975 Muskoka Beach Rd., Bracebridge
Site Location Province:	Ontario
Sampled By:	M. Karanfil

LAB USE ONLY - PLACE STICKER HERE

Rush Confirmation #:

Regulatory Criteria

REG 153: ☐ Table 1 ☑ Table 2 ☐ Table 3 ☐ Table _____ ☑ Res/Park ☐ Ind/Comm ☐ Agri/other ☑ Med/Fine ☐ Coarse ☐ For RSC

OTHER: ☐ CCME ☐ Reg 558* ☐ *min 3 day TAT ☐ MISA ☐ PWQO ☐ Reg 406, Table: _____ ☐ Sanitary Sewer Bylaw ☐ Storm Sewer Bylaw Municipality _____ ☐ Other: _____

Include Criteria on Certificate of Analysis (check if yes): ☐

SAMPLES MUST BE KEPT COOL (<10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

	Sample Identification (Please print or Type)	Date Sampled YYYY	MM	DD	Time (24hr) HH	MM	Matrix	1 FIELD FILTERED	2 FIELD PRESERVED	3 LAB FILTRATION REQUIRED	4 BTEX/ F1	5 F2 - F4	6 VOCs	7 Reg 153 metals and inorganics	8 Reg 153 ICPMS metals	9 Reg 153 metals (Hg, Cr VI, ICPMS metals, HWS - B)	10 PAHs	11	12	13	14	15	16	17	18	19	20	21 # OF CONTAINERS SUBMITTED	22 HOLD - DO NOT ANALYZE
1	BH3A2 SS2	2023	10	23	11	35	Soil										X											2	
2							Soil																						
3							Soil																						
4							Soil																						
5							Soil																						
6							Soil																						
7							Soil																						
8							Soil																						
9	QC-1	2023	10	23	—		Soil							X														2	
10							Soil																						
11							Soil																						
12							Soil																						

Regular Turnaround Time (TAT)

☑ 5 to 7 Day ☐ 10 Day

Rush Turnaround Time (TAT) Surcharges apply

☐ Same Day ☐ 1 Day ☐ 2 Day ☐ 3 Day ☐ 4 Day

Date Required: YYYY MM DD

Comments

*UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS AND CONDITIONS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/TERMS-AND-CONDITIONS OR BY CALLING THE LABORATORY LISTED ABOVE TO OBTAIN A COPY

LAB USE ONLY	Yes	No	°C	1	2	3
Seal present						
Seal intact						
Cooling media present						

LAB USE ONLY	Yes	No	°C	1	2	3
Seal present						
Seal intact						
Cooling media present						

LAB USE ONLY	Yes	No	°C	1	2	3	Temperature reading by:
Seal present							
Seal intact							
Cooling media present							

	Relinquished by: (Signature/ Print)	Date YYYY	MM	DD	Time HH	MM	Received by: (Signature/ Print)	Date YYYY	MM	DD	Time HH	MM	Special Instructions
1	MK	23	10	30	12	00	1 See plug-in						
2							2						

Your Project #: 140022038
Site Location: SITE B-1975, MUSKOKA BEACH
Your C.O.C. #: 961731-01-01

Attention: Marissa Lusito

Stantec Consulting Ltd
675 Cochrane Dr W.
West Tower Suite 300
Markham, ON
CANADA L3R 0B8

Report Date: 2023/11/14
Report #: R7910776
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C3Y9296
Received: 2023/11/07, 15:25

Sample Matrix: Soil
Samples Received: 4

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Methylnaphthalene Sum	3	N/A	2023/11/10	CAM SOP-00301	EPA 8270D m
Hot Water Extractable Boron	3	2023/11/10	2023/11/10	CAM SOP-00408	R153 Ana. Prot. 2011
1,3-Dichloropropene Sum	3	N/A	2023/11/10		EPA 8260C m
Free (WAD) Cyanide	1	2023/11/09	2023/11/13	CAM SOP-00457	OMOE E3015 m
Free (WAD) Cyanide	2	2023/11/09	2023/11/14	CAM SOP-00457	OMOE E3015 m
Conductivity	3	2023/11/10	2023/11/10	CAM SOP-00414	OMOE E3530 v1 m
Hexavalent Chromium in Soil by IC (1)	3	2023/11/13	2023/11/13	CAM SOP-00436	EPA 3060A/7199 m
Petroleum Hydrocarbons F2-F4 in Soil (2)	2	2023/11/09	2023/11/10	CAM SOP-00316	CCME CWS m
Petroleum Hydrocarbons F2-F4 in Soil (2)	1	2023/11/09	2023/11/09	CAM SOP-00316	CCME CWS m
Acid Extractable Metals by ICPMS	3	2023/11/10	2023/11/10	CAM SOP-00447	EPA 6020B m
Moisture	4	N/A	2023/11/08	CAM SOP-00445	Carter 2nd ed 51.2 m
PAH Compounds in Soil by GC/MS (SIM)	3	2023/11/09	2023/11/10	CAM SOP-00318	EPA 8270E
pH CaCl2 EXTRACT	3	2023/11/10	2023/11/10	CAM SOP-00413	EPA 9045 D m
Sodium Adsorption Ratio (SAR)	3	N/A	2023/11/10	CAM SOP-00102	EPA 6010C
Volatile Organic Compounds and F1 PHCs	3	N/A	2023/11/09	CAM SOP-00230	EPA 8260C m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCCFP, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Your Project #: 140022038
Site Location: SITE B-1975, MUSKOKA BEACH
Your C.O.C. #: 961731-01-01

Attention: Marissa Lusito

Stantec Consulting Ltd
675 Cochrane Dr W.
West Tower Suite 300
Markham, ON
CANADA L3R 0B8

Report Date: 2023/11/14
Report #: R7910776
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C3Y9296

Received: 2023/11/07, 15:25

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Soils are reported on a dry weight basis unless otherwise specified.

(2) All CCME PHC results met required criteria unless otherwise stated in the report. The CWS PHC methods employed by Bureau Veritas conform to all prescribed elements of the reference method and performance based elements have been validated. All modifications have been validated and proven equivalent following "Alberta Environment's Interpretation of the Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil Validation of Performance-Based Alternative Methods September 2003". Documentation is available upon request. Modifications from Reference Method for the Canada-wide Standard for Petroleum Hydrocarbons in Soil-Tier 1 Method: F2/F3/F4 data reported using validated cold solvent extraction instead of Soxhlet extraction.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to:
Julie Clement, Technical Account Manager
Email: Julie.CLEMENT@bureauveritas.com
Phone# (613)868-6079

==========

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Bureau Veritas Job #: C3Y9296
Report Date: 2023/11/14

Stantec Consulting Ltd
Client Project #: 140022038
Site Location: SITE B-1975, MUSKOKA BEACH
Sampler Initials: ND

O.REG 153 METALS & INORGANICS PKG (SOIL)

Bureau Veritas ID		XNN664			XNN664			XNN665		
Sampling Date		2023/10/31 13:30			2023/10/31 13:30			2023/11/02 10:15		
COC Number		961731-01-01			961731-01-01			961731-01-01		
	UNITS	**BH6 SS1**	**RDL**	**QC Batch**	**BH6 SS1 Lab-Dup**	**RDL**	**QC Batch**	**BH8 SS1**	**RDL**	**QC Batch**
Calculated Parameters										
Sodium Adsorption Ratio	N/A	0.87 (1)		9035325				1.4 (1)		9035325
Inorganics										
Conductivity	mS/cm	0.022	0.002	9041696				0.020	0.002	9041696
Available (CaCl2) pH	pH	5.49		9041636				5.56		9041636
WAD Cyanide (Free)	ug/g	<0.01	0.01	9039216	<0.01	0.01	9039216	<0.01	0.01	9039216
Chromium (VI)	ug/g	<0.18	0.18	9045293	<0.18	0.18	9045293	<0.18	0.18	9045293
Metals										
Hot Water Ext. Boron (B)	ug/g	<0.050	0.050	9041584				<0.050	0.050	9041459
Acid Extractable Antimony (Sb)	ug/g	<0.20	0.20	9042145				<0.20	0.20	9042145
Acid Extractable Arsenic (As)	ug/g	2.7	1.0	9042145				<1.0	1.0	9042145
Acid Extractable Barium (Ba)	ug/g	6.7	0.50	9042145				15	0.50	9042145
Acid Extractable Beryllium (Be)	ug/g	<0.20	0.20	9042145				<0.20	0.20	9042145
Acid Extractable Boron (B)	ug/g	<5.0	5.0	9042145				<5.0	5.0	9042145
Acid Extractable Cadmium (Cd)	ug/g	<0.10	0.10	9042145				<0.10	0.10	9042145
Acid Extractable Chromium (Cr)	ug/g	4.9	1.0	9042145				10	1.0	9042145
Acid Extractable Cobalt (Co)	ug/g	1.7	0.10	9042145				2.2	0.10	9042145
Acid Extractable Copper (Cu)	ug/g	2.2	0.50	9042145				3.6	0.50	9042145
Acid Extractable Lead (Pb)	ug/g	1.0	1.0	9042145				1.1	1.0	9042145
Acid Extractable Molybdenum (Mo)	ug/g	<0.50	0.50	9042145				<0.50	0.50	9042145
Acid Extractable Nickel (Ni)	ug/g	3.3	0.50	9042145				3.6	0.50	9042145
Acid Extractable Selenium (Se)	ug/g	<0.50	0.50	9042145				<0.50	0.50	9042145
Acid Extractable Silver (Ag)	ug/g	<0.20	0.20	9042145				<0.20	0.20	9042145
Acid Extractable Thallium (Tl)	ug/g	<0.050	0.050	9042145				<0.050	0.050	9042145
Acid Extractable Uranium (U)	ug/g	0.19	0.050	9042145				0.43	0.050	9042145
Acid Extractable Vanadium (V)	ug/g	15	5.0	9042145				34	5.0	9042145
Acid Extractable Zinc (Zn)	ug/g	19	5.0	9042145				16	5.0	9042145
Acid Extractable Mercury (Hg)	ug/g	<0.050	0.050	9042145				<0.050	0.050	9042145

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
(1) Sodium was not detected. To report SAR the sodium detection limit was used in the calculation. This value represents a maximum ratio.

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

O.REG 153 METALS & INORGANICS PKG (SOIL)

Bureau Veritas ID		XNN666		
Sampling Date		2023/11/02 15:00		
COC Number		961731-01-01		
	UNITS	**BH9 SS2**	**RDL**	**QC Batch**
Calculated Parameters				
Sodium Adsorption Ratio	N/A	0.73 (1)		9035325
Inorganics				
Conductivity	mS/cm	0.038	0.002	9041696
Available (CaCl2) pH	pH	6.19		9041494
WAD Cyanide (Free)	ug/g	<0.01	0.01	9039216
Chromium (VI)	ug/g	0.82	0.18	9045293
Metals				
Hot Water Ext. Boron (B)	ug/g	<0.050	0.050	9041584
Acid Extractable Antimony (Sb)	ug/g	<0.20	0.20	9041633
Acid Extractable Arsenic (As)	ug/g	1.6	1.0	9041633
Acid Extractable Barium (Ba)	ug/g	270	0.50	9041633
Acid Extractable Beryllium (Be)	ug/g	0.94	0.20	9041633
Acid Extractable Boron (B)	ug/g	6.6	5.0	9041633
Acid Extractable Cadmium (Cd)	ug/g	<0.10	0.10	9041633
Acid Extractable Chromium (Cr)	ug/g	52	1.0	9041633
Acid Extractable Cobalt (Co)	ug/g	16	0.10	9041633
Acid Extractable Copper (Cu)	ug/g	31	0.50	9041633
Acid Extractable Lead (Pb)	ug/g	6.6	1.0	9041633
Acid Extractable Molybdenum (Mo)	ug/g	<0.50	0.50	9041633
Acid Extractable Nickel (Ni)	ug/g	33	0.50	9041633
Acid Extractable Selenium (Se)	ug/g	<0.50	0.50	9041633
Acid Extractable Silver (Ag)	ug/g	<0.20	0.20	9041633
Acid Extractable Thallium (Tl)	ug/g	0.30	0.050	9041633
Acid Extractable Uranium (U)	ug/g	0.91	0.050	9041633
Acid Extractable Vanadium (V)	ug/g	70	5.0	9041633
Acid Extractable Zinc (Zn)	ug/g	85	5.0	9041633
Acid Extractable Mercury (Hg)	ug/g	<0.050	0.050	9041633

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) Sodium was not detected. To report SAR the sodium detection limit was used in the calculation. This value represents a maximum ratio.

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

O.REG 153 PAHS (SOIL)

Bureau Veritas ID		XNN664	XNN665	XNN666		
Sampling Date		2023/10/31 13:30	2023/11/02 10:15	2023/11/02 15:00		
COC Number		961731-01-01	961731-01-01	961731-01-01		
	UNITS	**BH6 SS1**	**BH8 SS1**	**BH9 SS2**	**RDL**	**QC Batch**
Calculated Parameters						
Methylnaphthalene, 2-(1-)	ug/g	<0.0071	<0.0071	<0.0071	0.0071	9035238
Polyaromatic Hydrocarbons						
Acenaphthene	ug/g	<0.0050	<0.0050	<0.0050	0.0050	9038396
Acenaphthylene	ug/g	<0.0050	<0.0050	<0.0050	0.0050	9038396
Anthracene	ug/g	<0.0050	<0.0050	<0.0050	0.0050	9038396
Benzo(a)anthracene	ug/g	<0.0050	<0.0050	<0.0050	0.0050	9038396
Benzo(a)pyrene	ug/g	<0.0050	<0.0050	<0.0050	0.0050	9038396
Benzo(b/j)fluoranthene	ug/g	<0.0050	<0.0050	<0.0050	0.0050	9038396
Benzo(g,h,i)perylene	ug/g	<0.0050	<0.0050	<0.0050	0.0050	9038396
Benzo(k)fluoranthene	ug/g	<0.0050	<0.0050	<0.0050	0.0050	9038396
Chrysene	ug/g	<0.0050	<0.0050	<0.0050	0.0050	9038396
Dibenzo(a,h)anthracene	ug/g	<0.0050	<0.0050	<0.0050	0.0050	9038396
Fluoranthene	ug/g	<0.0050	<0.0050	<0.0050	0.0050	9038396
Fluorene	ug/g	<0.0050	<0.0050	<0.0050	0.0050	9038396
Indeno(1,2,3-cd)pyrene	ug/g	<0.0050	<0.0050	<0.0050	0.0050	9038396
1-Methylnaphthalene	ug/g	<0.0050	<0.0050	<0.0050	0.0050	9038396
2-Methylnaphthalene	ug/g	<0.0050	<0.0050	<0.0050	0.0050	9038396
Naphthalene	ug/g	<0.0050	<0.0050	<0.0050	0.0050	9038396
Phenanthrene	ug/g	<0.0050	<0.0050	<0.0050	0.0050	9038396
Pyrene	ug/g	<0.0050	<0.0050	<0.0050	0.0050	9038396
Surrogate Recovery (%)						
D10-Anthracene	%	88	89	95		9038396
D14-Terphenyl (FS)	%	89	89	97		9038396
D8-Acenaphthylene	%	74	80	86		9038396

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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O.REG 153 VOCS BY HS & F1-F4 (SOIL)

Bureau Veritas ID		XNN664	XNN665	XNN667		
Sampling Date		2023/10/31 13:30	2023/11/02 10:15	2023/11/02 15:55		
COC Number		961731-01-01	961731-01-01	961731-01-01		
	UNITS	**BH6 SS1**	**BH8 SS1**	**BH9 SS5**	**RDL**	**QC Batch**
Calculated Parameters						
1,3-Dichloropropene (cis+trans)	ug/g	<0.050	<0.050	<0.050	0.050	9035329
Volatile Organics						
Acetone (2-Propanone)	ug/g	<0.49	<0.49	<0.49	0.49	9038768
Benzene	ug/g	<0.0060	<0.0060	<0.0060	0.0060	9038768
Bromodichloromethane	ug/g	<0.040	<0.040	<0.040	0.040	9038768
Bromoform	ug/g	<0.040	<0.040	<0.040	0.040	9038768
Bromomethane	ug/g	<0.040	<0.040	<0.040	0.040	9038768
Carbon Tetrachloride	ug/g	<0.040	<0.040	<0.040	0.040	9038768
Chlorobenzene	ug/g	<0.040	<0.040	<0.040	0.040	9038768
Chloroform	ug/g	<0.040	<0.040	<0.040	0.040	9038768
Dibromochloromethane	ug/g	<0.040	<0.040	<0.040	0.040	9038768
1,2-Dichlorobenzene	ug/g	<0.040	<0.040	<0.040	0.040	9038768
1,3-Dichlorobenzene	ug/g	<0.040	<0.040	<0.040	0.040	9038768
1,4-Dichlorobenzene	ug/g	<0.040	<0.040	<0.040	0.040	9038768
Dichlorodifluoromethane (FREON 12)	ug/g	<0.040	<0.040	<0.040	0.040	9038768
1,1-Dichloroethane	ug/g	<0.040	<0.040	<0.040	0.040	9038768
1,2-Dichloroethane	ug/g	<0.049	<0.049	<0.049	0.049	9038768
1,1-Dichloroethylene	ug/g	<0.040	<0.040	<0.040	0.040	9038768
cis-1,2-Dichloroethylene	ug/g	<0.040	<0.040	<0.040	0.040	9038768
trans-1,2-Dichloroethylene	ug/g	<0.040	<0.040	<0.040	0.040	9038768
1,2-Dichloropropane	ug/g	<0.040	<0.040	<0.040	0.040	9038768
cis-1,3-Dichloropropene	ug/g	<0.030	<0.030	<0.030	0.030	9038768
trans-1,3-Dichloropropene	ug/g	<0.040	<0.040	<0.040	0.040	9038768
Ethylbenzene	ug/g	<0.010	<0.010	<0.010	0.010	9038768
Ethylene Dibromide	ug/g	<0.040	<0.040	<0.040	0.040	9038768
Hexane	ug/g	<0.040	<0.040	<0.040	0.040	9038768
Methylene Chloride(Dichloromethane)	ug/g	<0.049	<0.049	<0.049	0.049	9038768
Methyl Ethyl Ketone (2-Butanone)	ug/g	<0.40	<0.40	<0.40	0.40	9038768
Methyl Isobutyl Ketone	ug/g	<0.40	<0.40	<0.40	0.40	9038768
Methyl t-butyl ether (MTBE)	ug/g	<0.040	<0.040	<0.040	0.040	9038768
Styrene	ug/g	<0.040	<0.040	<0.040	0.040	9038768

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

O.REG 153 VOCS BY HS & F1-F4 (SOIL)

Bureau Veritas ID		XNN664	XNN665	XNN667		
Sampling Date		2023/10/31 13:30	2023/11/02 10:15	2023/11/02 15:55		
COC Number		961731-01-01	961731-01-01	961731-01-01		
	UNITS	**BH6 SS1**	**BH8 SS1**	**BH9 SS5**	**RDL**	**QC Batch**
1,1,1,2-Tetrachloroethane	ug/g	<0.040	<0.040	<0.040	0.040	9038768
1,1,2,2-Tetrachloroethane	ug/g	<0.040	<0.040	<0.040	0.040	9038768
Tetrachloroethylene	ug/g	<0.040	<0.040	<0.040	0.040	9038768
Toluene	ug/g	<0.020	<0.020	<0.020	0.020	9038768
1,1,1-Trichloroethane	ug/g	<0.040	<0.040	<0.040	0.040	9038768
1,1,2-Trichloroethane	ug/g	<0.040	<0.040	<0.040	0.040	9038768
Trichloroethylene	ug/g	<0.010	<0.010	<0.010	0.010	9038768
Trichlorofluoromethane (FREON 11)	ug/g	<0.040	<0.040	<0.040	0.040	9038768
Vinyl Chloride	ug/g	<0.019	<0.019	<0.019	0.019	9038768
p+m-Xylene	ug/g	<0.020	<0.020	<0.020	0.020	9038768
o-Xylene	ug/g	<0.020	<0.020	<0.020	0.020	9038768
Total Xylenes	ug/g	<0.020	<0.020	<0.020	0.020	9038768
F1 (C6-C10)	ug/g	<10	<10	<10	10	9038768
F1 (C6-C10) - BTEX	ug/g	<10	<10	<10	10	9038768
F2-F4 Hydrocarbons						
F2 (C10-C16 Hydrocarbons)	ug/g	<10	<10	<10	10	9040689
F3 (C16-C34 Hydrocarbons)	ug/g	<50	<50	<50	50	9040689
F4 (C34-C50 Hydrocarbons)	ug/g	<50	<50	<50	50	9040689
Reached Baseline at C50	ug/g	Yes	Yes	Yes		9040689
Surrogate Recovery (%)						
o-Terphenyl	%	95	98	102		9040689
4-Bromofluorobenzene	%	94	95	94		9038768
D10-o-Xylene	%	85	81	87		9038768
D4-1,2-Dichloroethane	%	102	101	103		9038768
D8-Toluene	%	94	95	94		9038768

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

Bureau Veritas Job #: C3Y9296
Report Date: 2023/11/14

Stantec Consulting Ltd
Client Project #: 140022038
Site Location: SITE B-1975, MUSKOKA BEACH
Sampler Initials: ND

RESULTS OF ANALYSES OF SOIL

Bureau Veritas ID		XNN664	XNN665	XNN666	XNN667		
Sampling Date		2023/10/31 13:30	2023/11/02 10:15	2023/11/02 15:00	2023/11/02 15:55		
COC Number		961731-01-01	961731-01-01	961731-01-01	961731-01-01		
	UNITS	**BH6 SS1**	**BH8 SS1**	**BH9 SS2**	**BH9 SS5**	**RDL**	**QC Batch**
Inorganics							
Moisture	%	9.8	12	24	25	1.0	9036852

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

Bureau Veritas Job #: C3Y9296
Report Date: 2023/11/14

Stantec Consulting Ltd
Client Project #: 140022038
Site Location: SITE B-1975, MUSKOKA BEACH
Sampler Initials: ND

TEST SUMMARY

Bureau Veritas ID: XNN664
Sample ID: BH6 SS1
Matrix: Soil

Collected: 2023/10/31
Shipped:
Received: 2023/11/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Methylnaphthalene Sum	CALC	9035238	N/A	2023/11/10	Automated Statchk
Hot Water Extractable Boron	ICP	9041584	2023/11/10	2023/11/10	Medhat Nasr
1,3-Dichloropropene Sum	CALC	9035329	N/A	2023/11/10	Automated Statchk
Free (WAD) Cyanide	TECH	9039216	2023/11/09	2023/11/13	Jency Sara Johnson
Conductivity	AT	9041696	2023/11/10	2023/11/10	Leily Karimi
Hexavalent Chromium in Soil by IC	IC/SPEC	9045293	2023/11/13	2023/11/13	Sousan Besharatlou
Petroleum Hydrocarbons F2-F4 in Soil	GC/FID	9040689	2023/11/09	2023/11/09	(Kent) Maolin Li
Acid Extractable Metals by ICPMS	ICP/MS	9042145	2023/11/10	2023/11/10	Japneet Gill
Moisture	BAL	9036852	N/A	2023/11/08	Joe Thomas
PAH Compounds in Soil by GC/MS (SIM)	GC/MS	9038396	2023/11/09	2023/11/10	Jonghan Yoon
pH CaCl2 EXTRACT	AT	9041636	2023/11/10	2023/11/10	Kien Tran
Sodium Adsorption Ratio (SAR)	CALC/MET	9035325	N/A	2023/11/10	Automated Statchk
Volatile Organic Compounds and F1 PHCs	GC/MSFD	9038768	N/A	2023/11/09	Dina Wang

Bureau Veritas ID: XNN664 Dup
Sample ID: BH6 SS1
Matrix: Soil

Collected: 2023/10/31
Shipped:
Received: 2023/11/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Free (WAD) Cyanide	TECH	9039216	2023/11/09	2023/11/13	Jency Sara Johnson
Hexavalent Chromium in Soil by IC	IC/SPEC	9045293	2023/11/13	2023/11/13	Sousan Besharatlou

Bureau Veritas ID: XNN665
Sample ID: BH8 SS1
Matrix: Soil

Collected: 2023/11/02
Shipped:
Received: 2023/11/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Methylnaphthalene Sum	CALC	9035238	N/A	2023/11/10	Automated Statchk
Hot Water Extractable Boron	ICP	9041459	2023/11/10	2023/11/10	Jaswinder Kaur
1,3-Dichloropropene Sum	CALC	9035329	N/A	2023/11/10	Automated Statchk
Free (WAD) Cyanide	TECH	9039216	2023/11/09	2023/11/14	Jency Sara Johnson
Conductivity	AT	9041696	2023/11/10	2023/11/10	Leily Karimi
Hexavalent Chromium in Soil by IC	IC/SPEC	9045293	2023/11/13	2023/11/13	Sousan Besharatlou
Petroleum Hydrocarbons F2-F4 in Soil	GC/FID	9040689	2023/11/09	2023/11/10	(Kent) Maolin Li
Acid Extractable Metals by ICPMS	ICP/MS	9042145	2023/11/10	2023/11/10	Japneet Gill
Moisture	BAL	9036852	N/A	2023/11/08	Joe Thomas
PAH Compounds in Soil by GC/MS (SIM)	GC/MS	9038396	2023/11/09	2023/11/10	Jonghan Yoon
pH CaCl2 EXTRACT	AT	9041636	2023/11/10	2023/11/10	Kien Tran
Sodium Adsorption Ratio (SAR)	CALC/MET	9035325	N/A	2023/11/10	Automated Statchk
Volatile Organic Compounds and F1 PHCs	GC/MSFD	9038768	N/A	2023/11/09	Dina Wang

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

Bureau Veritas Job #: C3Y9296
Report Date: 2023/11/14

Stantec Consulting Ltd
Client Project #: 140022038
Site Location: SITE B-1975, MUSKOKA BEACH
Sampler Initials: ND

TEST SUMMARY

Bureau Veritas ID: XNN666
Sample ID: BH9 SS2
Matrix: Soil

Collected: 2023/11/02
Shipped:
Received: 2023/11/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Methylnaphthalene Sum	CALC	9035238	N/A	2023/11/10	Automated Statchk
Hot Water Extractable Boron	ICP	9041584	2023/11/10	2023/11/10	Medhat Nasr
Free (WAD) Cyanide	TECH	9039216	2023/11/09	2023/11/14	Jency Sara Johnson
Conductivity	AT	9041696	2023/11/10	2023/11/10	Leily Karimi
Hexavalent Chromium in Soil by IC	IC/SPEC	9045293	2023/11/13	2023/11/13	Sousan Besharatlou
Acid Extractable Metals by ICPMS	ICP/MS	9041633	2023/11/10	2023/11/10	Daniel Teclu
Moisture	BAL	9036852	N/A	2023/11/08	Joe Thomas
PAH Compounds in Soil by GC/MS (SIM)	GC/MS	9038396	2023/11/09	2023/11/10	Jonghan Yoon
pH CaCl2 EXTRACT	AT	9041494	2023/11/10	2023/11/10	Kien Tran
Sodium Adsorption Ratio (SAR)	CALC/MET	9035325	N/A	2023/11/10	Automated Statchk

Bureau Veritas ID: XNN667
Sample ID: BH9 SS5
Matrix: Soil

Collected: 2023/11/02
Shipped:
Received: 2023/11/07

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
1,3-Dichloropropene Sum	CALC	9035329	N/A	2023/11/10	Automated Statchk
Petroleum Hydrocarbons F2-F4 in Soil	GC/FID	9040689	2023/11/09	2023/11/10	(Kent) Maolin Li
Moisture	BAL	9036852	N/A	2023/11/08	Joe Thomas
Volatile Organic Compounds and F1 PHCs	GC/MSFD	9038768	N/A	2023/11/09	Dina Wang

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	2.0°C

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
9036852	JTS	RPD	Moisture	2023/11/08	1.3		%	20
9038396	JYO	Matrix Spike	D10-Anthracene	2023/11/10		94	%	50 - 130
			D14-Terphenyl (FS)	2023/11/10		94	%	50 - 130
			D8-Acenaphthylene	2023/11/10		89	%	50 - 130
			Acenaphthene	2023/11/10		95	%	50 - 130
			Acenaphthylene	2023/11/10		97	%	50 - 130
			Anthracene	2023/11/10		93	%	50 - 130
			Benzo(a)anthracene	2023/11/10		95	%	50 - 130
			Benzo(a)pyrene	2023/11/10		84	%	50 - 130
			Benzo(b/j)fluoranthene	2023/11/10		80	%	50 - 130
			Benzo(g,h,i)perylene	2023/11/10		88	%	50 - 130
			Benzo(k)fluoranthene	2023/11/10		80	%	50 - 130
			Chrysene	2023/11/10		91	%	50 - 130
			Dibenzo(a,h)anthracene	2023/11/10		87	%	50 - 130
			Fluoranthene	2023/11/10		92	%	50 - 130
			Fluorene	2023/11/10		97	%	50 - 130
			Indeno(1,2,3-cd)pyrene	2023/11/10		84	%	50 - 130
			1-Methylnaphthalene	2023/11/10		NC	%	50 - 130
			2-Methylnaphthalene	2023/11/10		NC	%	50 - 130
			Naphthalene	2023/11/10		89	%	50 - 130
			Phenanthrene	2023/11/10		100	%	50 - 130
			Pyrene	2023/11/10		91	%	50 - 130
9038396	JYO	Spiked Blank	D10-Anthracene	2023/11/09		95	%	50 - 130
			D14-Terphenyl (FS)	2023/11/09		98	%	50 - 130
			D8-Acenaphthylene	2023/11/09		73	%	50 - 130
			Acenaphthene	2023/11/09		93	%	50 - 130
			Acenaphthylene	2023/11/09		80	%	50 - 130
			Anthracene	2023/11/09		94	%	50 - 130
			Benzo(a)anthracene	2023/11/09		85	%	50 - 130
			Benzo(a)pyrene	2023/11/09		82	%	50 - 130
			Benzo(b/j)fluoranthene	2023/11/09		89	%	50 - 130
			Benzo(g,h,i)perylene	2023/11/09		95	%	50 - 130
			Benzo(k)fluoranthene	2023/11/09		92	%	50 - 130
			Chrysene	2023/11/09		93	%	50 - 130
			Dibenzo(a,h)anthracene	2023/11/09		87	%	50 - 130
			Fluoranthene	2023/11/09		97	%	50 - 130
			Fluorene	2023/11/09		92	%	50 - 130
			Indeno(1,2,3-cd)pyrene	2023/11/09		91	%	50 - 130
			1-Methylnaphthalene	2023/11/09		111	%	50 - 130
			2-Methylnaphthalene	2023/11/09		100	%	50 - 130
			Naphthalene	2023/11/09		89	%	50 - 130
			Phenanthrene	2023/11/09		92	%	50 - 130
			Pyrene	2023/11/09		98	%	50 - 130
9038396	JYO	Method Blank	D10-Anthracene	2023/11/09		94	%	50 - 130
			D14-Terphenyl (FS)	2023/11/09		96	%	50 - 130
			D8-Acenaphthylene	2023/11/09		69	%	50 - 130
			Acenaphthene	2023/11/09	<0.0050		ug/g	
			Acenaphthylene	2023/11/09	<0.0050		ug/g	
			Anthracene	2023/11/09	<0.0050		ug/g	
			Benzo(a)anthracene	2023/11/09	<0.0050		ug/g	
			Benzo(a)pyrene	2023/11/09	<0.0050		ug/g	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Benzo(b/j)fluoranthene	2023/11/09	<0.0050		ug/g	
			Benzo(g,h,i)perylene	2023/11/09	<0.0050		ug/g	
			Benzo(k)fluoranthene	2023/11/09	<0.0050		ug/g	
			Chrysene	2023/11/09	<0.0050		ug/g	
			Dibenzo(a,h)anthracene	2023/11/09	<0.0050		ug/g	
			Fluoranthene	2023/11/09	<0.0050		ug/g	
			Fluorene	2023/11/09	<0.0050		ug/g	
			Indeno(1,2,3-cd)pyrene	2023/11/09	<0.0050		ug/g	
			1-Methylnaphthalene	2023/11/09	<0.0050		ug/g	
			2-Methylnaphthalene	2023/11/09	<0.0050		ug/g	
			Naphthalene	2023/11/09	<0.0050		ug/g	
			Phenanthrene	2023/11/09	<0.0050		ug/g	
			Pyrene	2023/11/09	<0.0050		ug/g	
9038396	JYO	RPD	Acenaphthene	2023/11/09	26		%	40
			Acenaphthylene	2023/11/09	NC (1)		%	40
			Anthracene	2023/11/09	25		%	40
			Benzo(a)anthracene	2023/11/09	14		%	40
			Benzo(a)pyrene	2023/11/09	12		%	40
			Benzo(b/j)fluoranthene	2023/11/09	19		%	40
			Benzo(g,h,i)perylene	2023/11/09	10		%	40
			Benzo(k)fluoranthene	2023/11/09	NC		%	40
			Chrysene	2023/11/09	18		%	40
			Dibenzo(a,h)anthracene	2023/11/09	NC		%	40
			Fluoranthene	2023/11/09	35		%	40
			Fluorene	2023/11/09	30		%	40
			Indeno(1,2,3-cd)pyrene	2023/11/09	14		%	40
			1-Methylnaphthalene	2023/11/09	46 (2)		%	40
			2-Methylnaphthalene	2023/11/09	53 (2)		%	40
			Naphthalene	2023/11/09	NC (1)		%	40
			Phenanthrene	2023/11/09	29		%	40
			Pyrene	2023/11/09	19		%	40
9038768	DW5	Matrix Spike	4-Bromofluorobenzene	2023/11/09		98	%	60 - 140
			D10-o-Xylene	2023/11/09		100	%	60 - 130
			D4-1,2-Dichloroethane	2023/11/09		98	%	60 - 140
			D8-Toluene	2023/11/09		104	%	60 - 140
			Acetone (2-Propanone)	2023/11/09		94	%	60 - 140
			Benzene	2023/11/09		97	%	60 - 140
			Bromodichloromethane	2023/11/09		101	%	60 - 140
			Bromoform	2023/11/09		90	%	60 - 140
			Bromomethane	2023/11/09		106	%	60 - 140
			Carbon Tetrachloride	2023/11/09		86	%	60 - 140
			Chlorobenzene	2023/11/09		100	%	60 - 140
			Chloroform	2023/11/09		101	%	60 - 140
			Dibromochloromethane	2023/11/09		95	%	60 - 140
			1,2-Dichlorobenzene	2023/11/09		99	%	60 - 140
			1,3-Dichlorobenzene	2023/11/09		103	%	60 - 140
			1,4-Dichlorobenzene	2023/11/09		111	%	60 - 140
			Dichlorodifluoromethane (FREON 12)	2023/11/09		95	%	60 - 140
			1,1-Dichloroethane	2023/11/09		108	%	60 - 140
			1,2-Dichloroethane	2023/11/09		87	%	60 - 140
			1,1-Dichloroethylene	2023/11/09		101	%	60 - 140

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			cis-1,2-Dichloroethylene	2023/11/09		101	%	60 - 140
			trans-1,2-Dichloroethylene	2023/11/09		101	%	60 - 140
			1,2-Dichloropropane	2023/11/09		107	%	60 - 140
			cis-1,3-Dichloropropene	2023/11/09		92	%	60 - 140
			trans-1,3-Dichloropropene	2023/11/09		99	%	60 - 140
			Ethylbenzene	2023/11/09		82	%	60 - 140
			Ethylene Dibromide	2023/11/09		102	%	60 - 140
			Hexane	2023/11/09		104	%	60 - 140
			Methylene Chloride(Dichloromethane)	2023/11/09		107	%	60 - 140
			Methyl Ethyl Ketone (2-Butanone)	2023/11/09		104	%	60 - 140
			Methyl Isobutyl Ketone	2023/11/09		94	%	60 - 140
			Methyl t-butyl ether (MTBE)	2023/11/09		93	%	60 - 140
			Styrene	2023/11/09		101	%	60 - 140
			1,1,1,2-Tetrachloroethane	2023/11/09		99	%	60 - 140
			1,1,2,2-Tetrachloroethane	2023/11/09		112	%	60 - 140
			Tetrachloroethylene	2023/11/09		96	%	60 - 140
			Toluene	2023/11/09		92	%	60 - 140
			1,1,1-Trichloroethane	2023/11/09		90	%	60 - 140
			1,1,2-Trichloroethane	2023/11/09		97	%	60 - 140
			Trichloroethylene	2023/11/09		95	%	60 - 140
			Trichlorofluoromethane (FREON 11)	2023/11/09		91	%	60 - 140
			Vinyl Chloride	2023/11/09		111	%	60 - 140
			p+m-Xylene	2023/11/09		83	%	60 - 140
			o-Xylene	2023/11/09		78	%	60 - 140
			F1 (C6-C10)	2023/11/09		89	%	60 - 140
9038768	DW5	Spiked Blank	4-Bromofluorobenzene	2023/11/09		98	%	60 - 140
			D10-o-Xylene	2023/11/09		95	%	60 - 130
			D4-1,2-Dichloroethane	2023/11/09		95	%	60 - 140
			D8-Toluene	2023/11/09		105	%	60 - 140
			Acetone (2-Propanone)	2023/11/09		92	%	60 - 140
			Benzene	2023/11/09		96	%	60 - 130
			Bromodichloromethane	2023/11/09		98	%	60 - 130
			Bromoform	2023/11/09		88	%	60 - 130
			Bromomethane	2023/11/09		104	%	60 - 140
			Carbon Tetrachloride	2023/11/09		85	%	60 - 130
			Chlorobenzene	2023/11/09		101	%	60 - 130
			Chloroform	2023/11/09		99	%	60 - 130
			Dibromochloromethane	2023/11/09		93	%	60 - 130
			1,2-Dichlorobenzene	2023/11/09		101	%	60 - 130
			1,3-Dichlorobenzene	2023/11/09		105	%	60 - 130
			1,4-Dichlorobenzene	2023/11/09		115	%	60 - 130
			Dichlorodifluoromethane (FREON 12)	2023/11/09		96	%	60 - 140
			1,1-Dichloroethane	2023/11/09		107	%	60 - 130
			1,2-Dichloroethane	2023/11/09		85	%	60 - 130
			1,1-Dichloroethylene	2023/11/09		101	%	60 - 130
			cis-1,2-Dichloroethylene	2023/11/09		99	%	60 - 130
			trans-1,2-Dichloroethylene	2023/11/09		100	%	60 - 130
			1,2-Dichloropropane	2023/11/09		106	%	60 - 130
			cis-1,3-Dichloropropene	2023/11/09		89	%	60 - 130
			trans-1,3-Dichloropropene	2023/11/09		96	%	60 - 130
			Ethylbenzene	2023/11/09		84	%	60 - 130

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Ethylene Dibromide	2023/11/09		100	%	60 - 130
			Hexane	2023/11/09		103	%	60 - 130
			Methylene Chloride(Dichloromethane)	2023/11/09		105	%	60 - 130
			Methyl Ethyl Ketone (2-Butanone)	2023/11/09		101	%	60 - 140
			Methyl Isobutyl Ketone	2023/11/09		92	%	60 - 130
			Methyl t-butyl ether (MTBE)	2023/11/09		93	%	60 - 130
			Styrene	2023/11/09		103	%	60 - 130
			1,1,1,2-Tetrachloroethane	2023/11/09		99	%	60 - 130
			1,1,2,2-Tetrachloroethane	2023/11/09		110	%	60 - 130
			Tetrachloroethylene	2023/11/09		96	%	60 - 130
			Toluene	2023/11/09		94	%	60 - 130
			1,1,1-Trichloroethane	2023/11/09		89	%	60 - 130
			1,1,2-Trichloroethane	2023/11/09		96	%	60 - 130
			Trichloroethylene	2023/11/09		95	%	60 - 130
			Trichlorofluoromethane (FREON 11)	2023/11/09		91	%	60 - 130
			Vinyl Chloride	2023/11/09		111	%	60 - 130
			p+m-Xylene	2023/11/09		86	%	60 - 130
			o-Xylene	2023/11/09		81	%	60 - 130
			F1 (C6-C10)	2023/11/09		89	%	80 - 120
9038768	DW5	Method Blank	4-Bromofluorobenzene	2023/11/09		93	%	60 - 140
			D10-o-Xylene	2023/11/09		81	%	60 - 130
			D4-1,2-Dichloroethane	2023/11/09		98	%	60 - 140
			D8-Toluene	2023/11/09		95	%	60 - 140
			Acetone (2-Propanone)	2023/11/09	<0.49		ug/g	
			Benzene	2023/11/09	<0.0060		ug/g	
			Bromodichloromethane	2023/11/09	<0.040		ug/g	
			Bromoform	2023/11/09	<0.040		ug/g	
			Bromomethane	2023/11/09	<0.040		ug/g	
			Carbon Tetrachloride	2023/11/09	<0.040		ug/g	
			Chlorobenzene	2023/11/09	<0.040		ug/g	
			Chloroform	2023/11/09	<0.040		ug/g	
			Dibromochloromethane	2023/11/09	<0.040		ug/g	
			1,2-Dichlorobenzene	2023/11/09	<0.040		ug/g	
			1,3-Dichlorobenzene	2023/11/09	<0.040		ug/g	
			1,4-Dichlorobenzene	2023/11/09	<0.040		ug/g	
			Dichlorodifluoromethane (FREON 12)	2023/11/09	<0.040		ug/g	
			1,1-Dichloroethane	2023/11/09	<0.040		ug/g	
			1,2-Dichloroethane	2023/11/09	<0.049		ug/g	
			1,1-Dichloroethylene	2023/11/09	<0.040		ug/g	
			cis-1,2-Dichloroethylene	2023/11/09	<0.040		ug/g	
			trans-1,2-Dichloroethylene	2023/11/09	<0.040		ug/g	
			1,2-Dichloropropane	2023/11/09	<0.040		ug/g	
			cis-1,3-Dichloropropene	2023/11/09	<0.030		ug/g	
			trans-1,3-Dichloropropene	2023/11/09	<0.040		ug/g	
			Ethylbenzene	2023/11/09	<0.010		ug/g	
			Ethylene Dibromide	2023/11/09	<0.040		ug/g	
			Hexane	2023/11/09	<0.040		ug/g	
			Methylene Chloride(Dichloromethane)	2023/11/09	<0.049		ug/g	
			Methyl Ethyl Ketone (2-Butanone)	2023/11/09	<0.40		ug/g	
			Methyl Isobutyl Ketone	2023/11/09	<0.40		ug/g	
			Methyl t-butyl ether (MTBE)	2023/11/09	<0.040		ug/g	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Styrene	2023/11/09	<0.040		ug/g	
			1,1,1,2-Tetrachloroethane	2023/11/09	<0.040		ug/g	
			1,1,2,2-Tetrachloroethane	2023/11/09	<0.040		ug/g	
			Tetrachloroethylene	2023/11/09	<0.040		ug/g	
			Toluene	2023/11/09	<0.020		ug/g	
			1,1,1-Trichloroethane	2023/11/09	<0.040		ug/g	
			1,1,2-Trichloroethane	2023/11/09	<0.040		ug/g	
			Trichloroethylene	2023/11/09	<0.010		ug/g	
			Trichlorofluoromethane (FREON 11)	2023/11/09	<0.040		ug/g	
			Vinyl Chloride	2023/11/09	<0.019		ug/g	
			p+m-Xylene	2023/11/09	<0.020		ug/g	
			o-Xylene	2023/11/09	<0.020		ug/g	
			Total Xylenes	2023/11/09	<0.020		ug/g	
			F1 (C6-C10)	2023/11/09	<10		ug/g	
			F1 (C6-C10) - BTEX	2023/11/09	<10		ug/g	
9038768	DW5	RPD	Acetone (2-Propanone)	2023/11/09	NC		%	50
			Benzene	2023/11/09	NC		%	50
			Bromodichloromethane	2023/11/09	NC		%	50
			Bromoform	2023/11/09	NC		%	50
			Bromomethane	2023/11/09	NC		%	50
			Carbon Tetrachloride	2023/11/09	NC		%	50
			Chlorobenzene	2023/11/09	NC		%	50
			Chloroform	2023/11/09	NC		%	50
			Dibromochloromethane	2023/11/09	NC		%	50
			1,2-Dichlorobenzene	2023/11/09	NC		%	50
			1,3-Dichlorobenzene	2023/11/09	NC		%	50
			1,4-Dichlorobenzene	2023/11/09	NC		%	50
			Dichlorodifluoromethane (FREON 12)	2023/11/09	NC		%	50
			1,1-Dichloroethane	2023/11/09	NC		%	50
			1,2-Dichloroethane	2023/11/09	NC		%	50
			1,1-Dichloroethylene	2023/11/09	NC		%	50
			cis-1,2-Dichloroethylene	2023/11/09	NC		%	50
			trans-1,2-Dichloroethylene	2023/11/09	NC		%	50
			1,2-Dichloropropane	2023/11/09	NC		%	50
			cis-1,3-Dichloropropene	2023/11/09	NC		%	50
			trans-1,3-Dichloropropene	2023/11/09	NC		%	50
			Ethylbenzene	2023/11/09	NC		%	50
			Ethylene Dibromide	2023/11/09	NC		%	50
			Hexane	2023/11/09	NC		%	50
			Methylene Chloride(Dichloromethane)	2023/11/09	NC		%	50
			Methyl Ethyl Ketone (2-Butanone)	2023/11/09	NC		%	50
			Methyl Isobutyl Ketone	2023/11/09	NC		%	50
			Methyl t-butyl ether (MTBE)	2023/11/09	NC		%	50
			Styrene	2023/11/09	NC		%	50
			1,1,1,2-Tetrachloroethane	2023/11/09	NC		%	50
			1,1,2,2-Tetrachloroethane	2023/11/09	NC		%	50
			Tetrachloroethylene	2023/11/09	NC		%	50
			Toluene	2023/11/09	NC		%	50
			1,1,1-Trichloroethane	2023/11/09	NC		%	50
			1,1,2-Trichloroethane	2023/11/09	NC		%	50
			Trichloroethylene	2023/11/09	NC		%	50

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Trichlorofluoromethane (FREON 11)	2023/11/09	NC		%	50
			Vinyl Chloride	2023/11/09	NC		%	50
			p+m-Xylene	2023/11/09	NC		%	50
			o-Xylene	2023/11/09	NC		%	50
			Total Xylenes	2023/11/09	NC		%	50
			F1 (C6-C10)	2023/11/09	NC		%	30
			F1 (C6-C10) - BTEX	2023/11/09	NC		%	30
9039216	JJH	Matrix Spike [XNN664-01]	WAD Cyanide (Free)	2023/11/13		82	%	75 - 125
9039216	JJH	Spiked Blank	WAD Cyanide (Free)	2023/11/13		99	%	80 - 120
9039216	JJH	Method Blank	WAD Cyanide (Free)	2023/11/13	<0.01		ug/g	
9039216	JJH	RPD [XNN664-01]	WAD Cyanide (Free)	2023/11/13	NC		%	35
9040689	KLI	Matrix Spike	o-Terphenyl	2023/11/09		94	%	60 - 130
			F2 (C10-C16 Hydrocarbons)	2023/11/09		85	%	60 - 130
			F3 (C16-C34 Hydrocarbons)	2023/11/09		98	%	60 - 130
			F4 (C34-C50 Hydrocarbons)	2023/11/09		104	%	60 - 130
9040689	KLI	Spiked Blank	o-Terphenyl	2023/11/09		94	%	60 - 130
			F2 (C10-C16 Hydrocarbons)	2023/11/09		92	%	80 - 120
			F3 (C16-C34 Hydrocarbons)	2023/11/09		94	%	80 - 120
			F4 (C34-C50 Hydrocarbons)	2023/11/09		112	%	80 - 120
9040689	KLI	Method Blank	o-Terphenyl	2023/11/09		95	%	60 - 130
			F2 (C10-C16 Hydrocarbons)	2023/11/09	<10		ug/g	
			F3 (C16-C34 Hydrocarbons)	2023/11/09	<50		ug/g	
			F4 (C34-C50 Hydrocarbons)	2023/11/09	<50		ug/g	
9040689	KLI	RPD	F2 (C10-C16 Hydrocarbons)	2023/11/10	54 (3)		%	30
			F3 (C16-C34 Hydrocarbons)	2023/11/10	NC		%	30
			F4 (C34-C50 Hydrocarbons)	2023/11/10	NC		%	30
9041459	JWK	Matrix Spike	Hot Water Ext. Boron (B)	2023/11/10		90	%	75 - 125
9041459	JWK	Spiked Blank	Hot Water Ext. Boron (B)	2023/11/10		101	%	75 - 125
9041459	JWK	Method Blank	Hot Water Ext. Boron (B)	2023/11/10	<0.050		ug/g	
9041459	JWK	RPD	Hot Water Ext. Boron (B)	2023/11/10	0.29		%	40
9041494	KIT	Spiked Blank	Available (CaCl2) pH	2023/11/10		100	%	97 - 103
9041494	KIT	RPD	Available (CaCl2) pH	2023/11/10	0.62		%	N/A
9041584	MEN	Matrix Spike	Hot Water Ext. Boron (B)	2023/11/10		99	%	75 - 125
9041584	MEN	Spiked Blank	Hot Water Ext. Boron (B)	2023/11/10		101	%	75 - 125
9041584	MEN	Method Blank	Hot Water Ext. Boron (B)	2023/11/10	<0.050		ug/g	
9041584	MEN	RPD	Hot Water Ext. Boron (B)	2023/11/10	3.2		%	40
9041633	DT1	Matrix Spike	Acid Extractable Antimony (Sb)	2023/11/10		87	%	75 - 125
			Acid Extractable Arsenic (As)	2023/11/10		92	%	75 - 125
			Acid Extractable Barium (Ba)	2023/11/10		NC	%	75 - 125
			Acid Extractable Beryllium (Be)	2023/11/10		93	%	75 - 125
			Acid Extractable Boron (B)	2023/11/10		88	%	75 - 125
			Acid Extractable Cadmium (Cd)	2023/11/10		93	%	75 - 125
			Acid Extractable Chromium (Cr)	2023/11/10		95	%	75 - 125
			Acid Extractable Cobalt (Co)	2023/11/10		91	%	75 - 125
			Acid Extractable Copper (Cu)	2023/11/10		93	%	75 - 125
			Acid Extractable Lead (Pb)	2023/11/10		NC	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2023/11/10		90	%	75 - 125
			Acid Extractable Nickel (Ni)	2023/11/10		97	%	75 - 125
			Acid Extractable Selenium (Se)	2023/11/10		94	%	75 - 125
			Acid Extractable Silver (Ag)	2023/11/10		94	%	75 - 125

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Thallium (Tl)	2023/11/10		94	%	75 - 125
			Acid Extractable Uranium (U)	2023/11/10		97	%	75 - 125
			Acid Extractable Vanadium (V)	2023/11/10		96	%	75 - 125
			Acid Extractable Zinc (Zn)	2023/11/10		NC	%	75 - 125
			Acid Extractable Mercury (Hg)	2023/11/10		96	%	75 - 125
9041633	DT1	Spiked Blank	Acid Extractable Antimony (Sb)	2023/11/10		98	%	80 - 120
			Acid Extractable Arsenic (As)	2023/11/10		96	%	80 - 120
			Acid Extractable Barium (Ba)	2023/11/10		95	%	80 - 120
			Acid Extractable Beryllium (Be)	2023/11/10		96	%	80 - 120
			Acid Extractable Boron (B)	2023/11/10		93	%	80 - 120
			Acid Extractable Cadmium (Cd)	2023/11/10		97	%	80 - 120
			Acid Extractable Chromium (Cr)	2023/11/10		95	%	80 - 120
			Acid Extractable Cobalt (Co)	2023/11/10		94	%	80 - 120
			Acid Extractable Copper (Cu)	2023/11/10		95	%	80 - 120
			Acid Extractable Lead (Pb)	2023/11/10		98	%	80 - 120
			Acid Extractable Molybdenum (Mo)	2023/11/10		95	%	80 - 120
			Acid Extractable Nickel (Ni)	2023/11/10		97	%	80 - 120
			Acid Extractable Selenium (Se)	2023/11/10		101	%	80 - 120
			Acid Extractable Silver (Ag)	2023/11/10		99	%	80 - 120
			Acid Extractable Thallium (Tl)	2023/11/10		104	%	80 - 120
			Acid Extractable Uranium (U)	2023/11/10		101	%	80 - 120
			Acid Extractable Vanadium (V)	2023/11/10		93	%	80 - 120
			Acid Extractable Zinc (Zn)	2023/11/10		97	%	80 - 120
			Acid Extractable Mercury (Hg)	2023/11/10		100	%	80 - 120
9041633	DT1	Method Blank	Acid Extractable Antimony (Sb)	2023/11/10	<0.20		ug/g	
			Acid Extractable Arsenic (As)	2023/11/10	<1.0		ug/g	
			Acid Extractable Barium (Ba)	2023/11/10	<0.50		ug/g	
			Acid Extractable Beryllium (Be)	2023/11/10	<0.20		ug/g	
			Acid Extractable Boron (B)	2023/11/10	<5.0		ug/g	
			Acid Extractable Cadmium (Cd)	2023/11/10	<0.10		ug/g	
			Acid Extractable Chromium (Cr)	2023/11/10	<1.0		ug/g	
			Acid Extractable Cobalt (Co)	2023/11/10	<0.10		ug/g	
			Acid Extractable Copper (Cu)	2023/11/10	<0.50		ug/g	
			Acid Extractable Lead (Pb)	2023/11/10	<1.0		ug/g	
			Acid Extractable Molybdenum (Mo)	2023/11/10	<0.50		ug/g	
			Acid Extractable Nickel (Ni)	2023/11/10	<0.50		ug/g	
			Acid Extractable Selenium (Se)	2023/11/10	<0.50		ug/g	
			Acid Extractable Silver (Ag)	2023/11/10	<0.20		ug/g	
			Acid Extractable Thallium (Tl)	2023/11/10	<0.050		ug/g	
			Acid Extractable Uranium (U)	2023/11/10	<0.050		ug/g	
			Acid Extractable Vanadium (V)	2023/11/10	<5.0		ug/g	
			Acid Extractable Zinc (Zn)	2023/11/10	<5.0		ug/g	
			Acid Extractable Mercury (Hg)	2023/11/10	<0.050		ug/g	
9041633	DT1	RPD	Acid Extractable Antimony (Sb)	2023/11/10	6.2		%	30
			Acid Extractable Arsenic (As)	2023/11/10	2.9		%	30
			Acid Extractable Barium (Ba)	2023/11/10	4.9		%	30
			Acid Extractable Beryllium (Be)	2023/11/10	1.8		%	30
			Acid Extractable Boron (B)	2023/11/10	13		%	30
			Acid Extractable Cadmium (Cd)	2023/11/10	3.3		%	30
			Acid Extractable Chromium (Cr)	2023/11/10	2.6		%	30
			Acid Extractable Cobalt (Co)	2023/11/10	2.0		%	30

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Copper (Cu)	2023/11/10	3.0		%	30
			Acid Extractable Lead (Pb)	2023/11/10	1.1		%	30
			Acid Extractable Molybdenum (Mo)	2023/11/10	NC		%	30
			Acid Extractable Nickel (Ni)	2023/11/10	0.58		%	30
			Acid Extractable Selenium (Se)	2023/11/10	NC		%	30
			Acid Extractable Silver (Ag)	2023/11/10	NC		%	30
			Acid Extractable Thallium (Tl)	2023/11/10	5.3		%	30
			Acid Extractable Uranium (U)	2023/11/10	3.1		%	30
			Acid Extractable Vanadium (V)	2023/11/10	0.40		%	30
			Acid Extractable Zinc (Zn)	2023/11/10	3.0		%	30
			Acid Extractable Mercury (Hg)	2023/11/10	9.8		%	30
9041636	KIT	Spiked Blank	Available (CaCl2) pH	2023/11/10		100	%	97 - 103
9041636	KIT	RPD	Available (CaCl2) pH	2023/11/10	0.72		%	N/A
9041696	LKI	Spiked Blank	Conductivity	2023/11/10		103	%	90 - 110
9041696	LKI	Method Blank	Conductivity	2023/11/10	<0.002		mS/cm	
9041696	LKI	RPD	Conductivity	2023/11/10	2.4		%	10
9042145	JGC	Matrix Spike	Acid Extractable Antimony (Sb)	2023/11/10		88	%	75 - 125
			Acid Extractable Arsenic (As)	2023/11/10		93	%	75 - 125
			Acid Extractable Barium (Ba)	2023/11/10		NC	%	75 - 125
			Acid Extractable Beryllium (Be)	2023/11/10		95	%	75 - 125
			Acid Extractable Boron (B)	2023/11/10		95	%	75 - 125
			Acid Extractable Cadmium (Cd)	2023/11/10		91	%	75 - 125
			Acid Extractable Chromium (Cr)	2023/11/10		93	%	75 - 125
			Acid Extractable Cobalt (Co)	2023/11/10		89	%	75 - 125
			Acid Extractable Copper (Cu)	2023/11/10		89	%	75 - 125
			Acid Extractable Lead (Pb)	2023/11/10		94	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2023/11/10		91	%	75 - 125
			Acid Extractable Nickel (Ni)	2023/11/10		90	%	75 - 125
			Acid Extractable Selenium (Se)	2023/11/10		93	%	75 - 125
			Acid Extractable Silver (Ag)	2023/11/10		92	%	75 - 125
			Acid Extractable Thallium (Tl)	2023/11/10		93	%	75 - 125
			Acid Extractable Uranium (U)	2023/11/10		90	%	75 - 125
			Acid Extractable Vanadium (V)	2023/11/10		96	%	75 - 125
			Acid Extractable Zinc (Zn)	2023/11/10		NC	%	75 - 125
			Acid Extractable Mercury (Hg)	2023/11/10		91	%	75 - 125
9042145	JGC	Spiked Blank	Acid Extractable Antimony (Sb)	2023/11/10		95	%	80 - 120
			Acid Extractable Arsenic (As)	2023/11/10		94	%	80 - 120
			Acid Extractable Barium (Ba)	2023/11/10		97	%	80 - 120
			Acid Extractable Beryllium (Be)	2023/11/10		100	%	80 - 120
			Acid Extractable Boron (B)	2023/11/10		93	%	80 - 120
			Acid Extractable Cadmium (Cd)	2023/11/10		93	%	80 - 120
			Acid Extractable Chromium (Cr)	2023/11/10		92	%	80 - 120
			Acid Extractable Cobalt (Co)	2023/11/10		91	%	80 - 120
			Acid Extractable Copper (Cu)	2023/11/10		92	%	80 - 120
			Acid Extractable Lead (Pb)	2023/11/10		101	%	80 - 120
			Acid Extractable Molybdenum (Mo)	2023/11/10		92	%	80 - 120
			Acid Extractable Nickel (Ni)	2023/11/10		102	%	80 - 120
			Acid Extractable Selenium (Se)	2023/11/10		98	%	80 - 120
			Acid Extractable Silver (Ag)	2023/11/10		95	%	80 - 120
			Acid Extractable Thallium (Tl)	2023/11/10		98	%	80 - 120
			Acid Extractable Uranium (U)	2023/11/10		93	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Vanadium (V)	2023/11/10		91	%	80 - 120
			Acid Extractable Zinc (Zn)	2023/11/10		121 (2)	%	80 - 120
			Acid Extractable Mercury (Hg)	2023/11/10		96	%	80 - 120
9042145	JGC	Method Blank	Acid Extractable Antimony (Sb)	2023/11/10	<0.20		ug/g	
			Acid Extractable Arsenic (As)	2023/11/10	<1.0		ug/g	
			Acid Extractable Barium (Ba)	2023/11/10	<0.50		ug/g	
			Acid Extractable Beryllium (Be)	2023/11/10	<0.20		ug/g	
			Acid Extractable Boron (B)	2023/11/10	<5.0		ug/g	
			Acid Extractable Cadmium (Cd)	2023/11/10	<0.10		ug/g	
			Acid Extractable Chromium (Cr)	2023/11/10	<1.0		ug/g	
			Acid Extractable Cobalt (Co)	2023/11/10	<0.10		ug/g	
			Acid Extractable Copper (Cu)	2023/11/10	<0.50		ug/g	
			Acid Extractable Lead (Pb)	2023/11/10	<1.0		ug/g	
			Acid Extractable Molybdenum (Mo)	2023/11/10	<0.50		ug/g	
			Acid Extractable Nickel (Ni)	2023/11/10	<0.50		ug/g	
			Acid Extractable Selenium (Se)	2023/11/10	<0.50		ug/g	
			Acid Extractable Silver (Ag)	2023/11/10	<0.20		ug/g	
			Acid Extractable Thallium (Tl)	2023/11/10	<0.050		ug/g	
			Acid Extractable Uranium (U)	2023/11/10	<0.050		ug/g	
			Acid Extractable Vanadium (V)	2023/11/10	<5.0		ug/g	
			Acid Extractable Zinc (Zn)	2023/11/10	<5.0		ug/g	
			Acid Extractable Mercury (Hg)	2023/11/10	<0.050		ug/g	
9042145	JGC	RPD	Acid Extractable Antimony (Sb)	2023/11/10	NC		%	30
			Acid Extractable Arsenic (As)	2023/11/10	14		%	30
			Acid Extractable Barium (Ba)	2023/11/10	0.080		%	30
			Acid Extractable Beryllium (Be)	2023/11/10	1.2		%	30
			Acid Extractable Boron (B)	2023/11/10	0.76		%	30
			Acid Extractable Cadmium (Cd)	2023/11/10	NC		%	30
			Acid Extractable Chromium (Cr)	2023/11/10	0.71		%	30
			Acid Extractable Cobalt (Co)	2023/11/10	1.8		%	30
			Acid Extractable Copper (Cu)	2023/11/10	4.4		%	30
			Acid Extractable Lead (Pb)	2023/11/10	2.1		%	30
			Acid Extractable Molybdenum (Mo)	2023/11/10	NC		%	30
			Acid Extractable Nickel (Ni)	2023/11/10	2.8		%	30
			Acid Extractable Selenium (Se)	2023/11/10	NC		%	30
			Acid Extractable Silver (Ag)	2023/11/10	NC		%	30
			Acid Extractable Thallium (Tl)	2023/11/10	0.56		%	30
			Acid Extractable Uranium (U)	2023/11/10	9.8		%	30
			Acid Extractable Vanadium (V)	2023/11/10	0.64		%	30
			Acid Extractable Zinc (Zn)	2023/11/10	5.0		%	30
9045293	SB5	Matrix Spike [XNN664-01]	Chromium (VI)	2023/11/13		64 (4)	%	70 - 130
9045293	SB5	Spiked Blank	Chromium (VI)	2023/11/13		92	%	80 - 120
9045293	SB5	Method Blank	Chromium (VI)	2023/11/13	<0.18		ug/g	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
9045293	SB5	RPD [XNN664-01]	Chromium (VI)	2023/11/13	NC		%	35

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Detection Limit was raised due to matrix interferences.

(2) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

(3) Duplicate results exceeded RPD acceptance criteria for flagged analytes. Sample extract was reanalyzed with the same results. This is likely due to sample heterogeneity.

(4) The matrix spike recovery was below the lower control limit. This may be due in part to the reducing environment of the sample. The matrix spike was reanalyzed to confirm result.

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VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Cristina Carriere, Senior Scientific Specialist

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Rodney Major, General Manager responsible for Ontario Environmental laboratory operations.

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CHAIN OF CUSTODY RECORD

Page 1 of 1

INVOICE TO:	REPORT TO:	PROJECT INFORMATION:	Laboratory Use Only:
#3072	13R 0B8	marissa.Lusito@Stantec.com	
Company Name: #623 ~~Trans-Northern Pipelines Inc~~ Stantec Consulting Ltd LTD	Company Name: #15877 Stantec Consulting	Quotation #: ~~C13206~~	Bureau Veritas Job #: / Bottle Order #: 961731
Attention: Accounts Payable	Attention: ~~Trent Irwin~~ Marissa Lusito	P.O. #: ~~55875~~	
Address: ~~45 Vogell Rd Suite 310~~ 675 Cochrane Drive W #300 ~~Richmond Hill ON L4B 3P6~~ Markham ON L3R 0B8	Address: ~~200-835 Paramount Dr.~~ ~~Stoney Creek ON L8J 0B4~~	Project: ~~122120483~~ 121 140022.038	COC #: / Project Manager:
Tel: (905) ~~770-3353~~ 944 7777 Fax: (905) ~~770-8675~~	Tel: ~~(905) 381-3277~~ 905 944 7777 Fax:	Project Name:	C#961731-01-01 / Kudrat Bajwa
Email: ~~ap@inpi.ca~~ SAPinvoices@Stantec.com	Email: ~~Trent.Irwin@stantec.com~~; edd@stantec.com	Site #: Site B-1975 Muskoka Beach	
		Sampled By: Nathan Davenport	

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE BUREAU VERITAS DRINKING WATER CHAIN OF CUSTODY

Regulation 153 (2011)
- [ ] Table 1 [x] Res/Park [ ] Medium/Fine
- [x] Table 2 [ ] Ind/Comm [ ] Coarse
- [ ] Table 3 [ ] Agri/Other [ ] For RSC
- [ ] Table ___

Other Regulations
- [ ] CCME [ ] Sanitary Sewer Bylaw
- [ ] Reg 558. [ ] Storm Sewer Bylaw
- [ ] MISA Municipality ___
- [ ] PWQO [ ] Reg 406 Table ___
- [ ] Other ___

Special Instructions

Include Criteria on Certificate of Analysis (Y/N)? Y

Turnaround Time (TAT) Required:
Please provide advance notice for rush projects

Regular (Standard) TAT: [x]
(will be applied if Rush TAT is not specified):
Standard TAT = 5-7 Working days for most tests..
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
Date Required: ___ Time Required: ___ [ ]
Rush Confirmation Number: ___ *(call lab for #)*

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field-Filtered (please circle): Metals / Hg / Cr VI	ANALYSIS REQUESTED (PLEASE BE SPECIFIC): O.Reg 153 VOCs by HS & F1-F4 (PHCs) + Vec	CCME PAHs (Low Level)	Acid Extractable Lead by ICPMS	O. Reg PAHs 153	O. Reg 153 metals+inorganics	# of Bottles	Comments
1		BH6 SS1	2023/10/31	13:30	Soil	NA	✓			✓	✓	3	120, vial, 250
2		BH8 SS1	2023/11/02	10:15	↓		✓			✓	✓	3	120, vial, 250
3		BH9 SS2	2023/11/02	15:00		↓				✓	✓	2	250, 60
4		BH9 SS5	2023/11/02	15:55			✓					2	vial, 60
5													
6													
7													
8													
9													
10													

07-Nov-23 15:25
Kudrat Bajwa
C3Y9296
AJH ENV-1239

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted	Laboratory Use Only: Time Sensitive	Temperature (°C) on Recei	Custody Seal: Present / Intact	Yes	No
Nathan Davenport	23/11/06	17:20	RAJ MASANI	2023/11/07	1125	Q		2/2/2			

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/ENVIRONMENTAL-LABORATORIES/RESOURCES/COC-TERMS-AND-CONDITIONS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

** SAMPLE CONTAINER, PRESERVATION, HOLD TIME AND PACKAGE INFORMATION CAN BE VIEWED AT WWW.BVNA.COM/ENVIRONMENTAL-LABORATORIES/RESOURCES/CHAIN-CUSTODY-FORMS-COCS.

SAMPLES MUST BE KEPT COOL (< 10° C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

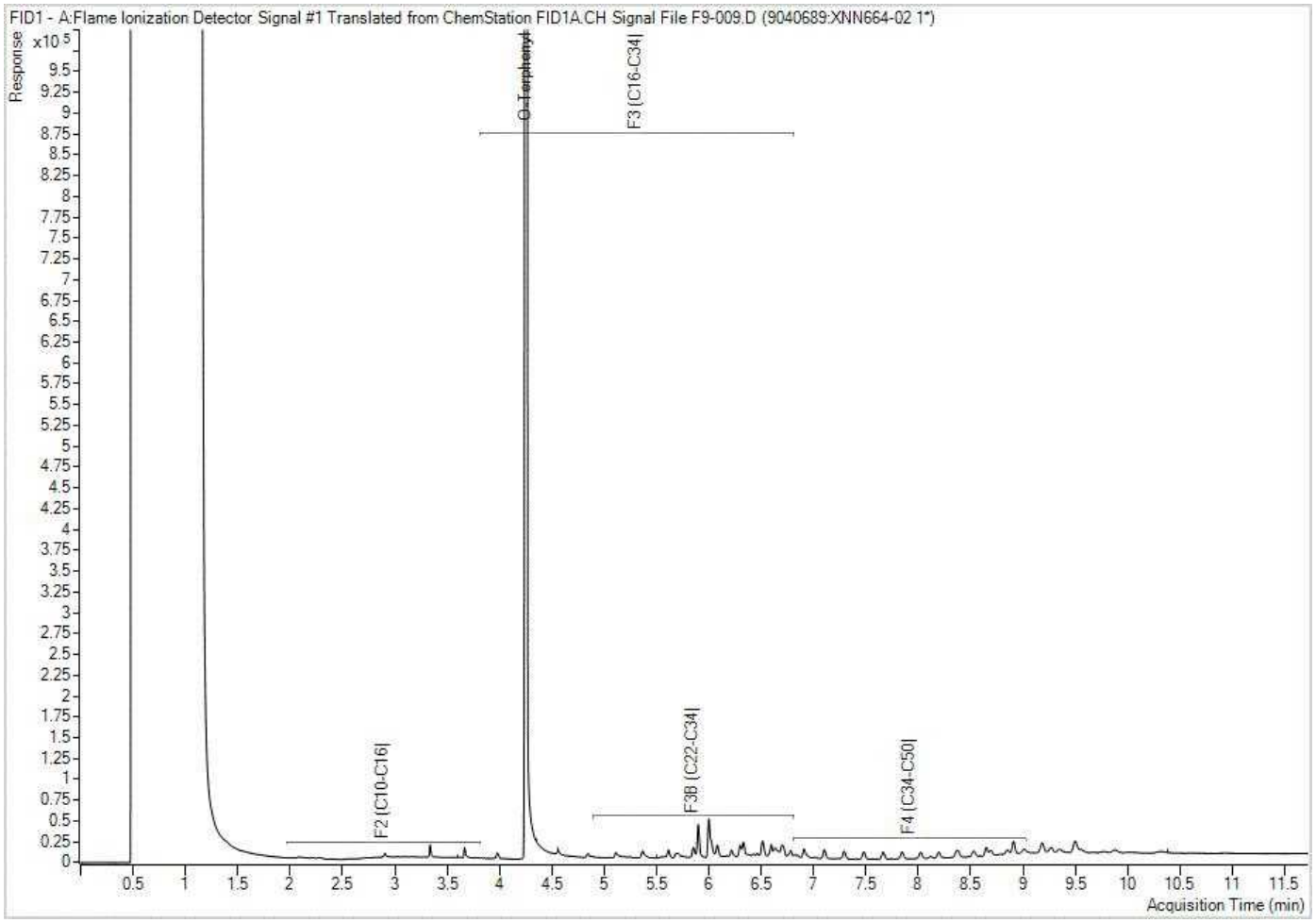
White: Bureau Veritas Yellow: Client

Bureau Veritas Canada (2019) Inc.

Bureau Veritas Job #: C3Y9296
Report Date: 2023/11/14
Bureau Veritas Sample: XNN664

Stantec Consulting Ltd
Client Project #: 140022038
Project name: SITE B-1975, MUSKOKA BEACH
Client ID: BH6 SS1

Petroleum Hydrocarbons F2-F4 in Soil Chromatogram

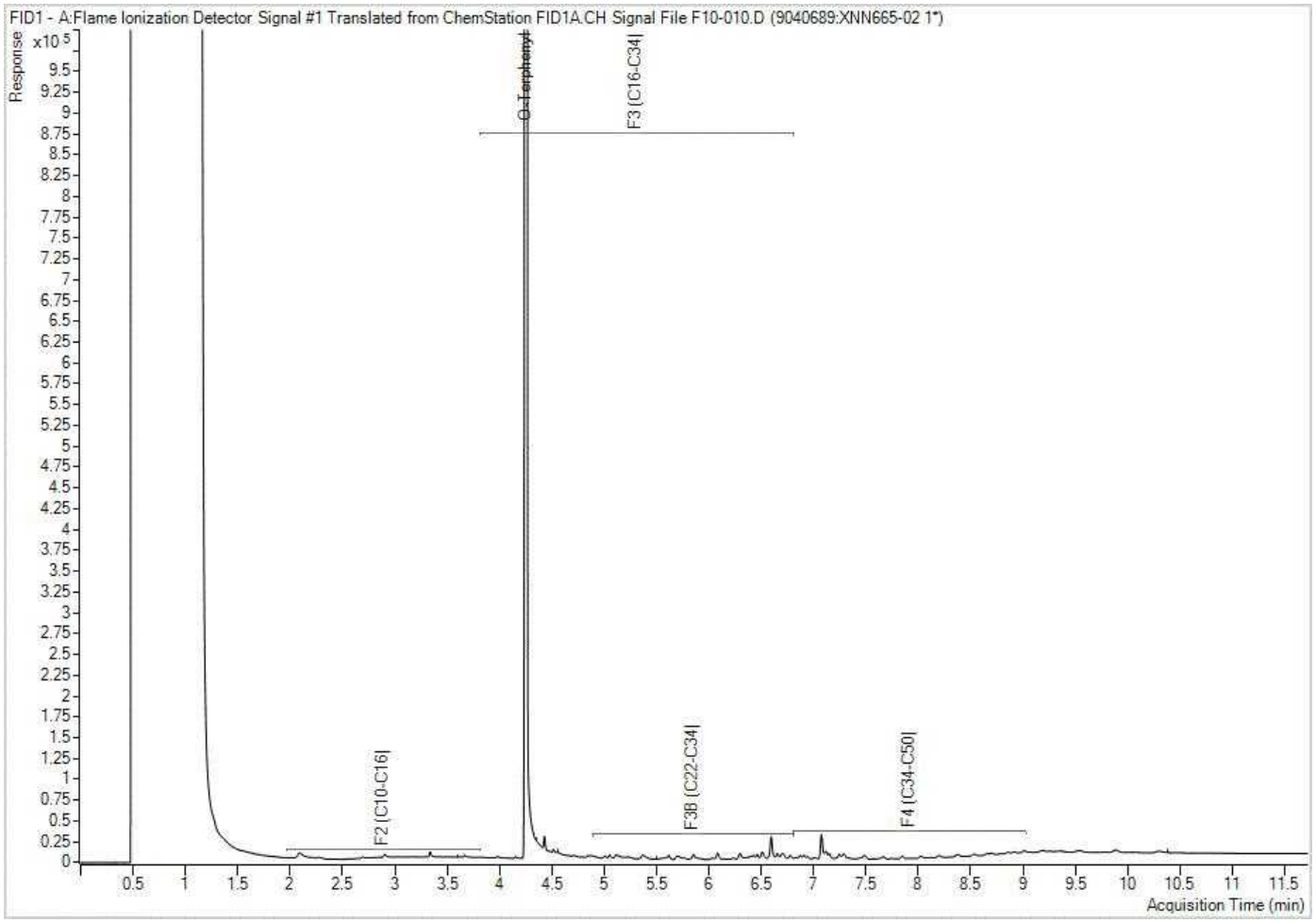


Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Bureau Veritas Job #: C3Y9296
Report Date: 2023/11/14
Bureau Veritas Sample: XNN665

Stantec Consulting Ltd
Client Project #: 140022038
Project name: SITE B-1975, MUSKOKA BEACH
Client ID: BH8 SS1

Petroleum Hydrocarbons F2-F4 in Soil Chromatogram

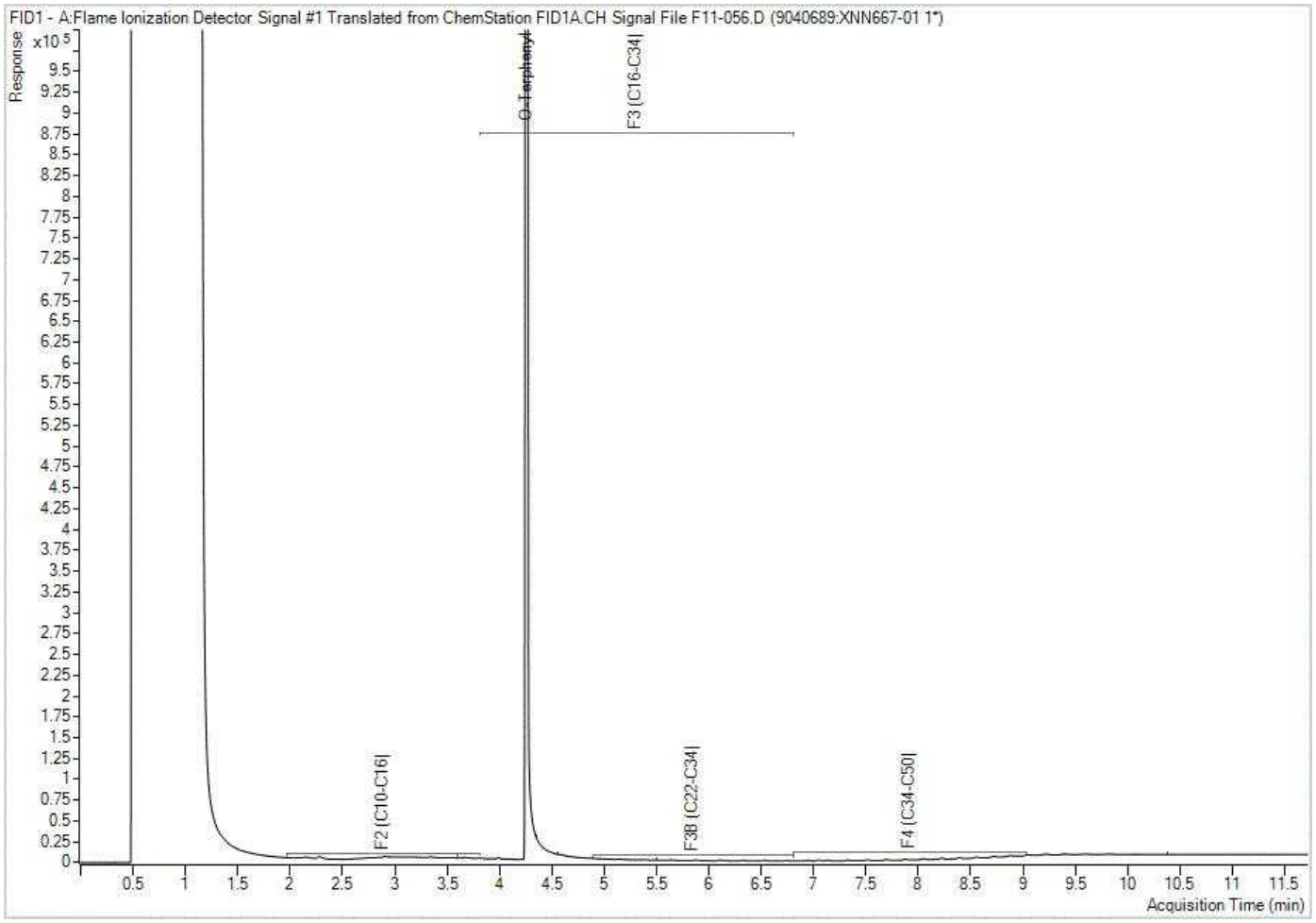


Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Bureau Veritas Job #: C3Y9296
Report Date: 2023/11/14
Bureau Veritas Sample: XNN667

Stantec Consulting Ltd
Client Project #: 140022038
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Petroleum Hydrocarbons F2-F4 in Soil Chromatogram



Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Stantec

Final Preliminary Due Diligence Geotechnical and Hydrogeological Investigation Report – Proposed Hospital at Site A – 300 Pine Street in Bracebridge, Ontario

November 14, 2024

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FINAL PRELIMINARY DUE DILIGENCE GEOTECHNICAL AND HYDROGEOLOGICAL INVESTIGATION REPORT – PROPOSED HOSPITAL AT SITE A – 300 PINE STREET IN BRACEBRIDGE, ONTARIO

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FINAL PRELIMINARY DUE DILIGENCE GEOTECHNICAL AND HYDROGEOLOGICAL INVESTIGATION REPORT – PROPOSED HOSPITAL AT SITE A – 300 PINE STREET IN BRACEBRIDGE, ONTARIO

The conclusions in the Report titled Preliminary Due Diligence Geotechnical and Hydrogeological Investigation Report – Proposed Hospital at Site A – 300 Pine Street in Bracebridge, Ontario are Stantec's professional opinion, as of the time of the Report, and concerning the scope described in the Report. The opinions in the document are based on conditions and information existing at the time the scope of work was conducted and do not take into account any subsequent changes. The Report relates solely to the specific project for which Stantec was retained and the stated purpose for which the Report was prepared. The Report is not to be used or relied on for any variation or extension of the project, or for any other project or purpose, and any unauthorized use or reliance is at the recipient's own risk.

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1.0 INTRODUCTION

Muskoka Algonquin Healthcare (MAHC) is going to construct a new hospital in Bracebridge, Ontario. It is understood that two Sites, located at 300 Pine Street ("Site A") and 1975 Muskoka Beach Road ("Site B"), are currently being considered for this purpose. The preferred Site will be selected at a later stage, based on the results of the due diligence investigation among other factors.

Stantec Consulting Ltd. (Stantec) was retained by MAHC to complete a due diligence level geotechnical investigation for the potential construction at both Sites to provide an overview of the subsurface conditions at the proposed area, and potential geotechnical issues or concerns associated with the proposed work. This report provides the results of the preliminary geotechnical investigation at 300 Pine Street in Bracebridge, Ontario ("Site A"). The results of the investigation for Site B are provided under separate cover.

It is also noted that further geotechnical investigation and/or assessment will be required for the selected Site once more information (i.e., Site grading plan, conceptual design, etc.) become available.

A test pit program was completed prior to the borehole drilling program to identify the bedrock depth across the project site in "Site A" under MAHC's instruction after receiving the authorization to proceed from MAHC, in order to support the Client for site selection. A total of ten (10) test pits were excavated beside the proposed borehole locations on October 25 and 26, 2023.

The borehole drilling program for the geotechnical investigation was completed in accordance with the proposal entitled "Fee Proposal for Professional Engineering Services, Muskoka Algonquin Healthcare – Preliminary Due Diligence," dated April 29, 2023.

Limitations associated with this report and its contents are provided in the statement of general conditions included in **Appendix A**.

2.0 PROPOSED NEW HOSPITAL AND SITE DESCRIPTION

2.1 SITE DESCRIPTION

The proposed Site A is located at 300 Pine Street, Bracebridge, Ontario.

The Site is located to the south-west of Highway 11 and Taylor Road and to the east of Cedar Lane. The Site is bounded by a hydro corridor to the north, Highway 11 to the east and south and industrial developments to the west. The Site is currently undeveloped, comprising predominantly of forest/wooded areas on most of east and southwest sections of the Site and a sand pit and an open area on northwest section of the Site. Bedrock outcrop was observed at multiple locations within the Site.

A conceptual site plan developed by Stantec indicated that the development will be located in the central section of the Site (in the forest area).

A topographical drawing of the Site prepared by Stantec and dated October 18, 2023 indicates that the topography at the location of the proposed building descends from approximately Elevation 283.5 m to the west to Elevation 275.0 m to the east, translating to an elevation difference of 8.5 m.

The site plan indicates that the forest area of the Site is at a higher elevation and is separated from the sand pit with a rock cliff as high as approximately 18 m. With the inclusion of the sand pit there is an elevation difference of approximately 26.8 m at the borehole locations ranging from approximately Elevations 255.2 m to 282.0 m.

2.2 PROPOSED DEVELOPMENT

The conceptual design for the proposed development is shown on the Borehole and Test Pit Location Plan drawing, Drawing 1 in **Appendix B**. The sketch indicates that the proposed development will include a new hospital building and associated service roads located in the northeast section of the Site in the existing forest area. No additional details for the development were known at the time of preparation of this report.

3.0 GEOLOGY REFERENCES AND SOURCES OF INFORMATION

3.1 OGS EARTH DATABASE

The Ontario Ministry of Northern Development and Mines (MNDM) has digitized geoscience data created from a variety of sources containing information about the physiography, surficial geology Paleozoic geology and geotechnical boreholes in the province of Ontario.

3.2 MTO GEOCRES FOUNDATION LIBRARY

The Ministry of Transportation of Ontario (MTO) Geocres Foundation Library is an online collection of reports obtained by the Ministry. The reports include information on borehole locations, groundwater conditions, and overburden & rock stratigraphy encountered during drilling for a variety of MTO projects (e.g. highways, interchanges, culverts, bridges, and similar). The reports include data interpretation and recommendations for use in design and construction.

3.3 MECP WELL WATER RECORDS

The Ministry of the Environment, Conservation and Parks (MECP) water well records (WWRs) database includes information on water well locations, groundwater conditions, and overburden & rock stratigraphy encountered during drilling. The MECP WWRs largely include domestic supply wells, municipal supply wells, and ground water monitoring wells. From a geotechnical perspective, the water well records are considered a low-quality dataset. However, the volume of information is extremely useful in understanding “general trends” in the subsurface conditions.

4.0 REGIONAL GEOLOGICAL CONDITIONS

4.1 OVERBURDEN

The Physiography of Southern Ontario by Chapman and Putnam (1984) indicates that the Site is located within a region known as Number 11 Strip, located within the wider Algonquin Highlands region. The map also indicates that the overburden at the Site consists of sand plains.

The Surficial Geology of Southern Ontario mapping data (MRD128-Revised, 2003) indicates that the overburden at the Site consists predominantly of coarse-textured glaciolacustrine deposits (sand, gravel, minor silt and clay). However, zones of ice-contact stratified deposits (sand and gravel, minor silt, clay and till) and Precambrian bedrock are present in the middle sections of the Site.

The Quaternary Geology of Ontario Southern Sheet (Map 2556) indicates that the overburden at the Site location is underlain by Glaciofluvial outwash deposits which described as Pleistocene (gravel and sand, includes proglacial river and deltaic deposits).

A review of the OGS Geotechnical Boreholes database did not yield any records in proximity of the proposed Site.

A review of the MTO Geocres Foundation Library yielded four (4) reports within 800 m of the proposed Site. The reports have little relevance with the current investigation to the proposed Hospital Site given the shallow bedrock encountered at Site.

A review of the MECP water well database identified nine (9) well records with recorded stratigraphy in proximity to the proposed Site. The depths of the wells ranged from 33.5 m to 97.6 m below ground surface. The well records generally indicate presence of sand, clay underlain by bedrock.

4.2 BEDROCK

The Bedrock Geology of Ontario, Southern Sheep Map 2544 indicates that the underlying bedrock at the Site consists mainly of migmatitic rocks and gneisses of undetermined protolith that is commonly layered biotite gneisses and migmatites; locally includes quartzofeldspathic gneisses, orthogneisses, paragneisses.

MECP water well records referenced above recorded the presence of bedrock at depths ranged from approximately 10.7 m to 81.4 m below ground surface.

4.3 GROUNDWATER

The MECP water well records referenced above indicated static water level recorded at depths of 9.1 m to 30.5 m below grade.

5.0 METHOD OF INVESTIGATION

5.1 FIELD INVESTIGATION

Prior to commencing the field investigation, Stantec contacted Ontario One Call to confirm the location of public services and utilities and retained the services of a private utility locate company, Premier Locates, to provide additional utility locate clearances at the intended borehole locations.

At the beginning of the investigation, ten (10) test pits, identified as TP-1 to TP-10, were advanced at the Site to depths ranging from approximately 0.5 m to 4.0 m below grade. The test pits were advanced on October 25 and 26, 2023, prior to the borehole drilling, using a CAT 305E excavator; supplied and operated by Wes Finch & Sons Excavating Ltd. Stantec field personnel recorded the conditions encountered in the test pits. These test pits were advanced near the same numbered boreholes to check the possible bedrock depth. The test pit records indicated almost similar type of materials encountered that recorded in the boreholes. The test pit logs are presented in **Appendix C**.

After the test pitting program, ten (10) boreholes, identified as BH PI-1 to BH PI-10, were drilled at the Site to depths ranging from approximately 0.2 m to 9.8 m below grade. The boreholes were advanced between November 3 to 10, 2023, using a track-mounted drill rig equipped with hollow stem augers; supplied and operated by Walker Drilling Ltd. Stantec field personnel recorded the conditions encountered in the boreholes.

Soil samples were recovered using a 50 mm (outside diameter) split-barrel sampler by conducting Standard Penetration Tests (SPTs) in accordance with the procedures outlined in ASTM D1586. Soil samples were collected at regular intervals. All soil samples recovered from the boreholes were placed in moisture-proof bags.

Field vane shear tests using MTO 'N' vane were performed in the cohesive soils encountered in boreholes BHMW PI-3, BH PI-8 and BHMW PI-9 in accordance with ASTM D2573.

Pocket penetrometer tests were also carried out on selected cohesive soil samples in the field.

Bedrock was inferred based on spoon refusal in boreholes BHMW PI-1, BH PI-2, BH PI-5, BH PI-6, BH PI-7, BH PI-8 and BHMW PI-9, and was cored in BH PI-10 using HQ size rock coring equipment in accordance with the procedures outlined in ASTM D2113. Total Core Recovery (TCR), Solid Core Recovery (SCR) and Rock Quality Designation (RQD) were recorded in the field. Rock samples recovered from the borehole were placed in wooden core box.

Soil samples that remained after environmental sampling and all rock cores were returned to Stantec's geotechnical and construction materials testing laboratory and warehouse facility in Markham, ON.

Three (3) 50 mm diameter groundwater monitoring wells were installed in boreholes BHMW PI-1, BHMW PI-3 and BHMW PI-9. The screen depths relative to the ground surface are noted on the borehole records included in **Appendix C**.

Groundwater conditions were recorded in all monitoring wells and are reported below in Section 6.5 of this report.

Boreholes (without monitoring wells) were backfilled with both soil cuttings and bentonite consistent with the requirements of the MECP Regulation 903.

5.2 SURVEYING

A topographic survey was completed by Stantec Geomatic Team, and the borehole and monitoring well locations and respective ground surface elevations were also surveyed by Stantec Geomatic Team. The approximate Universal Transverse Mercator (NAD83 UTM, Zone 17) northing and easting coordinates and respective ground surface elevations are provided in Table 5.1 below. The termination depth and elevation of each of the boreholes are also provided in the table for reference.

Table 5.1: Borehole Locations Summary

Borehole No.	UTM Coordinates (NAD83 - Zone 17)		Ground Surface Elevation (m)	Termination Depth (m)	Termination Elevation (m)
	Northing	Easting			
BHMW PI-1	4989237	634441	271.5	9.3	262.2
BH PI-2	4989095	634484	255.2	9.2	246.0
BHMW PI-3	4988926	634481	262.5	9.7	252.8
BH PI-4	4988811	634578	256.3	9.8	246.5
BH PI-5[1]	4989339	634594	279.4	3.8	275.6
BH PI-6	4989255	634655	276.2	0.2	276
BH PI-7	4989144	634626	277.5	1.9	275.6
BH PI-8	4989099	634686	273.4	5.0	268.4
BHMW PI-9[1]	4989008	634685	271.8	7.8	264.0
BH PI-10[1]	4989225	634554	282.0	3.5	278.5

Note:
1. The coordinates of BH PI-5, BHMW PI-9 and BH PI-10 were approximate based on the surveyed coordinates of nearby boreholes, and the ground surface elevations of these boreholes were inferred from the topographic drawing.

The borehole coordinates are also shown on the borehole records in **Appendix C** for reference.

5.3 LABORATORY TESTING

Soil (remaining after environmental sampling) and rock samples from the boreholes were subjected to visual and tactile examination on return to the Stantec's geotechnical and construction materials testing laboratory.

The laboratory testing program completed on selected samples consisted of the following:

- Gradation Analysis 9 samples
- Atterberg Limits 4 samples
- Moisture Content 60 samples

Results of the tests are indicated on the Borehole Records in **Appendix C** and are illustrated on the figures in **Appendix D.**

Samples remaining after testing were placed in storage and will be retained for a period of three months after the date of issue of the final report for this project. After the storage period, the samples will be discarded.

6.0 RESULTS OF INVESTIGATION

6.1 FRAME OF REFERENCE

6.1.1 Overburden

The soils encountered in the boreholes and reported herein have been classified in accordance with the Unified Soil Classification System as defined in ASTM D2487 and D2488, with modifications consistent with the methods of the MTO. The modifications specifically include the removal of the descriptions “lean” and “fat” with reference to clay soils and include a “Medium” category with respect to plasticity.

It should be noted that the internal diameter (I.D.) of the SPT sampler is 38 mm and hence the grain size test results and soil classifications may not reflect the entire gravel size fraction which extends to 75 mm diameter. The presence of cobbles (particles from 75 mm to 200 mm) and boulders (particles > 200 mm) where inferred to be present are described separately from the gravel content.

6.2 OVERVIEW

In general, the stratigraphy encountered in the boreholes and test pits consisted of:

- Ground surface cover consisting of topsoil and grass (in all boreholes except BHMW PI-1 and BH PI-2); underlain by,
- Cohesionless fill (in boreholes BHMW PI-1, BH PI-2 and BHMW PI-3); underlain by,
- Cohesive fill (in borehole BHMW PI-3); underlain by,
- Upper very loose to very dense silty sand to sandy silt, silty clayey sand to silty sand and silty sand to sand (in all boreholes except BHMW PI-1 and BH PI-6); underlain by,
- Soft to firm silty clay to clay (in boreholes BHMW PI-3, BH PI-8 and BHMW PI-9); underlain by,
- Lower dense to very dense silty sand (in borehole BHMW PI-3) and loose to compact sandy silt (in boreholes BH PI-8 and BHMW PI-9); underlain by,
- Bedrock inferred at depths of 0.2 m to 9.3 m below grade (BHMW PI-1, BH PI-2, BH PI-5, BH PI-6, BH PI-7, BH PI-8 and BHMW PI-9), and cored at a depth of 2.1 m (BH PI-10) below grade.

Groundwater level could not be measured in open borehole in BH PI-10 due to rock coring. Boreholes BH PI-2, BH PI-6 and BH PI-7 were dry upon completion. Groundwater levels were measured in open boreholes at depths of approximately 2.1 m, 2.3 m and 2.1 m below grade corresponding to approximately elevations 254.2 m, 277.1 m and 271.3 m in boreholes BH PI-4, BH PI-5 and BH PI-8, respectively.

Groundwater levels were recorded at depths of 8.7 m and 6.1 m below grade, corresponding to approximately elevations 253.8 m and 265.7 m in the monitoring wells installed in boreholes BHMW PI-3 and BHMW PI-9, respectively on November 10th, 2023. The groundwater levels were recorded at the

depths of 9.0 m and 6.9 m below grade, corresponding to approximately elevations 253.5 m and 264.9 m in the monitoring wells installed in boreholes BHMW PI-3 and BHMW PI-9, respectively on November 20th, 2023. Borehole BHMW PI-1 was dry on November 20th, 2023.

The subsurface conditions observed in the boreholes are presented in detail on the Borehole Records provided in **Appendix C**. An explanation of the symbols and terms used to describe the Borehole Records is also provided in **Appendix C**.

A fence diagram illustrating the soil conditions encountered in the boreholes is provided in **Appendix B** as well.

6.3 OVERBURDEN

6.3.1 Ground Surface Cover

Topsoil was present at all borehole locations except boreholes BHMW PI-1, BH PI-2 and BHMW PI-3. The topsoil was approximately 50 mm to 200 mm thick. Borehole BH PI-6 was terminated at a depth of approximately 0.2 m below grade, corresponding to approximately elevation 276.0 m due to spoon and auger refusals on inferred bedrock.

6.3.2 Cohesionless Fill

Cohesionless fill materials consisting of dark brown to brown silty sand to silty sand with gravel, brown to grey gravel with sand to gravel were encountered in boreholes BHMW PI-1, BH PI-2 and BHMW PI-3. Samples obtained from the cohesionless fill layer typically contained trace rootlets and trace wood debris.

The cohesionless fill layer was approximately 9.3 m (BHMW PI-1) to 0.8 m (BH PI-2 and BHMW PI-3) thick and extended to depths ranging from approximately 0.8 m to 9.3 m below grade, corresponding to approximately elevations 254.4 m to 262.2 m. The cohesionless soils encountered in boreholes BHMW PI-1 and BHMW PI-3 are considered to be fill materials, due to the high percentage of gravel component encountered in overburden. Borehole BHMW PI-1 was terminated in this stratum at 9.3 m below grade due to refusal on inferred bedrock.

The cohesionless fill layer was also encountered at TP-1 and TP-3 locations and extended to depths ranging from approximately 1.8 m to 1.2 m below grade, respectively.

The N-values obtained from the SPTs advanced in the cohesionless fill materials ranged from 2 to 22, indicating that the cohesionless fill is in a very loose to compact condition.

Based on visual and tactile examination of the samples, the cohesionless fill material was characterized as moist to wet. The moisture contents of the samples tested ranged from approximately 1% to 12%, averaging 8%.

A grain size distribution test was completed on a single sample of the cohesionless fill. The result of the test is shown in Table 6.1 below.

Table 6.1: Grain Size Distribution – Cohesionless Fill

Borehole	Sample	Depth (m)	Description	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
BHMW PI-1	SS4	2.6	Possible FILL: GRAVEL with Sand (GP)	55	40	4	1

The grain size distribution test result is shown on the borehole record in **Appendix C** and is illustrated on Figure 1 in **Appendix D**.

In accordance with the Unified Soil Classification System, the sample tested can be classified as Gravel with Sand (GP).

6.3.3 Cohesive Fill

A stratum of brown possible cohesive fill was encountered below the cohesionless fill described in the preceding section in borehole BHMW PI-3. This cohesive fill stratum was described as brown colored sandy clay, and typically contained trace gravel. The cohesive fill layer was approximately 0.7 m thick and extended to a depth of approximately 1.5 m below grade, corresponding to approximately elevation 261.0 m.

The N-value obtained from the SPT advanced in the cohesive fill material was 3, indicating a soft consistency.

Based on visual and tactile examination of the sample, the cohesive fill material was characterized as moist. The moisture content of a sample tested was approximately 31%.

A grain size distribution test was completed on one sample of the cohesive fill. The result of the test is shown in Table 6.2 below.

Table 6.2: Grain Size Distribution – Cohesive Fill

Borehole	Sample	Depth (m)	Description	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
BHMW PI-3	SS2	1.1	Possible FILL: Sandy CLAY (CL)	4	46	17	33

The grain size distribution test result is shown on the borehole record in **Appendix C** and is illustrated on Figure 2 in **Appendix D**.

An Atterberg Limits test was conducted on the sample referenced above. The test results are summarized in Table 6.3 below.

Table 6.3: Atterberg Limits Test – Cohesive Fill

Borehole	Sample	Depth (m)	Description	Moisture Content (%)	Liquid Limit	Plastic Limit	Plasticity Index
BHMW PI-3	SS2	1.1	Possible FILL: Sandy CLAY (CL)	31	29	14	15

The results of the Atterberg Limits test are shown on the borehole record in **Appendix C** and are illustrated on Figure 3 in **Appendix D.**

In accordance with the Unified Soil Classification System, the sample tested can be classified as Sandy Clay (CL).

6.3.4 Upper Sand to Silty Sand to Sandy Silt, Silty Clayey Sand to Silty Sand

A stratum of native brown cohesionless soil (sand to silty sand to sandy silt and silty clayey sand to silty sand) was encountered below the cohesionless fill described in the preceding section in borehole BH PI-2, below the cohesive fill described in the preceding section in borehole BHMW PI-3 and below the topsoil in boreholes BH PI-4 to BH PI-10 (except in borehole BH PI-6). Brown to grey colored silty sand to sandy silt was noted in BH PI-10.

The upper native cohesionless stratum extended to depths ranging from 1.5 m (BH PI-8) to 9.8 m (BH PI-4) below existing grade (Elevations ranging from 246.0 m to 279.9 m). Four (4) boreholes were terminated in this stratum. Borehole BH PI-4 was terminated in this stratum at a depth of approximately 9.8 m corresponding to elevation 246.5 m. Boreholes BH PI-2, BH PI-5 and BHPI-7 were terminated in this stratum at a depth of approximately 9.2 m, 3.8 m, and 1.9 m below grade, respectively, due to refusal on inferred bedrock.

Trace to some gravel and trace clay were noted in the samples obtained from this stratum. Possible cobbles or boulder were inferred in the samples of this stratum in borehole BH PI-2 due to a sampling refusal. One of the spoon samples at approximately 1.1 m depth of this stratum in borehole BH PI-5 contains organic matters.

The upper native cohesionless stratum was also encountered at all test pit locations, except TP-1 and TP-7 below topsoil or fill and extended to depths ranging from approximately 0.5 m to 3.7 m below grade.

The N-values obtained from the SPTs advanced in this stratum ranged from 2 to refusal (in excess of 50 blows/0.3 m), indicating very loose to very dense compactness conditions. The refusal was encountered in boreholes BH PI-2 and BH PI-7 due to possible cobbles or boulder above the bedrock surface and may have been influenced by the presence of bedrock. In this respect, the stratum can be considered to be generally in a very loose to dense condition.

Based on visual and tactile examination of the samples, these soils were assessed as moist to wet. The moisture content of the samples tested ranged from approximately 4% to 26%, averaging 14%.

Grain size distribution tests were completed on four (4) samples of the stratum. The results of the tests are shown in Table 6.4 below.

Table 6.4: Grain Size Distribution – Upper Native Cohesionless Soils

Borehole	Sample	Depth (m)	Description	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
BH PI-2	SS7	6.4	SAND with Silt and Gravel (SW-SM)	27	65	7	1
BH PI-4	SS8	7.9	Silty SAND (SM)	0	74	20	6
BH PI-5	SS5	3.4	SAND (SP)	0	96	3	1
BH PI-7	SS3	1.8	Silty SAND (SM)	9	70	19	2

The grain size distribution test results are shown on the borehole records in **Appendix C** and are illustrated on Figure 1 in **Appendix D**.

In accordance with the Unified Soil Classification System, the samples tested can be classified as Sand with Silt and Gravell (SW-SM), Silty Sand (SM) and Sand (SP).

6.3.5 Silty Clay to Clay

A stratum of native brown to grey silty clay to clay was encountered underlying the native cohesionless soils described in the preceding section in boreholes BHMW PI-3, BH PI-8 and BHMW PI-9. The samples of this layer were typically sandy or contained trace to some sand. This silty clay to silty clay stratum was approximately 2.3 m (BH PI-8) to 3.1 m (BHMW PI-9) thick and extended to depths approximately 7.6 m, 3.8 m and 6.1 m below grade, corresponding to elevations 254.9 m, 269.6 m and 265.7 m, respectively in boreholes BHMW PI-3, BH PI-8, BHMW PI-9.

The silty clay to clay layer was also encountered at test pit locations of TP-8 and TP-9 below silty sand to sandy silt layer and extended to the depths approximately 2.7 m to 4.0 m below grade, respectively.

The N-values obtained from the SPTs advanced in the silty clay to clay soils ranged from 2 to 7, based on this range the consistency of this soil can be interpreted as soft to firm. Shear vane tests using MTO N-vane were also performed in this soil layer during the field investigation to measure the undrained shear strength of the soil. A summary of the results is provided in Table 6.5.

Table 6.5: Field Shear Vane Test Results – Native Cohesive Soils

Borehole	Depth (m)	Sample Material	Undrained Shear Strength (kPa)	Sensitivity
BHMW PI-3	5.5	Silty CLAY (CL-ML) to CLAY (CL)	45	1.6
BHMW PI-3	7.0	Silty CLAY (CL-ML) to CLAY (CL)	38	2.7
BH PI-8	3.2	Silty CLAY (CL-ML) to CLAY (CL)	45	1.8
BHMW PI-9	4.0	Silty CLAY (CL-ML) to CLAY (CL)	24	2.0
BHMW PI-9	5.5	Silty CLAY (CL-ML) to CLAY (CL)	18	1.8

Based on visual and tactile examination of the samples, the cohesive soils were assessed as moist to wet. The moisture contents of the samples tested ranged from approximately 22% to 56%, averaging 41%. The higher moisture content of approximately 56% was noted in the cohesive stratum in boreholes BHMW PI-3 and BHMW PI-9.

Grain size distribution tests were completed on two (2) samples of the native cohesive stratum. The results of the tests are shown in Table 6.6 below.

Table 6.6: Grain Size Distribution – Native Cohesive Soils

Borehole	Sample	Depth (m)	Description	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
BHMW PI-3	SS6	4.9	Sandy Silty CLAY (CL-ML)	0	41	46	13
BH PI-8	SS3	1.8	CLAY with Sand (CL)	0	24	35	41

The grain size distribution test results are shown on the borehole records in **Appendix C** and are illustrated on Figure 2 in **Appendix D**.

Atterberg Limits tests were conducted on the samples referenced above. The test results are summarized in Table 6.7 below.

Table 6.7: Atterberg Limits Test – Native Cohesive Soils

Borehole	Sample	Depth (m)	Description	Moisture Content (%)	Liquid Limit	Plastic Limit	Plasticity Index
BHMW PI-3	SS6	4.9	Sandy Silty CLAY (CL-ML)	22	19	15	4
BH PI-8	SS3	1.8	CLAY with Sand (CL)	31	32	16	16

The results of the Atterberg Limits tests are shown on the borehole records in **Appendix C** and are illustrated on Figure 3 in **Appendix D.**

In accordance with the Unified Soil Classification System, the samples tested can be classified as Sandy Silty Clay (CL-ML) and Clay with Sand (CL).

6.3.6 Lower Silty Sand and Sandy Silt

A stratum of native brown silty sand was encountered below the native cohesive soils described in the preceding section in borehole BHMW PI-3. Samples obtained from the lower silty sand stratum typically contained trace to some gravel. Borehole BHMW PI-3 was terminated in this stratum at depth approximately 9.7 m below grade, corresponding to elevation 252.8 m.

A stratum of native brown to grey sandy silt was encountered below the native cohesive soil described in the preceding section in boreholes BH PI-8 and BHMW PI-9. Samples obtained from the lower sandy silt

stratum typically contained trace clay. Boreholes BH PI-8 and BHMW PI-9 were terminated in this stratum at depths of approximately 5.0 m and 7.8 m below grade, corresponding to elevations 268.4 m and 264.0 m, respectively.

The N-values obtained from the SPTs advanced in the lower silty sand soil were 44 and 74, indicating a dense to very dense compactness condition. And the N-values obtained from the SPTs advanced in the lower sandy silt soil were 8 and 12, indicating loose to compact compactness condition.

Based on visual and tactile examination of the samples, these soils were assessed as moist to wet. The moisture contents of the samples tested ranged from approximately 4% to 26%, averaging 18%. The higher moisture content of approximately 26% was noted in borehole BH PI-8 and lower moisture content of approximately 4% was noted in borehole BHMW PI-3.

No grain size distribution and Atterberg Limits tests were completed on the lower native silty sand stratum.

A grain size distribution test was completed on a single sample of the silt/sandy silt stratum. The result of the test is shown in Table 6.8 below.

Table 6.8: Grain Size Distribution – Silt

Borehole	Sample	Depth (m)	Description	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
BHMW PI-9	SS7	6.4	SILT (ML)	0	3	91	6

The grain size distribution test result is shown on the borehole record in **Appendix C** and are illustrated on Figure 2 in **Appendix D**.

An Atterberg Limits test was conducted on the sample referenced above. The test results are summarized in Table 6.9 below.

Table 6.9: Atterberg Limits Test – Silt

Borehole	Sample	Depth (m)	Description	Moisture Content (%)	Liquid Limit	Plastic Limit	Plasticity Index
BHMW PI-9	SS7	6.4	SILT (ML)	24	NP	NP	NP

The results of the Atterberg Limits test are shown on the borehole records in **Appendix C** and are illustrated on Figure 3 in **Appendix D.**

Based on the results of Atterberg Limits tests, the silt sample is non-plastic.

In accordance with the Unified Soil Classification System, the sample tested can be classified as Silt (ML).

6.4 BEDROCK

Presence of bedrock was inferred based on spoon and auger refusal at a depth of approximately 0.2 m to 9.3 m below grade in boreholes BHMW PI-1, BH PI-2, BH PI-5, BH PI-6, BH PI-7, BH PI-8 and BHMW PI-9. The bedrock was encountered at approximately 2.1 m below grade (corresponding elevation of 279.9 m) in borehole BH PI-10 and cored to 3.5 m. The rock core photo is included in **Appendix E**.

Bedrock was contacted in four (4) test pits at depths ranging from 0.5 m to 1.8 m below grade.

Bedrock outcrop was observed or inferred at surface at multiple locations including a rock cliff at the edge of the sand pit within the Site.

The bedrock can be described as dark grey and pink gneissic bending gneiss.

The RQD of the bedrock core was 57%, indicating a fair rock quality. The bedrock can also be described as fresh to slightly weathered.

6.5 GROUNDWATER

Groundwater level could not be measured in open boreholes in BHMW PI-1, BHMW PI-3 and BHMW PI-9 (with monitoring wells) and BH PI-10 due to the use of water for rock coring. Boreholes BH PI-2, BH PI-6 and BH PI-7 were dry upon completion of drilling. Groundwater levels were measured in open boreholes at depths of approximately 2.1 m, 2.3 m and 2.1 m below grade corresponding to approximately elevations 254.2 m, 277.1 m and 271.3 m in boreholes BH PI-4, BH PI-5 and BH PI-8, respectively.

Water seepage was observed at about 1.5 m below grade and water level was measured at about 3.5 m below grade upon completion of TP-5. No water seepage was observed at the other test pit locations.

Groundwater levels were measured in the monitoring wells installed in boreholes BHMW PI-1, BHMW PI-3 and BHMW PI-9, respectively on November 10th and November 20th, 2023, and are presented below in Table 6.10.

Table 6.10: Summary of Monitoring Well Readings

Borehole	November 10, 2023		November 20, 2023	
	Depth (m)	Elevation (m)	Depth (m)	Elevation (m)
BHMW PI-1[1]	-	-	Dry	-
BHMW PI-3	8.7	253.8	9.0	253.5
BHMW PI-9	6.1	265.7	6.9	264.9

Groundwater level is subject to fluctuations due to seasonal changes and precipitation events. The water levels should be expected to be higher during the spring season or during and following periods of heavy precipitation or snow melt. Perched groundwater may also be encountered in the fill materials.

7.0 DISCUSSION AND RECOMMENDATIONS

7.1 SUBSURFACE AND GROUNDWATER CONDITIONS SUMMARY

The following bullets provide a general description and overview of the conditions encountered in the geotechnical investigation as previously summarized:

- Ground surface cover consisting of topsoil and grass (in all boreholes except BHMW PI-1 and BH PI-2); underlain by,
- Cohesionless fill (in boreholes BHMW PI-1, BH PI-2 and BHMW PI-3); underlain by,
- Cohesive fill (in borehole BHMW PI-3); underlain by,
- Upper very loose to very dense silty sand to sandy silt, silty clayey sand to silty sand and silty sand to sand (in all boreholes except BHMW PI-1 and BH PI-6); underlain by,
- Soft to firm silty clay to clay (in boreholes BHMW PI-3, BH PI-8 and BHMW PI-9); underlain by,
- Lower dense to very dense silty sand (in borehole BHMW PI-3) and loose to compact sandy silt (in boreholes BH PI-8 and BHMW PI-9); underlain by,
- Bedrock inferred at depths of 0.2 m to 9.3 m below grade (BHMW PI-1, BH PI-2, BH PI-5, BH PI-6, BH PI-7, BH PI-8 and BHMW PI-9), and contacted at a depth of 2.1 m (BH PI-10) below grade.

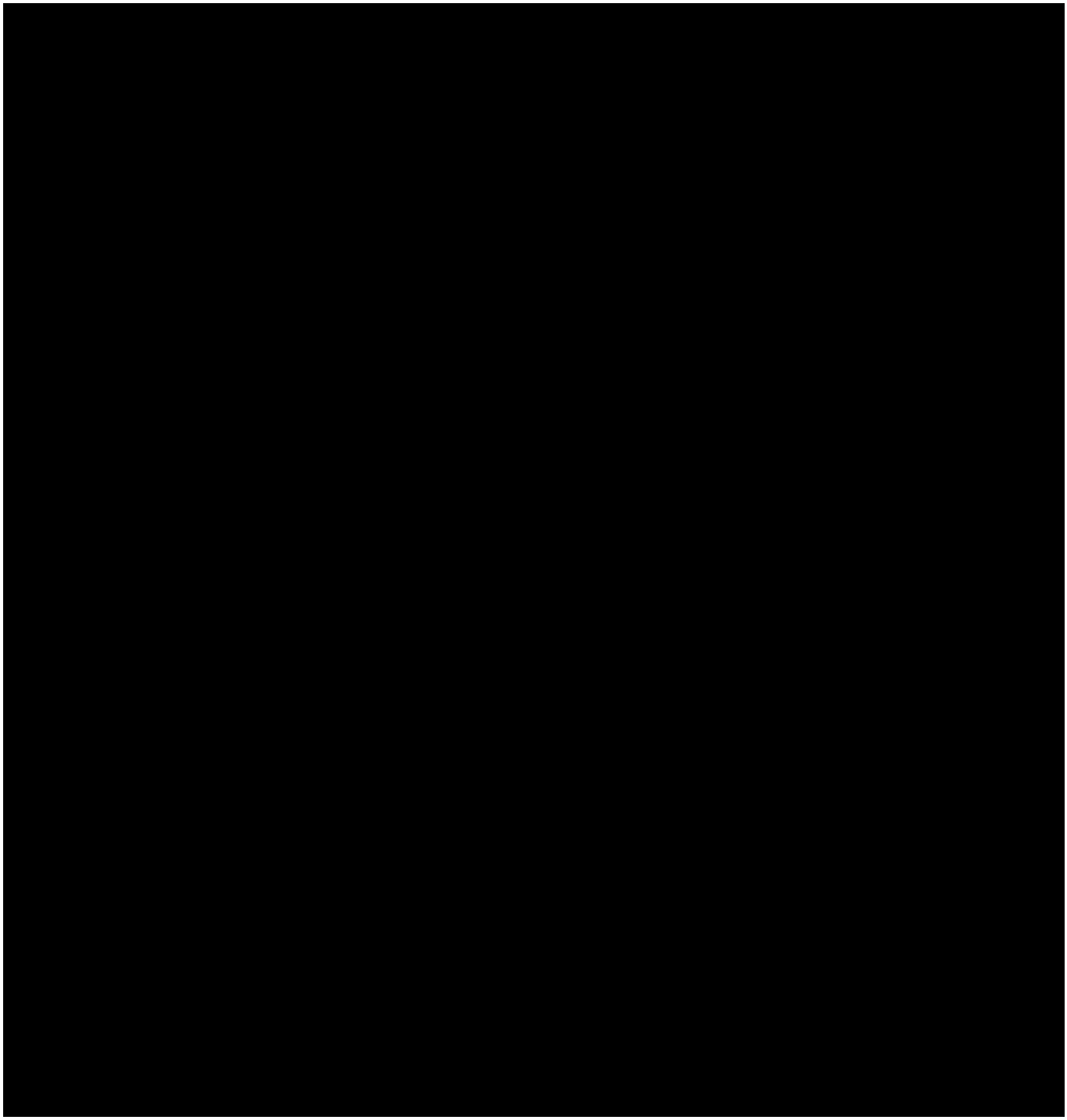
Groundwater levels were recorded at depths of 8.7 m and 6.1 m below grade, corresponding to approximately elevations 253.8 m and 265.7 m in the monitoring wells installed in boreholes BHMW PI-3 and BHMW PI-9, respectively on November 10th, 2023. The levels were recorded at depths of 9.0 m and 6.9 m below grade, corresponding to approximately elevations 253.5 m and 264.9 m in the monitoring wells installed in respective wells on November 20th, 2023. Borehole BHMW PI-1 was dry on November 20th, 2023.

7.2 EVALUATION OF EXISTING CONDITIONS

The following general development considerations and constraints are provided with respect to observations made during the investigation, the subsurface conditions encountered, and the intended scope of development:

- There is no existing development within the Site and hence, demolition of existing infrastructure is not anticipated to be required. The northwest section of the Site is a sand pit and the rest is covered by mature trees. It is unlikely that there has been any historic development on the Site. In this respect, buried abandoned infrastructure is not anticipated to be present at the Site. However, any services or infrastructure that are encountered will require decommissioning and removal.
- The current planned location of the development is approximately 18 m to 28 m higher than the west portion of the Site (sand pit area) separated with an approximately 18 m high rock cliff. A deep layer of possible fill was encountered in the boreholes drilled in this portion. In this respect, the proposed development is anticipated to remain within the forest portion of the Site.





7.3 CONSTRAINTS DUE TO NATURAL ENVIRONMENT

7.3.1 Frost Depth

The Ontario Building Code and the guidelines in the Canadian Foundation Engineering Manual require any exterior foundations and foundations in unheated areas exposed to freezing temperatures be provided with adequate protection against frost. Based on OPSD 3090.101, Foundation Frost Depths for Southern Ontario, the depth of frost penetration for the Site area is approximately 1.7 m.

All foundations should therefore be protected from frost action by a minimum soil cover of 1.7 m or be provided with equivalent protection using manufactured insulation. Where adequate earth cover for frost protection cannot be provided, the use of rigid insulation can be considered. As a general guideline, 25 mm of rigid insulation may be assumed to provide approximately 300 mm of equivalent soil cover.

7.3.2 Seismic Conditions

The seismic Site class determination is based on the soil conditions in the 30 m of stratigraphy underlying the foundations.

For the purposes of this report, the SPT N-value method has been used to assess the Seismic Site Classification, consistent with the second of three methods stated in the Ontario Building Code (OBC, 2012). This method requires calculation of a mean N-value for each soil stratum present. A weighted harmonic average of the mean N-values is subsequently calculated over the required depth of 30 m. The deepest borehole was 9.8 m deep and terminated in loose sandy silt to silty sand. For the purposes of this report, it is assumed that soils conditions remain the same/improve below this depth. Bedrock was inferred/contacted in seven (7) of the boreholes.

Based on the soil conditions encountered in the boreholes, a weighted harmonic average N-value of 16 was calculated for foundations placed below frost depth. Therefore, in accordance with Table 4.1.8.4.A of the 2012 Ontario Building Code (OBC), Seismic Site Class “D” should be used for design of foundations placed on the native soils. Where buildings are supported on shallow foundations directly placed on bedrock Seismic Site Class “B” can be used.

To confirm the seismic Site class, measurement of the shear wave velocity using a geophysical method (e.g., MASW) could be considered.

A copy of the NBC 2020 Seismic Hazard Calculation Data sheet is provided in **Appendix F** for reference.

7.4 SITE PREPARATION

7.4.1 Erosion and Sediment Control

A Site-specific and project-specific erosion and sediment control program should be implemented prior to commencement of earthwork activities on the Site and extending throughout the period of construction.

The surface of the fill materials may become loose, and loss of strength can occur, when exposed to precipitation and ground surface runoff. This condition will be exacerbated under the application of loads from traffic and construction vehicles and operations.

It is recommended that the erosion and sediment control program contain, in part, a temporary grading plan which will promote ground surface runoff away from areas of planned development and construction activity, to be collected in low-lying areas or temporary ditches and swales.



FFE likely excavation in bedrock, will be required. The use of shallow foundations and slab-on-grade on a combination of bedrock and fill materials should be avoided to mitigate the potential for differential settlement. It is noted that excavation in the very strong bedrock will require blasting. For reference, the bedrock was encountered or inferred at approximately elevations 275.6 m, 268.4 m, 279.9 m in boreholes BH PI-7, BH PI-8 and BH PI-10, respectively, translating an elevation difference of 11.5 m at the conceptual building location.

Following grading and inspection of the exposed sub-grade, the sub-grade must be proof-rolled and compacted using large, vibratory compaction equipment with a minimum static weight of ten tonnes. This will provide a uniform, compact surface for the intended construction. The proof rolling program should consist of a minimum of five passes per unit area to provide a uniform surface for construction and to confirm that the sub-grade has been compacted to achieve a similar condition to that of the engineered fill placed on the native sub-grade surface.

If imported fill is required, the material used for building pad should consist of OPSS Granular B (Type 1 or Type II). Consistent with the recommendations provided above for excavation backfill, the backfill material used in should be placed in 200 mm (8 inch) thick loose lifts. Each lift should be uniformly compacted to achieve a minimum of 98% of the material's SPMDD.

7.6 FOUNDATIONS

7.6.1 Overview

Conventional spread/strip footings founded on the compact to dense upper silty sand to sandy silt, silty clayey sand to silty sand and silty sand to sand soils can be considered to support the building. However, limited geotechnical resistance/reaction is available for these foundations due to the presence of very loose to loose zones in this stratum. Any loose or soft soils should be removed from the foundation sub-grade and replaced with granular engineered fill.

Alternatively, deep foundations (i.e., driven pipe piles, caissons) founded on the bedrock can be considered to support the building. Consideration can also be given to the use of ground improvement methods such as Controlled Modulus Columns (CMC) or Rammed Aggregate Piers (RAP) to improve the bearing capacity for shallow foundations. Deep foundations founded on the bedrock can provide a large capacity. Additional investigation will be required for the design of deep foundations to confirm the bedrock depth and quality once the building location is finalized.

7.6.2 Shallow Foundation

Conventional spread and strip footing foundations can be founded on the compact native cohesionless (silty sand to sandy silt, silty clayey sand to silty sand and silty sand to sand) soils encountered in the boreholes or engineered fill. Foundations should have a minimum soil cover of 1.7 m (or equivalent manufactured insulation).

For preliminary design purposes and based on the conditions encountered in boreholes BH PI-7, BH PI-8 and BH PI-10 located at the concept building location, a factored geotechnical resistance of 175 kPa at Ultimate Limit State (ULS) and 75 kPa at Serviceability Limit State (SLS) can be considered for shallow foundations with widths up to 3 m placed on the compact native cohesionless soils.

The above ULS value includes a resistance factor of 0.5. The SLS values are based on individual footing settlement of 25 mm (typical differential settlement of 19 mm would apply).

Bedrock was encountered/inferred at elevations 275.6 m, 268.4 m, and 279.9 m in boreholes BH PI-7, BH PI-8 and BH PI-10, respectively, located indicating an elevation difference of 11.5 m at the concept building location. In this respect, the use of shallow foundations placed on bedrock may not be feasible at the concept building location. However, subject to design grade and bedrock depth at the final building location the use of shallow or augered footings placed on bedrock may be considered. For preliminary design purposes a factored geotechnical resistance of 1,500 kPa can be considered for shallow foundations or augered footings placed on the bedrock. The ULS value includes a resistance factor of 0.5. Settlement of shallow foundations founded on the bedrock is anticipated to be less than 25 mm, therefore, the geotechnical reaction at SLS is not anticipated to be a governing factor.

The minimum foundation width should be in accordance with the Ontario Building Code (OBC).

7.6.3 Deep Foundation

Where, the bedrock is not available at a shallow depth required for shallow or augered foundations, which is likely the condition for most of the site, the use of caissons founded in the bedrock can be considered. Given the potential slope of the bedrock surface (as discussed in Section 7.6.2), it is suggested that caissons are socketed into the bedrock with a minimum socket length of one caisson diameter. For preliminary design purpose a factored geotechnical resistance of 5.0 MPa may be considered. This includes a resistance factor of 0.4. The settlement of caissons founded on the bedrock is anticipated to be less than 25 mm, therefore, the geotechnical reaction at SLS is not anticipated to be a governing factor. Further investigations will be required for these options.

Additional investigation will be required for the design of deep foundations to confirm the bedrock depth and quality once the building location is finalized.

7.7 SLAB-ON-GRADE

It is presumed that the structural engineer will assess the standard design thickness for the floor slab and make design adjustments as warranted, in consideration of the recommendations provided herein, and the anticipated design loads.

Site preparation for the construction of the building floor slab should be carried out as recommended in Section 7.5. This includes stripping of all vegetation and topsoil, removal of all deleterious materials

where present, proof rolling and compacting the exposed loose surficial subgrade and backfilling to the design sub-grade level with compacted OPSS SSM as a minimum.

The floor slab should be constructed on a layer of compacted granular fill to provide a uniform base for construction and to act as a moisture break beneath the concrete floor slab. For this purpose, a 300 mm thick layer of granular fill meeting the requirements of OPSS Granular A should be placed beneath the floor slab. The granular layer can be placed in a single lift. The layer should be uniformly compacted to a minimum of 100% of the material's SPMDD.

The floor slab(s) should not be connected to any load bearing walls and/or columns.

For preliminary design purposes, a modulus of sub-grade reaction, k_1, of 20 MN/m^3 (for a loaded area of 300 mm x 300 mm) can be used for the design of the floor slab, given the conditions encountered in the boreholes, the Site preparation recommendations as provided herein, and the placement of the granular base layer as recommended. The modulus should be adjusted for the actual size of the loaded area in the structural design of the floor slab.

If the concrete floor slab is required in an unheated area, the slab-on-grade should be placed on a layer of high-density closed-cell insulation (such as Styrofoam) with a thickness consistent with providing adequate frost protection. As a general guideline, 25 mm of insulation provides the equivalent insulation of approximately 300 mm of soil.

Where the Finished Floor Elevation (FFE) is at a minimum of 150 mm higher than the exterior grade and that the surrounding area is sloped away from the building and all related infrastructure the use of under-drains and perimeter drains will not be required.

7.8 LATERAL EARTH PRESSURE PARAMETERS

The recommendations provided in this section of the report can be considered for evaluation of lateral earth pressure for the foundation walls, temporary shoring and retaining wall design, if required.

Retaining walls must be designed with consideration for the influence of lateral earth pressures. Where required, backfill material used around the walls should be free of deleterious material, be free draining and classed as non-frost susceptible. The granular backfill should be capped with a less permeable material and graded to help direct run-off away from the structure.

Lateral earth pressure parameters for use in design are provided below in Table 7.1. The table includes parameters for the use of OPSS 1010 Granular A and B fill which are recommended to be used behind the walls to provide drainage. In addition, we have included values for the native cohesionless soils for reference.

Table 7.1: Un-factored Lateral Earth Pressure Parameters

Parameters	OPSS Granular A and B Type II	Granular Fill (OPSS 1010 B Type I)	Existing Granular Fill	Native Very Loose to Very Dense Cohesionless Soils
Bulk Unit Weight (kN/m^3)	21	21	20	21
Angle of Internal Friction (degrees)	35	32	28	28
Coefficient of Active Earth Pressure, k_a	0.27	0.29	0.36	0.36
Coefficient of Passive Earth Pressure, k_p	3.69	2.77	2.77	2.77
Coefficient of Earth Pressure at Rest, k_o	0.43	0.53	0.53	0.53
Coefficient of Friction between Soil and Cast-In-Place Concrete	0.45	0. 45	0.40	0.40

For rigidly-tied earth retention structures (e.g. non-yielding retaining walls), an at-rest earth pressure coefficient should be used for design. If the walls are allowed to rotate or translate an active earth pressure coefficient should be used in design.

Presuming that free-draining granular materials are used as backfill (where required), a geosynthetic separator fabric is recommended between the face of the adjacent fill and native soils and the granular backfill adjacent to the walls to prevent the migration of fines into the backfill. The granular backfilling materials should be placed in 200 mm thick lift and compacted to 100% material's SPMDD.

The values provided in the table above also presume a horizontal slope at the back of the wall. The effects of surcharge loads would need to be added to these lateral earth pressures.

7.9 ASPHALT PAVEMENT

In absence of design traffic load, the pavement structures provided in Table 7.2 may be considered for preliminary pavement design subject to adopting the recommendations described herein for Site preparation and grade raise.

Table 7.2: Recommended Asphalt Pavement Structure Design

Material	Standard Duty	Heavy Duty	Compaction Requirements
HL3 (surface course asphalt)	40 mm	50 mm	92 % MTRD
HL8 (base course asphalt)	50 mm	80 mm	92 % MTRD
OPSS Granular 'A' Base	150 mm	150 mm	100 % SPMDD
OPSS Granular 'B' Sub-base	200 mm	300 mm	100 % SPMDD

In preparation for construction of new pavements, the finished sub-grade surface should be proof-rolled and compacted to identify the presence of soft, wet, or deflecting areas; such areas should be removed and replaced with approved engineered fill compacted to a minimum of 98% SPMDD.

The base and sub-base materials should be compacted to a minimum of 100% SPMDD. The asphaltic concrete should be compacted to a minimum of 92% of Maximum Theoretical Relative Density (MTRD).

7.10 EXCAVATIONS

Depending on depth and location, excavations for the proposed development are anticipated to encounter fill materials, the native very loose to very dense cohesionless soils (silty sand to sandy silt, silty clayey sand to silty sand and silty sand to sand) and soft to firm silty clay to clay.

Temporary excavations must be carried out in accordance with the latest edition of the Occupational Health and Safety Act (OHSA) & Regulations. For the purpose of this report, it is anticipated that temporary excavations would remain open for a duration of two weeks. For general reference, the following comments are provided with respect to the soils encountered in the geotechnical boreholes and the relevant classification of these soils in accordance with the OH&S Act. The comments provided do not consider the benefits for the use of temporary construction shoring.

The cohesionless fill and native loose to very dense cohesionless soils above groundwater level should be considered as Type 3 soils. The maximum excavation side slope for a Type 3 soil is 1:1 (Horizontal: Vertical) in accordance with the OHSA regulation.

The native soft to firm silty clay to clay soils should be classified as Type 4 soils. The maximum excavation side slope for a Type 4 soil is 3:1 (Horizontal: Vertical) in accordance with the OHSA regulation. Where excavations extend below the groundwater levels observed in open boreholes, or the soils are observed to be water-bearing or in loose/soft conditions, they should be classified as Type 4 soils. The cohesive fill should also be considered as Type 4 soils The maximum excavation side slope for a Type 4 soil is 3:1 (Horizontal: Vertical) in accordance with the OHSA regulation.

Based on the bedrock depths encountered in the boreholes, excavations for the proposed development are anticipated to extend to bedrock. If bedrock encountered, side slopes of temporary excavations in bedrock may be left near vertical. Consistent with the OHSA, the walls of an excavation in bedrock must be stripped of any loose rock or other material that could slide, fall, or roll upon a worker.

Where an excavation contains more than one soil type, the soil shall be classified as the type with the highest number exposed in the excavation.

Excavation side slopes should be protected from exposure to precipitation and associated ground surface runoff and should be inspected regularly for signs of instability. If localized instability is noted at the time of excavation or while an excavation remains open, or if wet conditions are encountered, the side slopes of the excavations should be flattened as required to maintain safe working conditions.

If space is restricted such that the side slopes cannot be safely cut back in accordance with the OHSA Regulation, or sloughing and cave-in are encountered in the excavations, the slopes should be flattened to achieve a stable configuration or temporary shoring must be provided. To prevent overstressing of the shoring structure, the excavated spoil should be placed away from the edge of the excavation at least at a distance equal to the depth of the excavation.

Stockpiling of any materials adjacent to excavations should be avoided. Similarly, traffic should not be permitted in proximity to open excavations. For this purpose, it is recommended that all storage of materials and traffic be restricted from a distance equal to depth of excavation around the excavations, measured from the crest of the excavation designed and constructed in accordance with the OH&S Act.

7.11 GROUNDWATER CONTROL

The groundwater level was recorded at depths ranging from 6.1 m to 9.0 m in the two of the monitoring wells installed at the Site and was observed at depths of 2.1 m to 2.3 m in three open boreholes.

Given the conditions encountered in open boreholes and the presence of overlying granular fill and granular native soils, the rate of perched water seepage into shallow excavations is anticipated to be medium to high in the beginning and decreasing with time. The rate of seepage into excavations that extend below the groundwater should be anticipated to be higher. However, given the presence of the rock cliff and significantly lower elevation of the sand pit area groundwater is not anticipated to be a major concern at this Site. Any seepage encountered during the proposed construction should be handled by pumping from sumps using conventional submersible pumps provided the excavations remain open for a short period of time. More dewatering efforts may be required if deeper and larger excavations are required for the proposed construction.

The above comments are provided for reference. The Contractor should determine the appropriate groundwater control/dewatering measures in accordance with the conditions encountered and the equipment and methods intended for use. The Contractor's methods of dewatering should be provided for the Engineer's/Owner's Representative Civil Engineer's review.

Discharge of accumulated seepage and standing water (regardless of source) should conform to the Ontario Ministry of the Environment Conservation and Park's (MECP) guidelines and City/Municipal requirements.

Where dewatering is undertaken, the design of the dewatering system would need to address the extent of dewatering required, the depth of intended excavation, and the soil and groundwater conditions that prevail at the intended excavation location(s). This is beyond the scope of this geotechnical investigation.

It is noted that under the current MECP regulations, registration with the Environmental Sector and Activity Registry (ESAR) is required for dewatering at rates above 50,000 L/day but below 400,000 L/day. A Permit to Take Water is required for dewatering applications that require exceeding 400,000 L/day.

7.12 SITE MATERIALS REUSE

Fill Materials

The Site excavated topsoil could be used for landscaping purposes only, subject to environmental test results.

The cohesionless fill materials encountered in the investigation can be considered suitable for reuse as general use in backfilling service trenches. Any deleterious materials presented in the fill materials such as topsoil inclusions, or similar materials must be removed prior to reuse.

The existing cohesive fill is not suitable for reuse as engineered fill, granular base, and sub-base materials, or for similar applications where development of frost could jeopardize the serviceability of the planned infrastructure.

Native Cohesionless Soils

The native compact to very dense cohesionless soils can be considered for reuse as excavation backfill and engineered fill, provided that the soil is free of deleterious materials and is within 2% of the material's optimum moisture content.

Native Cohesive Soils

The native cohesive soils are not suitable for reuse as engineered fill, granular base, and sub-base materials, or for similar applications where development of frost could jeopardize the serviceability of the planned infrastructure.

Bedrock (Gneiss)

The bedrock can be considered for reuse as excavation backfill. However, breaking of the material into pieces smaller than 100 mm will be required.

7.13 BACKFILL

7.13.1 Perimeter Foundation Wall Backfill

The free-draining granular backfill placed adjacent to the exterior (perimeter) walls should be placed in loose lifts having a maximum thickness of 300 mm.

Each lift should be uniformly compacted using suitable compaction equipment for the purpose intended, to achieve a minimum of 95% of the material's SPMDD.

Care should be taken immediately adjacent to existing foundation walls to avoid over-compaction of the soil which could result in damage to the walls.

7.13.2 Bedding and Cover Material for Buried Services & Utilities

Pipe bedding and cover materials specifications for buried services and utilities should be in accordance with the manufacturer's and/or the designer's recommendations. The following recommendations are provided in consideration of the geotechnical aspects of design and construction, and with due

consideration for the conditions encountered in the boreholes included in the current geotechnical investigation.

Bedding for services and utilities should consist of OPSS Granular A material. A minimum of 150 mm of bedding is recommended.

Cover material for services and utilities should consist of OPSS Granular A material. A minimum of 300 mm of cover material is recommended.

The bedding and cover material should be placed in lifts that do not exceed 200 mm. Each lift should be uniformly compacted to achieve a minimum of 98% of the material's SPMDD. Cover material should be placed and compacted to 900 mm over the crown of the pipe/utility prior to permitting ride-on compaction equipment to be used. Care must be taken in all cases to avoid incurring damage to the services and utilities. This may require the use of alternative equipment from the norm and/or adjustment to the typical placement and compaction methodologies.

These recommendations should be confirmed with the pipe/utility manufacturer. Pipe manufactures may have additional/alternative requirements that should be reviewed by the Designer and Contractor prior to installation of the services.

A discussion related to the general presence of groundwater is provided in a preceding section of this report. If standing water is present in any open excavation where services and utilities are to be installed, the use of a geosynthetic separator fabric and clear stone bedding/cover is recommended to mitigate concerns with handling, placing, and compacting granular bedding and backfill materials.

7.13.3 Service and Utility Trench Backfill

Backfill for service trenches may consist of approved portions of the native cohesionless soils subject to the constraints and limitations stated above with respect to reuse of these materials/soils.

All trench backfills placed within areas of planned development should be placed in 200 mm thick loose lifts and compacted to a minimum of 98% SPMDD for the full thickness of the backfill.

All trench backfills placed beyond the limits of planned development, such as in landscaped areas, should be placed in 200 mm thick loose lifts and compacted to a minimum of 95% SPMDD.

Water, sewer, and storm lines installed outside of heated areas should be provided with a minimum of 1.7 m of soil cover for adequate frost protection.

7.13.4 Municipal Infrastructure Backfill

Where manholes and catch-basins are required, these components should be constructed and backfilled in accordance with Town of Bracebridge and The District Municipality of Muskoka Sewer and Watermain standards.

Care should be taken in compacting backfill materials around structures to achieve the required compaction, thus avoiding future settlement around the installations.

7.14 ANALYTICAL CHEMISTRY RESULTS

7.14.1 Soil Corrosivity Potential

Three (3) soil samples were submitted to AGAT Laboratories in Mississauga, Ontario for analysis of resistivity, pH, redox potential, and concentrations of sulphides. The purpose of the testing was to evaluate the potential for corrosion of ductile iron pipe in contact with the soil and groundwater at the Site, consistent with the methods of ANSI/AWWA.

The moisture content conditions were assessed based on the results of the moisture content tests conducted as a component of the geotechnical testing program as well as the overall drainage characteristics of the soils. The test results are summarized in below.

Table 7.3: Results of Chemical Analysis for Corrosion Potential

Parameter	**Sample Information**					
Borehole No.	**BH PI-1**		**BH PI-4**		**BH PI-8**	
Sample No.	SS2		SS3		SS4	
Median Depth	1.1 m BGS		1.8 m BGS		2.6 m BGS	
Description	Silty Sand to Silty Sand with Gravel Fill		Sandy Silt to Silty Sand		Silty Clay to Clay	
Parameter	**Measured Values**	**ANSI/AWWA Point Rating**	**Measured Values**	**ANSI/AWWA Point Rating**	**Measured Values**	**ANSI/AWWA Point Rating**
Resistivity, (Ohm-cm)	30300	0	66700	0	28600	0
pH	6.97	0	6.17	0	6.54	0
Redox Potential, (mV)	228	0	241	0	314	0
Sulphides, (%)	<0.01	2	<0.01	2	<0.01	2
Moisture	moist	1	moist to wet	2	moist	1
Total ANSI/AWWA Points	3		4		3	

The ANSI/AWWA rating system considers a score of 10 points or more indicative of the potential for corrosion of buried steel (less than 10 points indicates no potential for corrosion of buried steel). Based on the ANSI/AWWA rating system, the soil samples tested have low potential for corrosion.

It is noted that other factors may influence the corrosion potential, such as the application of de-icing salts that leach into the soil, or the presence of stray electrical currents.

It is also noted that municipal specifications and procedures may supersede the results of the testing as reported herein, and reference should be made to the regulatory authority guidelines and requirements in this respect.

Copies of the results of the chemical analysis are included in **Appendix D** for reference.

7.14.2 Cement Type

The soil samples submitted to AGAT Laboratories for corrosivity were also analyzed for the concentration of soluble sulphates and chlorides. The concentration of soluble sulphates and chlorides provides an indication of the degree of sulphate attack and chloride attack that is expected for concrete in contact with soil and groundwater. The results of the testing are shown in Table 7.4 below.

Table 7.4: Results of Chemical Analysis for Soluble Sulphates and Chlorides

Borehole No	Sample No.	Depth (m BGS)	pH	Sulphate (µg/g)	Chloride (µg/g)
BH PI-1	SS2	1.1	6.97	7	<2
BH PI-4	SS3	1.8	6.17	3	<2
BH PI-8	SS4	2.6	6.54	8	<2

Soluble sulphate concentrations less than 1000 µg/g generally indicate that a low degree of sulphate attack is expected for concrete in contact with soil and groundwater. Consistent with this, the results of testing of the soil samples referenced in the table above indicate that a low degree of sulphate attack is expected for concrete in contact with the respective soils.

In consideration of the results of the testing, Type GU Portland Cement should be suitable for use in buried concrete in contact with the soils referenced in the table.

Copies of the results of the chemical analysis are included in **Appendix D** for reference.

8.0 REFERENCES

ASTM 4.08. Standard D2487-06: Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).

Canadian Geotechnical Society. Canadian Foundation Engineering Manual, 4th Edition. Richmond: BiTech Publisher Ltd, 2006.

Chapman, L.J. and Putnam, D.F. 1984. The Physiography of Southern Ontario; Ontario Geological Survey, Special Volume 2, 270p. Accompanied by Map P.2715 (coloured), scale 1:600 000.

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Ontario Geological Survey 2000. Quaternary geology, seamless coverage of the Province of Ontario; Ontario Geological Survey, Data Set 14---Revised.

Ontario Geological Survey 2011. 1:250 000 scale bedrock geology of Ontario; Ontario Geological Survey, Miscellaneous Release---Data 126-Revision 1

Ontario Geological Survey (OGS) Borehole Record database.

Ontario Geological Survey 2010. Surficial Geology of Southern Ontario; Ontario Geological Survey, Miscellaneous Release--Data 128-REV.

Ontario Ministry of the Environment, Conservation and Park (MECP) Water Well Record database.

9.0 CLOSURE

Use of this report is subject to the Statement of General Conditions provided in **Appendix A**. It is the responsibility of Muskoka Algonquin Healthcare who is identified as "the Client" within the Statement of General Conditions, and its agents to review the conditions and to notify Stantec Consulting Ltd. should any of these not be satisfied. The Statement of General Conditions addresses the following:

- Use of the report;
- Basis of the report;
- Standard of care;
- Interpretation of Site conditions;
- Varying or unexpected Site conditions; and,
- Planning, design, or construction.

Respectfully Submitted,

STANTEC CONSULTING LTD.

APPENDIX A

A.1 STATEMENT OF GENERAL CONDITIONS

STATEMENT OF GENERAL CONDITIONS

USE OF THIS REPORT: This report has been prepared for the sole benefit of the Client or its agent and may not be used by any third party without the express written consent of Stantec Consulting Ltd. and the Client. Any use which a third party makes of this report is the responsibility of such third party.

BASIS OF THE REPORT: The information, opinions, and/or recommendations made in this report are in accordance with Stantec Consulting Ltd.'s present understanding of the site specific project as described by the Client. The applicability of these is restricted to the site conditions encountered at the time of the investigation or study. If the proposed site specific project differs or is modified from what is described in this report or if the site conditions are altered, this report is no longer valid unless Stantec Consulting Ltd. is requested by the Client to review and revise the report to reflect the differing or modified project specifics and/or the altered site conditions.

STANDARD OF CARE: Preparation of this report, and all associated work, was carried out in accordance with the normally accepted standard of care in the state or province of execution for the specific professional service provided to the Client. No other warranty is made.

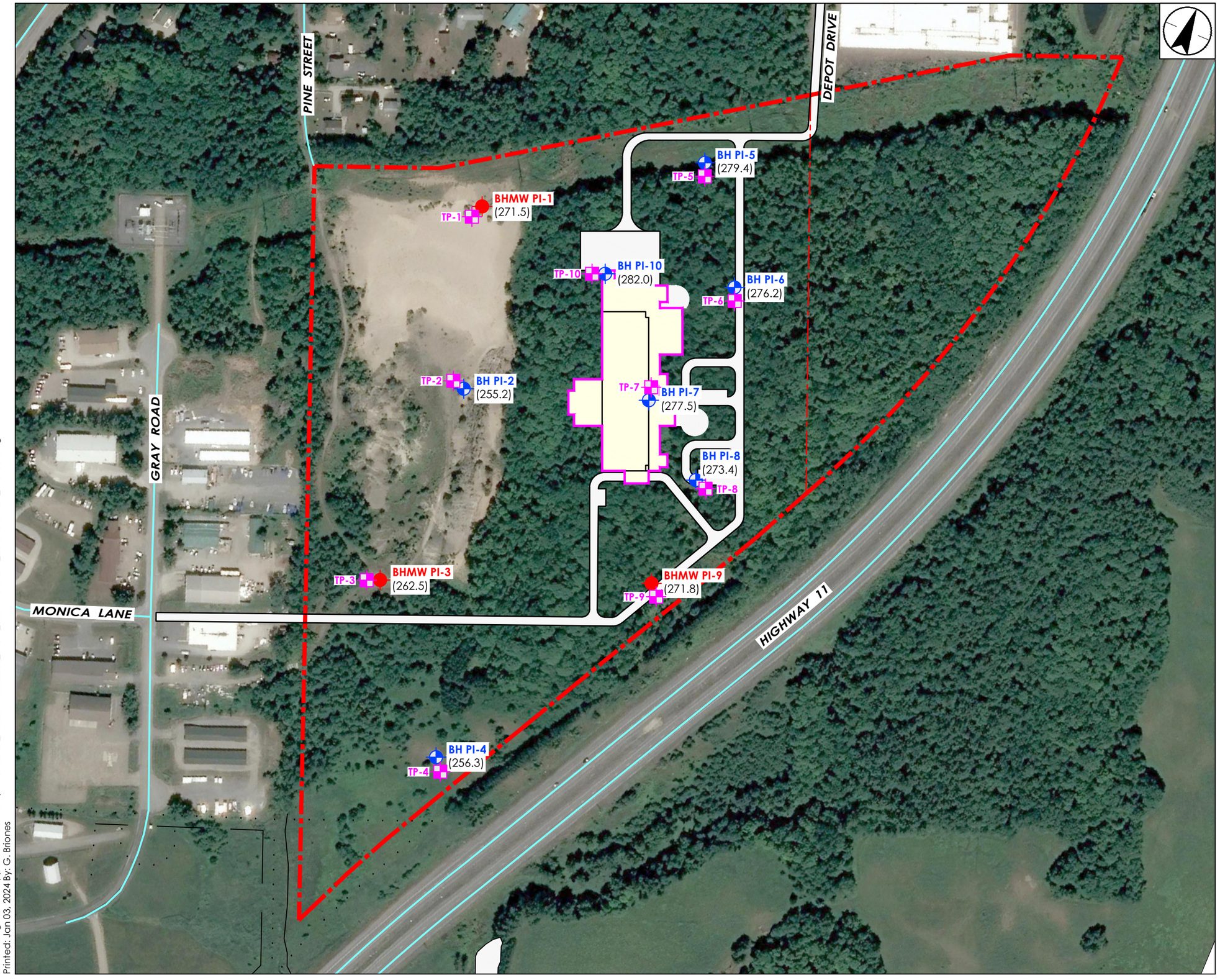
INTERPRETATION OF SITE CONDITIONS: Soil, rock, or other material descriptions, and statements regarding their condition, made in this report are based on site conditions encountered by Stantec Consulting Ltd. at the time of the work and at the specific testing and/or sampling locations. Classifications and statements of condition have been made in accordance with normally accepted practices which are judgmental in nature; no specific description should be considered exact, but rather reflective of the anticipated material behavior. Extrapolation of in situ conditions can only be made to some limited extent beyond the sampling or test points. The extent depends on variability of the soil, rock and groundwater conditions as influenced by geological processes, construction activity, and site use.

VARYING OR UNEXPECTED CONDITIONS: Should any site or subsurface conditions be encountered that are different from those described in this report or encountered at the test locations, Stantec Consulting Ltd. must be notified immediately to assess if the varying or unexpected conditions are substantial and if reassessments of the report conclusions or recommendations are required. Stantec Consulting Ltd. will not be responsible to any party for damages incurred as a result of failing to notify Stantec Consulting Ltd. that differing site or sub-surface conditions are present upon becoming aware of such conditions.

PLANNING, DESIGN, OR CONSTRUCTION: Development or design plans and specifications should be reviewed by Stantec Consulting Ltd., sufficiently ahead of initiating the next project stage (property acquisition, tender, construction, etc), to confirm that this report completely addresses the elaborated project specifics and that the contents of this report have been properly interpreted. Specialty quality assurance services (field observations and testing) during construction are a necessary part of the evaluation of sub-subsurface conditions and site preparation works. Site work relating to the recommendations included in this report should only be carried out in the presence of a qualified geotechnical engineer; Stantec Consulting Ltd. cannot be responsible for site work carried out without being present.

APPENDIX B

B.1 DRAWINGS



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Ottawa, ON, Canada K2C 3G4
www.stantec.com

LEGEND

- PROPERTY BOUNDARY
- PROPOSED BUILDING
- BOREHOLE (STANTEC, 2023)
- BOREHOLE WITH MONITORING WELL (STANTEC, 2023)
- TEST PIT (STANTEC, 2023)
- (268.0) BOREHOLE ELEVATION (m)

NOTES

1. COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N.
2. BASE PLAN PRODUCED BY STANTEC (TORONTO), FILENAME: 300 Pine Street Due Diligence.DWG
3. IMAGERY: © 2023 MICROSOFT CORPORATION © 2023 MAXAR © CNES (2023) DISTRIBUTION AIRBUS DS.

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1 : 3000

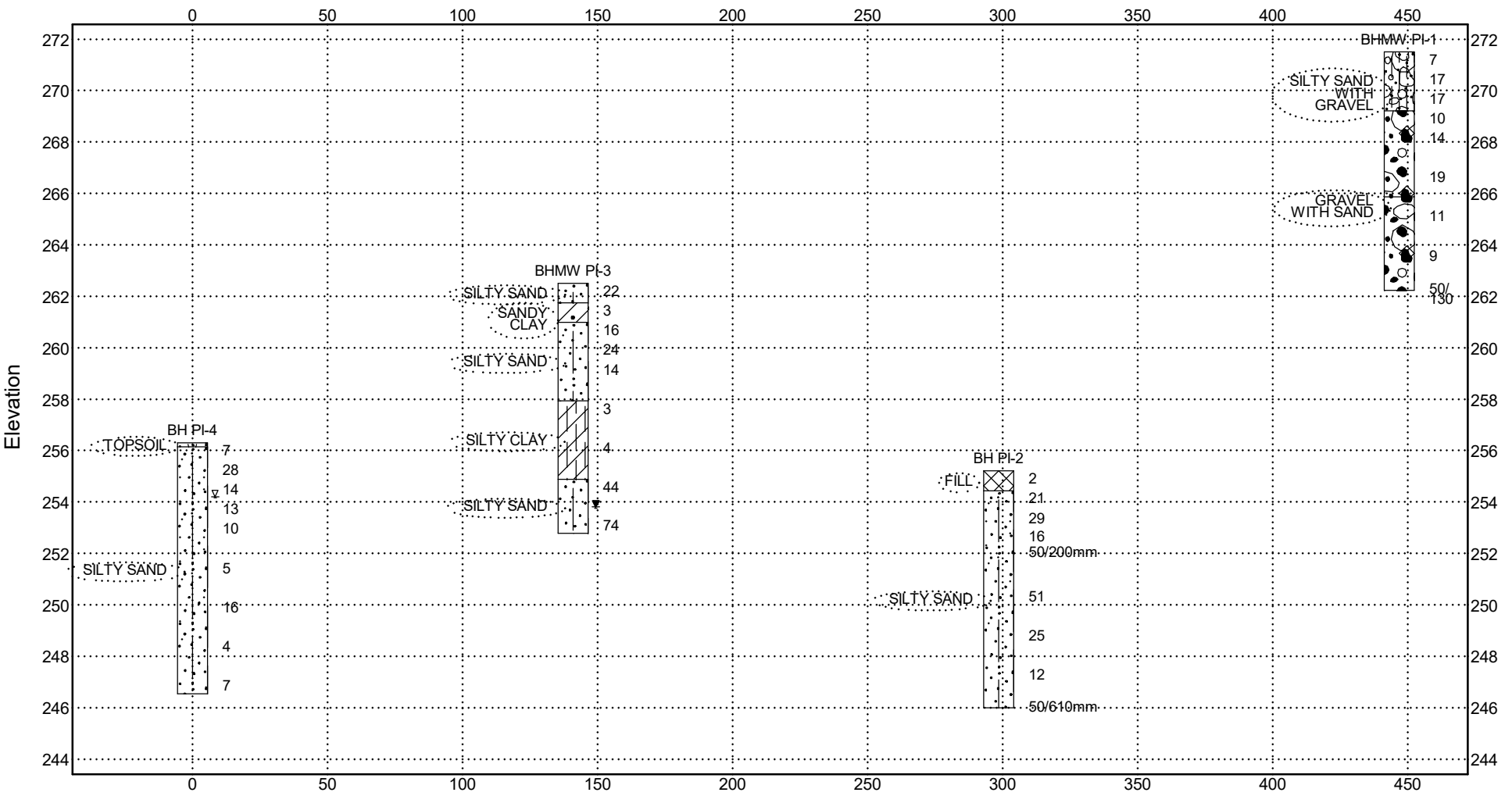
JANUARY 2024
Project No. 140022038

Client/Project
MUSKOKA ALGONQUIN HEALTHCARE
SOUTH MUSKOKA MEMORIAL HOSPITAL
300 PINE STREET, BRACEBRIDGE, ON

Drawing No.
1

Title
BOREHOLE AND TEST PIT LOCATION PLAN

C:\Users\gbriones\appdata\local\temp\AcPublish_12088\140022038_Site A_300 Pine Street_Borehole Plan_240103.dwg
Printed: Jan 03, 2024 By: G. Briones



Borehole	North	East	Elev.	Depth
BH PI-2	4989095	634484	255.2	9.2
BH PI-4	4988811	634578	256.3	9.8
BHMW PI-1	4989237	634441	271.5	9.3
BHMW PI-3	4988926	634481	262.5	9.7

DISTANCES:
Beginning
Ending
VIEWING ANGLES (degrees):
Horizontal
Vertical

Position	North	East
Left, Front		
Right, Front		
Left, Back		
Right, Back		

SUBSURFACE FENCE DIAGRAM

PROJECT: Muskoka Algonquin Stage 1.3 - Bracebridge

LOCATION: 300 Pine Street, Bracebridge, Ontario

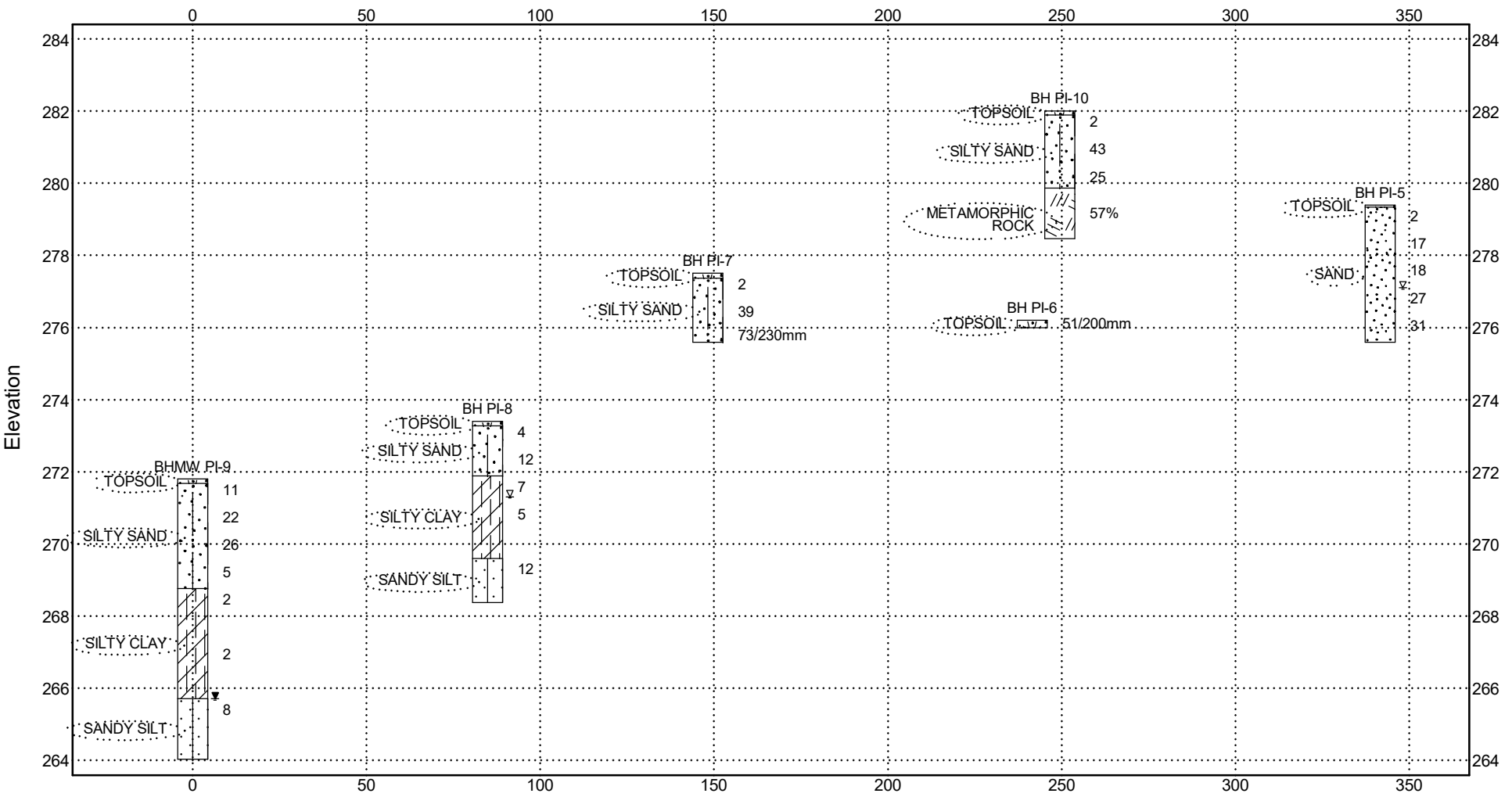
PROJECT No.: 140022038

DATE: Dec 23

FIGURE: 1

Stantec

STN13-FENCE 140022038 (BRACEBRIDGE - SITE A)_20231208.GPJ STANTEC_MARKHAM_DATA_TEMPLATE_2015-05-20.GDT 12/8/23



Borehole	North	East	Elev.	Depth
BH PI-10	4989225	634554	282.0	3.5
BH PI-5	4989339	634594	279.4	3.8
BH PI-6	4989255	634655	276.2	0.2
BH PI-7	4989144	634626	277.5	1.9
BH PI-8	4989099	634686	273.4	5.0
BHMW PI-9	4989008	634685	271.8	7.8

DISTANCES:
Beginning
Ending
VIEWING ANGLES (degrees):
Horizontal
Vertical

Position	North	East
Left, Front		
Right, Front		
Left, Back		
Right, Back		

SUBSURFACE FENCE DIAGRAM

PROJECT: Muskoka Algonquin Stage 1.3 - Bracebridge

LOCATION: 300 Pine Street, Bracebridge, Ontario

PROJECT No.: 140022038

DATE: Dec 23

FIGURE: 2

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STN13-FENCE 140022038 (BRACEBRIDGE - SITE A)_20231208.GPJ STANTEC_MARKHAM_DATA_TEMPLATE_2015-05-20.GDT 12/8/23

APPENDIX C

C.1 SYMBOLS AND TERMS USED ON BOREHOLE RECORDS

C.2 BOREHOLE LOGS

C.3 TEST PIT LOGS

SYMBOLS AND TERMS USED ON BOREHOLE AND TEST PIT RECORDS

SOIL DESCRIPTION

Terminology describing common soil genesis:

Rootmat	- vegetation, roots and moss with organic matter and topsoil typically forming a mattress at the ground surface
Topsoil	- mixture of soil and humus capable of supporting vegetative growth
Peat	- mixture of visible and invisible fragments of decayed organic matter
Till	- unstratified glacial deposit which may range from clay to boulders
Fill	- material below the surface identified as placed by humans (excluding buried services)

Terminology describing soil structure:

Desiccated	- having visible signs of weathering by oxidization of clay minerals, shrinkage cracks, etc.
Fissured	- having cracks, and hence a blocky structure
Varved	- composed of regular alternating layers of silt and clay
Stratified	- composed of alternating successions of different soil types, e.g. silt and sand
Layer	- > 75 mm in thickness
Seam	- 2 mm to 75 mm in thickness
Parting	- < 2 mm in thickness

Terminology describing soil types:
The classification of soil types are made on the basis of grain size and plasticity in accordance with the Unified Soil Classification System (USCS) (ASTM D 2487 or D 2488) which excludes particles larger than 75 mm. For particles larger than 75 mm, and for defining percent clay fraction in hydrometer results, definitions proposed by Canadian Foundation Engineering Manual, 4th Edition are used. The USCS provides a group symbol (e.g. SM) and group name (e.g. silty sand) for identification.

Terminology describing cobbles, boulders, and non-matrix materials (organic matter or debris):
Terminology describing materials outside the USCS, (e.g. particles larger than 75 mm, visible organic matter, and construction debris) is based upon the proportion of these materials present:

Trace, or occasional	Less than 10%
Some	10-20%
Frequent	> 20%

Terminology describing compactness of cohesionless soils:
The standard terminology to describe cohesionless soils includes compactness (formerly "relative density"), as determined by the Standard Penetration Test (SPT) N-Value - also known as N-Index. The SPT N-Value is described further on page 3. A relationship between compactness condition and N-Value is shown in the following table.

Compactness Condition	SPT N-Value
Very Loose	<4
Loose	4-10
Compact	10-30
Dense	30-50
Very Dense	>50

Terminology describing consistency of cohesive soils:
The standard terminology to describe cohesive soils includes the consistency, which is based on undrained shear strength as measured by *in situ* vane tests, penetrometer tests, or unconfined compression tests. Consistency may be crudely estimated from SPT N-Value based on the correlation shown in the following table (Terzaghi and Peck, 1967). The correlation to SPT N-Value is used with caution as it is only very approximate.

Consistency	Undrained Shear Strength		Approximate SPT N-Value
	kips/sq.ft.	kPa	
Very Soft	<0.25	<12.5	<2
Soft	0.25 - 0.5	12.5 - 25	2-4
Firm	0.5 - 1.0	25 - 50	4-8
Stiff	1.0 - 2.0	50 – 100	8-15
Very Stiff	2.0 - 4.0	100 - 200	15-30
Hard	>4.0	>200	>30

ROCK DESCRIPTION

Except where specified below, terminology for describing rock is as defined by the International Society for Rock Mechanics (ISRM) 2007 publication "The Complete ISRM Suggested Methods for Rock Characterization, Testing and Monitoring: 1974-2006"

Terminology describing rock quality:

RQD	Rock Mass Quality
0-25	*Very Poor Quality*
25-50	*Poor Quality*
50-75	*Fair Quality*
75-90	*Good Quality*
90-100	*Excellent Quality*

Alternate (Colloquial) Rock Mass Quality	
Very Severely Fractured	*Crushed*
Severely Fractured	*Shattered or Very Blocky*
Fractured	*Blocky*
Moderately Jointed	*Sound*
Intact	*Very Sound*

RQD (Rock Quality Designation) denotes the percentage of intact and sound rock retrieved from a borehole of any orientation. All pieces of intact and sound rock core equal to or greater than 100 mm (4 in.) long are summed and divided by the total length of the core run. RQD is determined in accordance with ASTM D6032.

SCR (Solid Core Recovery) denotes the percentage of solid core (cylindrical) retrieved from a borehole of any orientation. All pieces of solid (cylindrical) core are summed and divided by the total length of the core run (It excludes all portions of core pieces that are not fully cylindrical as well as crushed or rubble zones).

Fracture Index (FI) is defined as the number of naturally occurring fractures within a given length of core. The Fracture Index is reported as a simple count of natural occurring fractures.

Terminology describing rock with respect to discontinuity and bedding spacing:

Spacing (mm)	Discontinuities	Bedding
>6000	*Extremely Wide*	-
2000-6000	*Very Wide*	*Very Thick*
600-2000	*Wide*	*Thick*
200-600	*Moderate*	*Medium*
60-200	*Close*	*Thin*
20-60	*Very Close*	*Very Thin*
<20	*Extremely Close*	*Laminated*
<6	-	*Thinly Laminated*

Terminology describing rock strength:

Strength Classification	Grade	Unconfined Compressive Strength (MPa)
Extremely Weak	R0	<1
Very Weak	R1	1 – 5
Weak	R2	5 – 25
Medium Strong	R3	25 – 50
Strong	R4	50 – 100
Very Strong	R5	100 – 250
Extremely Strong	R6	>250

Terminology describing rock weathering:

Term	Symbol	Description
Fresh	W1	No visible signs of rock weathering. Slight discoloration along major discontinuities
Slightly	W2	Discoloration indicates weathering of rock on discontinuity surfaces. All the rock material may be discolored.
Moderately	W3	Less than half the rock is decomposed and/or disintegrated into soil.
Highly	W4	More than half the rock is decomposed and/or disintegrated into soil.
Completely	W5	All the rock material is decomposed and/or disintegrated into soil. The original mass structure is still largely intact.
Residual Soil	W6	All the rock converted to soil. Structure and fabric destroyed.

STRATA PLOT

Strata plots symbolize the soil or bedrock description. They are combinations of the following basic symbols. The dimensions within the strata symbols are not indicative of the particle size, layer thickness, etc.



Boulders Cobbles Gravel | Sand | Silt | Clay | Organics | Asphalt | Concrete | Fill | Igneous Bedrock | Meta-morphic Bedrock | Sedi-mentary Bedrock

SAMPLE TYPE

SS	Split spoon sample (obtained by performing the Standard Penetration Test)
ST	Shelby tube or thin wall tube
DP	Direct-Push sample (small diameter tube sampler hydraulically advanced)
PS	Piston sample
BS	Bulk sample
HQ, NQ, BQ, etc.	Rock core samples obtained with the use of standard size diamond coring bits.

WATER LEVEL MEASUREMENT



measured in standpipe, piezometer, or well



inferred

RECOVERY

For soil samples, the recovery is recorded as the length of the soil sample recovered. For rock core, recovery is defined as the total cumulative length of all core recovered in the core barrel divided by the length drilled and is recorded as a percentage on a per run basis.

N-VALUE

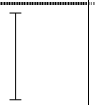
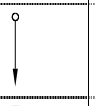
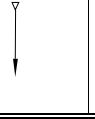
Numbers in this column are the field results of the Standard Penetration Test: the number of blows of a 140 pound (63.5 kg) hammer falling 30 inches (760 mm), required to drive a 2 inch (50.8 mm) O.D. split spoon sampler one foot (300 mm) into the soil. In accordance with ASTM D1586, the N-Value equals the sum of the number of blows (N) required to drive the sampler over the interval of 6 to 18 in. (150 to 450 mm). However, when a 24 in. (610 mm) sampler is used, the number of blows (N) required to drive the sampler over the interval of 12 to 24 in. (300 to 610 mm) may be reported if this value is lower. For split spoon samples where insufficient penetration was achieved and N-Values cannot be presented, the number of blows are reported over sampler penetration in millimetres (e.g. 50/75). Some design methods make use of N-values corrected for various factors such as overburden pressure, energy ratio, borehole diameter, etc. No corrections have been applied to the N-values presented on the log.

DYNAMIC CONE PENETRATION TEST (DCPT)

Dynamic cone penetration tests are performed using a standard 60 degree apex cone connected to 'A' size drill rods with the same standard fall height and weight as the Standard Penetration Test. The DCPT value is the number of blows of the hammer required to drive the cone one foot (300 mm) into the soil. The DCPT is used as a probe to assess soil variability.

OTHER TESTS

S	Sieve analysis
H	Hydrometer analysis
k	Laboratory permeability
γ	Unit weight
G_s	Specific gravity of soil particles
CD	Consolidated drained triaxial
CU	Consolidated undrained triaxial with pore pressure measurements
UU	Unconsolidated undrained triaxial
DS	Direct Shear
C	Consolidation
Q_u	Unconfined compression
I_p	Point Load Index (I_p on Borehole Record equals $I_p(50)$ in which the index is corrected to a reference diameter of 50 mm)

	Single packer permeability test; test interval from depth shown to bottom of borehole
	Double packer permeability test; test interval as indicated
	Falling head permeability test using casing
	Falling head permeability test using well point or piezometer

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BOREHOLE RECORD

N: 4 989 237 E: 634 441

BHMW PI-1

CLIENT Muskoka Algonquin Healthcare — PROJECT No. 140022038

LOCATION 300 Pine Street, Bracebridge, Ontario — DATUM Geodetic

DATES: BORING November 8 & 9, 2023 — WATER LEVEL — TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	DEPTH (ft)	TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0	**271.5**	**Silty Sand**	0					
0		Possible FILL: loose to compact, brown, Silty SAND (SM) to Silty SAND with Gravel (SM) - trace rootlets at SS1 - trace of wooden fragments at SS3 - moist	1	SS	1	460/610	7	
			2					
1			3	SS	2	360/610	17	
			4					
			5					
2			6	SS	3	300/610	17	
	269.2		7					
		Possible FILL: loose to compact, brown, GRAVEL with Sand (GP) to GRAVEL (GP) - trace of wooden fragments at SS4 and SS5 - moist	8	SS	4	230/610	10	55 40 4 1
3			9					
			10					
			11	SS	5	150/610	14	
			12					
4			13					
			14					
			15					
			16	SS	6	76/610	19	
5			17					
			18					
		Brown to grey	19					
6			20					
			21	SS	7	0.0/610	11	No recovery from SS7 possibly due to gravels. Auger sample taken.
			22					
7			23					
			24					
			25					
8			26	SS	8	76/610	9	
			27					
			28					
9			29					
	262.2		30	SS	9	0.0/130	50/130	>>
		End of Borehole at approximately 9.3 m below existing grade due to refusal on inferred bedrock.	31					
			32					
10								

UNDRAINED SHEAR STRENGTH (kPa)
50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90 100

Continued Next Page

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 989 237 E: 634 441

BHMW PI-1

CLIENT Muskoka Algonquin Healthcare PROJECT No. 140022038

LOCATION 300 Pine Street, Bracebridge, Ontario DATUM Geodetic

DATES: BORING November 8 & 9, 2023 WATER LEVEL TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm) TCR(%) / SCR(%)	SAMPLES N-VALUE OR RQD(%)
	261.5								
10		Monitoring well installed in borehole, screened from approximately 6.1 m to 9.1 m below grade. The groundwater level was measured below existing grade as follows. dry - November 20, 2023			33				
					34				
					35				
11					36				
					37				
					38				
					39				
12					40				
					41				
					42				
13					43				
					44				
					45				
14					46				
					47				
					48				
15					49				
					50				
					51				
					52				
16					53				
					54				
					55				
17					56				
					57				
					58				
18					59				
					60				
					61				
19					62				
					63				
					64				
20					65				

UNDRAINED SHEAR STRENGTH (kPa)

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

REMARKS & GRAIN SIZE DISTRIBUTION (%)

10 20 30 40 50 60 70 80 90 100

GR SA SI CL

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 989 095 E: 634 484

BH PI-2

CLIENT Muskoka Algonquin Healthcare PROJECT No. 140022038

LOCATION 300 Pine Street, Bracebridge, Ontario DATUM Geodetic

DATES: BORING November 9 & 10, 2023 WATER LEVEL TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	DEPTH (ft)	TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0	255.2	**Silty Sand**	0					
		FILL: brown, silty sand with gravel - trace rootlets - moist to wet	1	SS	1	300/610	2	
	254.4		2					
1		Compact to very dense, brown, Silty SAND (SM) to Sandy SILT (ML) - trace gravel to with gravel - moist to wet	3	SS	2	510/610	21	
			4					
			5					
2			6	SS	3	380/610	29	
			7					
		- possble cobbles	8	SS	4	460/510	16	
			9					
3			10	SS	5	0.0/180	50/200mm	No recovery from spoons SS5 and SS6 due to possbile cobbles or boulder
			11					
			12					
4			13					
			14					
			15					
			16	SS	6	0.0/610	51	
5			17					
			18					
			19					
6			20					
			21	SS	7	360/610	25	27 65 7 1
			22					
7			23					
			24					
			25					
			26	SS	8	360/610	12	
8			27					
			28					
			29					
9			30	SS	9	25/61	50/610mm	
	246.0	- rock fragments						
		End of Borehole at approximately 9.2 m below existing grade due to refusal on inferred bedrock.	31					
			32					
10								

UNDRAINED SHEAR STRENGTH (kPa)

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90 100

Continued Next Page

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

BOREHOLE RECORD

N: 4 989 095 E: 634 484

BH PI-2

CLIENT Muskoka Algonquin Healthcare PROJECT No. 140022038

LOCATION 300 Pine Street, Bracebridge, Ontario DATUM Geodetic

DATES: BORING November 9 & 10, 2023 WATER LEVEL TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm) TCR(%) / SCR(%)	SAMPLES N-VALUE OR RQD(%)
	245.2								
10		Borehole dry and caved-in inside open borehole measured at 5.3 m below existing grade. Borehole was backfille with soil cuttings and hole plug.			33				
					34				
					35				
11					36				
					37				
					38				
					39				
12					40				
					41				
					42				
13					43				
					44				
					45				
14					46				
					47				
					48				
15					49				
					50				
					51				
					52				
16					53				
					54				
					55				
17					56				
					57				
					58				
18					59				
					60				
					61				
19					62				
					63				
					64				
20					65				

UNDRAINED SHEAR STRENGTH (kPa)

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

REMARKS & GRAIN SIZE DISTRIBUTION (%)

10 20 30 40 50 60 70 80 90 100

GR SA SI CL

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 988 926 E: 634 481

BHMW PI-3

CLIENT Muskoka Algonquin Healthcare

PROJECT No. 140022038

LOCATION 300 Pine Street, Bracebridge, Ontario

DATUM Geodetic

DATES: BORING November 10, 2023

WATER LEVEL November 10, 2023

TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	DEPTH (ft)	TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)
	262.5	**Grass**					
0		Possible FILL: compact, dark brown, silty sand - with gravel - trace rootlets - moist	0–1	SS	1	300/610	22
	261.7		2–3				
1		Possible FILL: soft, brown, Sandy CLAY (CL) - trace gravel - moist	3–4	SS	2	460/610	3
	261.0		5–6	SS	3	410/610	16
2		Compact, brown, Silty Clayey SAND (SC-SM) to Silty SAND (SM) - trace gravel - moist SS5 contains trace clay	7–8				
			8–9	SS	4	380/610	24
3			10–11	SS	5	360/610	14
			12–13				
4			14–15				
	257.9						
		Soft, brown to grey, Silty CLAY (CL-ML) to CLAY (CL) - sandy to trace sand - moist	15–16	SS	6	560/610	3
5			17–18	VT	1		
			19–20				
6			20–21	SS	7	580/610	4
			22–23	VT	2		
7			24–25				
	254.9						
		Dense to very dense, brown, Silty SAND (SM) - trace gravel to with gravel - moist	25–26	SS	8	410/610	44
8			27–28				
			29–30				
9			30–31	SS	9	410/590	74
	252.8						
		End of Borehole at approximately	32				
10							

Continued Next Page

UNDRAINED SHEAR STRENGTH (kPa)

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m

STANDARD PENETRATION TEST, BLOWS/0.3m

10 20 30 40 50 60 70 80 90 100

REMARKS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

4 46 17 33

0 41 46 13

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 988 926 E: 634 481

BHMW PI-3

CLIENT Muskoka Algonquin Healthcare PROJECT No. 140022038

LOCATION 300 Pine Street, Bracebridge, Ontario DATUM Geodetic

DATES: BORING November 10, 2023 WATER LEVEL November 10, 2023 TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	SAMPLES: TYPE	SAMPLES: NUMBER	SAMPLES: RECOVERY (mm) TCR(%) / SCR(%)	SAMPLES: N-VALUE OR RQD(%)
10	252.5	9.7 m below existing grade. Monitoring well installed in borehole, screened from approximately 6.1 m to 9.1 m below grade. The groundwater level was measured below existing grade as follows. 8.7 m - November 10, 2023 9.0 m - November 20, 2023			33				
					34				
					35				
11					36				
					37				
					38				
					39				
12					40				
					41				
					42				
13					43				
					44				
					45				
14					46				
					47				
					48				
15					49				
					50				
					51				
16					52				
					53				
					54				
17					55				
					56				
					57				
18					58				
					59				
					60				
19					61				
					62				
					63				
					64				
20					65				

UNDRAINED SHEAR STRENGTH (kPa)

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

REMARKS & GRAIN SIZE DISTRIBUTION (%)

10 20 30 40 50 60 70 80 90 100

GR SA SI CL

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 988 811 E: 634 578

BH PI-4

CLIENT Muskoka Algonquin Healthcare PROJECT No. 140022038

LOCATION 300 Pine Street, Bracebridge, Ontario DATUM Geodetic

DATES: BORING November 9, 2023 WATER LEVEL TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	DEPTH (ft)	TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0	**256.3**	**Topsoil**	0					
	256.1	150 mm TOPSOIL						
		Loose to compact, brown, Sandy SILT (ML) to Silty SAND (SM) - trace clay - moist to wet	1	SS	1	510/610	7	
1			2					
			3	SS	2	360/610	28	
			4					
			5					
2			6	SS	3	510/610	14	
			7					
			8	SS	4	460/610	13	
			9					
3			10					
			11	SS	5	430/610	10	
			12					
4			13					
			14					
			15					
			16	SS	6	430/610	5	Low blow counts were likley due to the disturbance from the groundwater pressure
5			17					
			18					
			19					
6			20					
			21	SS	7	580/610	16	
			22					
7			23					
			24					
			25					
			26	SS	8	610/610	4	0 74 20 6
8			27					
			28					
			29					
9			30					
			31	SS	9	480/610	7	
	246.5		32					
10		End of Borehole at approximately						

Continued Next Page

UNDRAINED SHEAR STRENGTH (kPa)

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90 100

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 988 811 E: 634 578

BH PI-4

CLIENT Muskoka Algonquin Healthcare PROJECT No. 140022038

LOCATION 300 Pine Street, Bracebridge, Ontario DATUM Geodetic

DATES: BORING November 9, 2023 WATER LEVEL TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm) TCR(%) / SCR(%)	SAMPLES N-VALUE OR RQD(%)
	246.3								
10		9.8 m below existing grade.			33				
		Water level and caved-in inside open borehole measured at 2.1 m and 3.0 m below grade, respectively.			34				
					35				
11					36				
					37				
		Borehole was backfilled with soil cuttings and hole plug.			38				
					39				
12					40				
					41				
					42				
13					43				
					44				
					45				
14					46				
					47				
					48				
15					49				
					50				
					51				
16					52				
					53				
					54				
17					55				
					56				
					57				
18					58				
					59				
					60				
19					61				
					62				
					63				
					64				
20					65				

UNDRAINED SHEAR STRENGTH (kPa)

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

REMARKS & GRAIN SIZE DISTRIBUTION (%)

10 20 30 40 50 60 70 80 90 100

GR SA SI CL

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 989 339 E: 634 594

BH PI-5

CLIENT Muskoka Algonquin Healthcare PROJECT No. 140022038

LOCATION 300 Pine Street, Bracebridge, Ontario DATUM Geodetic

DATES: BORING November 3, 2023 WATER LEVEL TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	DEPTH (ft)	SAMPLES TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)
0	279.4	**Topsoil**	0				
		50 mm TOPSOIL					
		Very loose to dense, brown, Silty SAND (SM) to SAND (SP)	1	SS	1	150/610	2
		- trace clay	2				
1		- wet	3	SS	2	250/610	17
		SS2 contains oraginc matters	4				
			5				
2			6	SS	3	460/610	18
			7				
			8	SS	4	300/610	27
			9				
3			10				
			11	SS	5	610/610	31
	275.6		12				
4		End of Borehole at approximately 3.8 m below existing grade due to refusal on inferred bedrock.	13				
			14				
		Water level and caved-in inside open borehole measured at 2.3 m and 2.7 m below grade, respectively.	15				
5			16				
			17				
		Borehole was backfilled with soil cuttings and hole plug.	18				
			19				
6			20				
			21				
			22				
7			23				
			24				
			25				
8			26				
			27				
			28				
9			29				
			30				
			31				
10			32				

UNDRAINED SHEAR STRENGTH (kPa)

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90 100

REMARKS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

0 96 3 1

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 989 255 E: 634 655

BH PI-6

CLIENT Muskoka Algonquin Healthcare PROJECT No. 140022038

LOCATION 300 Pine Street, Bracebridge, Ontario DATUM Geodetic

DATES: BORING November 8, 2023 WATER LEVEL TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm) TCR(%) / SCR(%)	SAMPLES N-VALUE OR RQD(%)
0	**276.2**	**Topsoil**			0				
	276.0	200 mm TOPSOIL with silty sand, trace clay, trace rootlets			1	SS	1	100 5	1/200mm
		End of Borehole at approximately 0.2 m below existing grade due to refusal on inferred bedrock.			2				
1					3				
					4				
					5				
2					6				
					7				
					8				
					9				
3					10				
					11				
					12				
4					13				
					14				
					15				
					16				
5					17				
					18				
					19				
					20				
6					21				
					22				
					23				
					24				
7					25				
					26				
					27				
					28				
8					29				
					30				
					31				
					32				
9									
10									

UNDRAINED SHEAR STRENGTH (kPa)

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

REMARKS & GRAIN SIZE DISTRIBUTION (%)

10 20 30 40 50 60 70 80 90 100

GR SA SI CL

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 989 144 E: 634 626

BH PI-7

CLIENT Muskoka Algonquin Healthcare PROJECT No. 140022038

LOCATION 300 Pine Street, Bracebridge, Ontario DATUM Geodetic

DATES: BORING November 8, 2023 WATER LEVEL TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	SAMPLES TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)
0	277.5	**Topsoil**			0				
		125 mm TOPSOIL			1	SS	1	380/610	2
		Very loose to dense, brown, Silty SAND (SM)			2				
		-trace clay			3	SS	2	410/610	39
1		- wet			4				
		SS2 and SS3 contain trace gravel			5				
	275.6				6	SS	3	300/380	73/230mm
2		End of Borehole at approximately 1.9 m below existing grade due to refusal on inferred bedrock.			7				
					8				
		Borehole dry and caved-in inside open borehole measured at 1.6 m below existing grade.			9				
3					10				
		Borehole was backfille with soil cuttings and hole plug.			11				
					12				
4					13				
					14				
					15				
5					16				
					17				
					18				
6					19				
					20				
					21				
7					22				
					23				
					24				
					25				
8					26				
					27				
					28				
					29				
9					30				
					31				
					32				
10									

UNDRAINED SHEAR STRENGTH (kPa)

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90 100

REMARKS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

9 70 19 2

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 989 099 E: 634 686

BH PI-8

CLIENT Muskoka Algonquin Healthcare PROJECT No. 140022038

LOCATION 300 Pine Street, Bracebridge, Ontario DATUM Geodetic

DATES: BORING November 7, 2023 WATER LEVEL TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	SAMPLES TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)
0	**273.4**	**Topsoil**			0				
		125 mm TOPSOIL							
		Loose to compact, brown, Silty SAND (SM) - trace clay - moist			1	SS	1	360/610	4
1					2				
					3	SS	2	460/610	12
	271.9				4				
		Firm, brown to grey, Silty CLAY (CL-ML) to CLAY (CL) - trace sand to with sand - moist		▽	5				
2					6	SS	3	460/610	7
					7				
					8	SS	4	530/610	5
					9				
3					10	VT	1		
					11				
	269.6				12				
		Compact, brown, Sandy SILT (ML) - trace clay - wet			13	SS	5	430/610	12
4					14				
					15				
	268.4				16				
5		End of Borehole at approximately 5.0 m below existing grade due to refusal on inferred bedrock. Water level and caved-in inside open borehole measured at 2.1 m and 3.7 m below existing grade, respectively. Borehole was backfille with soil cuttings and hole plug.			17				
					18				
					19				
6					20				
					21				
					22				
7					23				
					24				
					25				
8					26				
					27				
					28				
9					29				
					30				
					31				
10					32				

UNDRAINED SHEAR STRENGTH (kPa)

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90 100

REMARKS & GRAIN SIZE DISTRIBUTION (%)

GR SA SI CL

0 24 35 41

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 989 008 E: 634 685

BHMW PI-9

CLIENT Muskoka Algonquin Healthcare PROJECT No. 140022038

LOCATION 300 Pine Street, Bracebridge, Ontario DATUM Geodetic

DATES: BORING November 8, 2023 WATER LEVEL November 10, 2023 TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	DEPTH (ft)	SAMPLES TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)
0	271.8	**Topsoil**	0				
		125 mm TOPSOIL					
		Loose to compact, brown, Silty SAND (SM) to Sandy SILT (ML) - trace clay - moist	1	SS	1	410/610	11
1			2				
			3	SS	2	360/610	22
			4				
			5				
2			6	SS	3	530/610	26
			7				
			8	SS	4	410/610	5
			9				
3	268.8		10				
		Soft, brown, Silty CLAY (CL-ML) to CLAY (CL) - trace sand - moist to wet	11	SS	5	610/610	2
			12				
4			13	VT	1		
			14				
			15				
		- grey	16	SS	6	610/610	2
5		SS6 contains sand seam	17				
			18	VT	2		
			19				
6	265.7		20				
		Loose, grey, Sandy SILT (ML) - trace clay - wet	21	SS	7	610/610	8
			22				
7		SS7 contains silt (ML)	23				
			24				
	264.0		25				
8		End of Borehole at approximately 7.8 m below existing grade due to refusal on inferred bedrock.	26				
			27				
			28				
		Monitoring well installed in borehole, screened from approximately 4.6 m to 7.6 m below grade.	29				
9			30				
			31				
			32				
10							

Continued Next Page

UNDRAINED SHEAR STRENGTH (kPa)

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

REMARKS & GRAIN SIZE DISTRIBUTION (%)

10 20 30 40 50 60 70 80 90 100

GR SA SI CL

0 3 91 6

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 989 008 E: 634 685

BHMW PI-9

CLIENT Muskoka Algonquin Healthcare PROJECT No. 140022038

LOCATION 300 Pine Street, Bracebridge, Ontario DATUM Geodetic

DATES: BORING November 8, 2023 WATER LEVEL November 10, 2023 TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm) TCR(%) / SCR(%)	SAMPLES N-VALUE OR RQD(%)	UNDRAINED SHEAR STRENGTH (kPa) 50 100 150 200 / WATER CONTENT & ATTERBERG LIMITS W_P W W_L / DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m / STANDARD PENETRATION TEST, BLOWS/0.3m	REMARKS & GRAIN SIZE DISTRIBUTION (%) 10 20 30 40 50 60 70 80 90 100 GR SA SI CL
	261.8										
10		The groundwater level was measured below existing grade as follows. 6.1 m - November 10, 2023 6.9 m - November 20, 2023			33						
					34						
					35						
11					36						
					37						
					38						
12					39						
					40						
					41						
13					42						
					43						
					44						
14					45						
					46						
					47						
15					48						
					49						
					50						
16					51						
					52						
					53						
17					54						
					55						
					56						
18					57						
					58						
					59						
19					60						
					61						
					62						
					63						
					64						
20					65						

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 989 225 E: 634 554

BH PI-10

CLIENT Muskoka Algonquin Healthcare PROJECT No. 140022038

LOCATION 300 Pine Street, Bracebridge, Ontario DATUM Geodetic

DATES: BORING November 6 & 7, 2023 WATER LEVEL TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	SAMPLES TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)
0	**282.0**	**Topsoil**			0				
		100 mm TOPSOIL			1	SS	1	460/610	2
		Very loose to dense, brown to grey, Silty SAND (SM) to Sandy SILT (ML)			2				
1		- trace gravel and clay			3	SS	2	360/610	43
		- wet			4				
					5				
2	279.9				6	SS	3	410/610	25
		Gneiss			7				
		- dark grey and pink gneissic bending, fair quality			8				
		- fresh (W1) to slightly weathered (W2)			9	HQ	1	100%/68%	57%
3		- broken core from approximately 2.4 m to 2.6 m below grade			10				
	278.5	- flat to dipping discontinuities with close joint spacing			11				
		End of Borehole at approximately 3.5 m below existing grade.			12				
4					13				
		Borehole was backfilled with cuttings and hole plug.			14				
					15				
					16				
5					17				
					18				
					19				
6					20				
					21				
					22				
7					23				
					24				
					25				
8					26				
					27				
					28				
9					29				
					30				
					31				
10					32				

UNDRAINED SHEAR STRENGTH (kPa)

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

REMARKS & GRAIN SIZE DISTRIBUTION (%)

10 20 30 40 50 60 70 80 90 100

GR SA SI CL

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

TEST PIT RECORD

N: 4 989 237 E: 634 441

TP-1

CLIENT Muskoka Algonquin Healthcare PROJECT No. 140022038

LOCATION 300 Pine Street, Bracebridge, Ontario DATUM Geodetic

EXCAVATION DATE: October 26, 2023 WATER LEVEL TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm) TCR(%) / SCR(%)	SAMPLES N-VALUE OR RQD(%)
0	271.5	**Silty Sand**			0				
		Possilbe Fill: brown, sand with gravel to gravel with sand			1				
1					2				
					3				
					4				
	269.7	- occasional cobbles			5				
2		End of Test Pit at approximately 1.8 m below existing grade.			6				
					7				
		Early termination due to sloughing of grnular materials.			8				
3					9				
		No seepage was observed upon completion of the test pit.			10				
					11				
		The cooridnates and ground surface elevation of TP-1 were inferred from the survey data of BHMW PI-1.			12				
4					13				
					14				
					15				
					16				
5					17				
					18				
					19				
					20				
6					21				
					22				
					23				
					24				
7					25				
					26				
					27				
					28				
8					29				
					30				
					31				
9					32				
10									

UNDRAINED SHEAR STRENGTH (kPa)

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

REMARKS & GRAIN SIZE DISTRIBUTION (%)

10 20 30 40 50 60 70 80 90 100

GR SA SI CL

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

TEST PIT RECORD

N: 4 989 095 E: 634 484

TP-2

CLIENT Muskoka Algonquin Healthcare PROJECT No. 140022038

LOCATION 300 Pine Street, Bracebridge, Ontario DATUM Geodetic

EXCAVATION DATE: October 26, 2023 WATER LEVEL TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm) TCR(%) / SCR(%)	SAMPLES N-VALUE OR RQD(%)
0	255.2	**Silty Sand**			0				
		Brown silty sand to sand - trace gravel gravel			1				
1					2				
					3				
2					4				
					5				
					6				
					7				
					8				
					9				
3	252.2				10				
		End of Test Pit at approximately 3.0 m below existing grade. No seepage was observed upon completion of the test pit. The cooridnates and ground surface elevation of TP-2 were inferred from the survey data of BH PI-2.			11				
					12				
4					13				
					14				
					15				
					16				
5					17				
					18				
					19				
					20				
					21				
					22				
6					23				
					24				
					25				
					26				
					27				
					28				
7					29				
					30				
					31				
					32				
8									
9									
10									

UNDRAINED SHEAR STRENGTH (kPa)

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

REMARKS & GRAIN SIZE DISTRIBUTION (%)

10 20 30 40 50 60 70 80 90 100

GR SA SI CL

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

TEST PIT RECORD

N: 4 988 926 E: 634 481

TP-3

CLIENT Muskoka Algonquin Healthcare PROJECT No. 140022038

LOCATION 300 Pine Street, Bracebridge, Ontario DATUM Geodetic

EXCAVATION DATE: October 26, 2023 WATER LEVEL TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm) TCR(%) / SCR(%)	SAMPLES N-VALUE OR RQD(%)
	262.5	**Grass**			0				
0		Possible Fill: brown, silty sand with gravel			0				
					1				
1	261.3				2				
		Brown, silty sand to sandy silt			3				
					4				
2					5				
					6				
					7				
					8				
					9				
3	259.5	- with gravel, occasional cobbles			10				
		End of Test Pit at approximately 3.0 m below existing grade.			11				
					12				
4		No seepage was observed upon completion of the test pit.			13				
					14				
					15				
		The cooridnates and ground surface elevation of TP-3 were inferred from the survey data of BHMW PI-3.			16				
5					17				
					18				
					19				
					20				
6					21				
					22				
					23				
					24				
7					25				
					26				
					27				
					28				
8					29				
					30				
					31				
9					32				
10									

UNDRAINED SHEAR STRENGTH (kPa)

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

REMARKS & GRAIN SIZE DISTRIBUTION (%)

10 20 30 40 50 60 70 80 90 100

GR SA SI CL

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

TEST PIT RECORD

N: 4 988 811 E: 634 578

TP-4

CLIENT Muskoka Algonquin Healthcare PROJECT No. 140022038

LOCATION 300 Pine Street, Bracebridge, Ontario DATUM Geodetic

EXCAVATION DATE: October 26, 2023 WATER LEVEL TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm) TCR(%) / SCR(%)	SAMPLES N-VALUE OR RQD(%)
0	**256.3**	**Topsoil**			0				
	256.1	Topsoil			1				
		Light brown to brown, silty sand to sandy silt			2				
1					3				
					4				
					5				
2					6				
					7				
					8				
					9				
3	253.3	- appeared to contain more moisture			10				
		End of Test Pit at approximately 3.0 m below existing grade.			11				
					12				
4		No seepage was observed upon completion of the test pit.			13				
					14				
					15				
		The cooridnates and ground surface elevation of TP-4 were inferred from the survey data of BH PI-4.			16				
5					17				
					18				
					19				
6					20				
					21				
					22				
7					23				
					24				
					25				
8					26				
					27				
					28				
9					29				
					30				
					31				
10					32				

UNDRAINED SHEAR STRENGTH (kPa)

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

REMARKS & GRAIN SIZE DISTRIBUTION (%)

10 20 30 40 50 60 70 80 90 100

GR SA SI CL

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

TEST PIT RECORD

N: 4 989 339 E: 634 594

TP-5

CLIENT Muskoka Algonquin Healthcare

PROJECT No. 140022038

LOCATION 300 Pine Street, Bracebridge, Ontario

DATUM Geodetic

EXCAVATION DATE: October 25, 2023

WATER LEVEL

TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	SAMPLES: TYPE	SAMPLES: NUMBER	SAMPLES: RECOVERY (mm) TCR(%) / SCR(%)	SAMPLES: N-VALUE OR RQD(%)
0	**279.4**	**Topsoil**			0				
		Topsoil			1				
		Brown, silty sand - with gravel			2				
1					3				
					4				
					5				
		- cobble/boulder			6				
2					7				
					8				
					9				
3					10				
				▽	11				
	275.7	- grey			12				
		End of Test Pit at approximately 3.7 m below existing grade. Water seepage was observed at about 1.5 m below exisitng grade, and water level inside open test pit measured at 3.5 m below existing grade upon completion of the test pit The cooridnates and ground surface elevation of TP-5 were inferred from the survey data of BH PI-5.			13				
4					14				
					15				
					16				
5					17				
					18				
					19				
6					20				
					21				
					22				
7					23				
					24				
					25				
8					26				
					27				
					28				
9					29				
					30				
					31				
10					32				

UNDRAINED SHEAR STRENGTH (kPa)

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

REMARKS & GRAIN SIZE DISTRIBUTION (%)

10 20 30 40 50 60 70 80 90 100

GR SA SI CL

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

TEST PIT RECORD

N: 4 989 255 E: 634 655

TP-6

CLIENT Muskoka Algonquin Healthcare PROJECT No. 140022038

LOCATION 300 Pine Street, Bracebridge, Ontario DATUM Geodetic

EXCAVATION DATE: October 25, 2023 WATER LEVEL TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm) TCR(%) / SCR(%)	SAMPLES N-VALUE OR RQD(%)
0	**276.2**	**Topsoil**			0				
	276.0	Topsoil			1				
	275.7	Brown, silty sand with rock fragments and cobbles			2				
1		End of Test Pit at approximately 0.5 m below existing grade due to inferred bedrock			3				
					4				
		No seepage was observed upon completion of the test pit.			5				
2					6				
		The cooridnates and ground surface elevation of TP-6 were inferred from the survey data of BH PI-6.			7				
					8				
					9				
3					10				
					11				
					12				
4					13				
					14				
					15				
5					16				
					17				
					18				
6					19				
					20				
					21				
7					22				
					23				
					24				
8					25				
					26				
					27				
9					28				
					29				
					30				
10					31				
					32				

UNDRAINED SHEAR STRENGTH (kPa)

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

REMARKS & GRAIN SIZE DISTRIBUTION (%)

10 20 30 40 50 60 70 80 90 100

GR SA SI CL

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

TEST PIT RECORD

N: 4 989 144 E: 634 626

TP-7

CLIENT Muskoka Algonquin Healthcare PROJECT No. 140022038

LOCATION 300 Pine Street, Bracebridge, Ontario DATUM Geodetic

EXCAVATION DATE: October 25, 2023 WATER LEVEL TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm) TCR(%) / SCR(%)	SAMPLES N-VALUE OR RQD(%)	UNDRAINED SHEAR STRENGTH (kPa) 50 100 150 200 / WATER CONTENT & ATTERBERG LIMITS W_P W W_L / DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m / STANDARD PENETRATION TEST, BLOWS/0.3m	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0	**277.5**	**Topsoil**			0					10 20 30 40 50 60 70 80 90 100	
		Black to brown, topsoil with grevel and cobbles			1						
	276.7				2						
1		End of Test Pit at approximately 0.8 m below existing grade due to inferred bedrock			3						
					4						
		No seepage was observed upon completion of the test pit.			5						
2					6						
					7						
		The cooridnates and ground surface elevation of TP-7 were inferred from the survey data of BH PI-7.			8						
					9						
3					10						
					11						
					12						
4					13						
					14						
					15						
					16						
5					17						
					18						
					19						
6					20						
					21						
					22						
7					23						
					24						
					25						
					26						
8					27						
					28						
					29						
9					30						
					31						
					32						
10											

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

TEST PIT RECORD

N: 4 989 099 E: 634 686

TP-8

CLIENT Muskoka Algonquin Healthcare

PROJECT No. 140022038

LOCATION 300 Pine Street, Bracebridge, Ontario

DATUM Geodetic

EXCAVATION DATE: October 25, 2023

WATER LEVEL

TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm) TCR(%) / SCR(%)	SAMPLES N-VALUE OR RQD(%)
0	273.4	**Topsoil**			0				
		Topsoil			1				
		Brown, silty sand			2				
1					3				
					4				
					5				
2	271.3				6				
		Grey, silty clay			7				
					8				
					9				
3					10				
					11				
					12				
4	269.4				13				
		End of Test Pit at approximately 4.0 m below existing grade.			14				
					15				
		No seepage was observed upon completion of the test pit.			16				
5					17				
					18				
		The cooridnates and ground surface elevation of TP-8 were inferred from the survey data of BH PI-8.			19				
					20				
6					21				
					22				
					23				
7					24				
					25				
					26				
8					27				
					28				
					29				
9					30				
					31				
					32				
10									

UNDRAINED SHEAR STRENGTH (kPa)

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

REMARKS & GRAIN SIZE DISTRIBUTION (%)

10 20 30 40 50 60 70 80 90 100

GR SA SI CL

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

TEST PIT RECORD

N: 4 989 008 E: 634 685

TP-9

CLIENT Muskoka Algonquin Healthcare PROJECT No. 140022038

LOCATION 300 Pine Street, Bracebridge, Ontario DATUM Geodetic

EXCAVATION DATE: October 25, 2023 WATER LEVEL TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm) TCR(%) / SCR(%)	SAMPLES N-VALUE OR RQD(%)
	271.8	**Topsoil**							
0		Topsoil			0				
		Brown, silty sand to sandy silt - with gravel			1				
1					2				
					3				
					4				
					5				
2	269.7				6				
		Grey, silty clay			7				
	269.1				8				
		End of Test Pit at approximately 2.7 m below existing grade.			9				
3					10				
		No seepage was observed upon completion of the test pit.			11				
					12				
4		The cooridnates and ground surface elevation of TP-9 were inferred from the survey data of BHMW PI-9.			13				
					14				
					15				
					16				
5					17				
					18				
					19				
6					20				
					21				
					22				
7					23				
					24				
					25				
8					26				
					27				
					28				
9					29				
					30				
					31				
10					32				

UNDRAINED SHEAR STRENGTH (kPa)

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

REMARKS & GRAIN SIZE DISTRIBUTION (%)

10 20 30 40 50 60 70 80 90 100

GR SA SI CL

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

TEST PIT RECORD

N: 4 989 225 E: 634 554

TP-10

CLIENT Muskoka Algonquin Healthcare

PROJECT No. 140022038

LOCATION 300 Pine Street, Bracebridge, Ontario

DATUM Geodetic

EXCAVATION DATE: October 25, 2023

WATER LEVEL

TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm) TCR(%) / SCR(%)	SAMPLES N-VALUE OR RQD(%)	UNDRAINED SHEAR STRENGTH (kPa) 50 100 150 200 / WATER CONTENT & ATTERBERG LIMITS W_P W W_L / DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m / STANDARD PENETRATION TEST, BLOWS/0.3m	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0	**282.0**	**Topsoil**			0					10 20 30 40 50 60 70 80 90 100	
		Topsoil			1						
		Brown to grey, silty sand to sandy silt - trace gravel to with gravel			2						
1					3						
	280.3				4						
		End of Test Pit at approximately 1.7 m below existing grade due to inferred bedrock			5						
		No seepage was observed upon completion of the test pit.			6						
2		The cooridnates and ground surface elevation of TP-10 were inferred from the survey data of BH PI-10.			7						
					8						
					9						
3					10						
					11						
					12						
4					13						
					14						
					15						
5					16						
					17						
					18						
6					19						
					20						
					21						
7					22						
					23						
					24						
8					25						
					26						
					27						
9					28						
					29						
					30						
10					31						
					32						

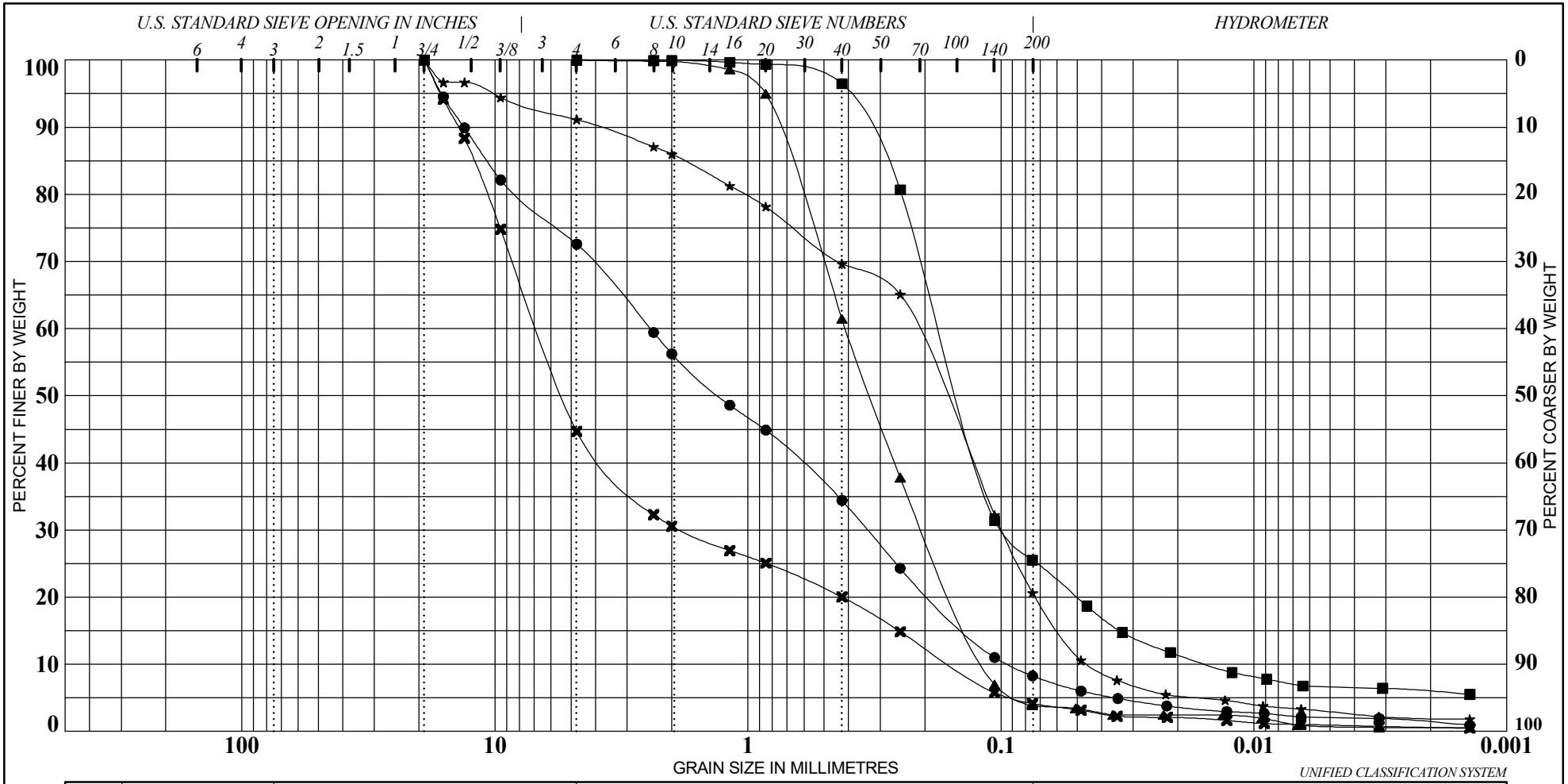
□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

APPENDIX D

D.1 LABORATORY TEST RESULTS



BLDs	COBBLES	GRAVEL		SAND			SILT & CLAY	
		coarse	fine	coarse	medium	fine	SILT	CLAY

Sample		Depth (m)	Description	W%	W_L	W_P	I_P	%Gravel	%Sand	%Silt	%Clay
●	BH PI-2	6.4	SAND with SILT & GRAVEL (SW-SM)	5				27	65	7	1
■	BH PI-4	7.9	SILTY SAND (SM)	7				0	74	20	6
▲	BH PI-5	3.4	SAND (SP)	17				0	96	3	1
★	BH PI-7	1.8	SILTY SAND (SM)	12				9	70	19	2
✖	BHMW PI-1	2.6	GRAVEL with SAND (GP)	3				55	40	4	1

Stantec

Project: Muskoka Algonquin Stage 1.3 - Bracebridge

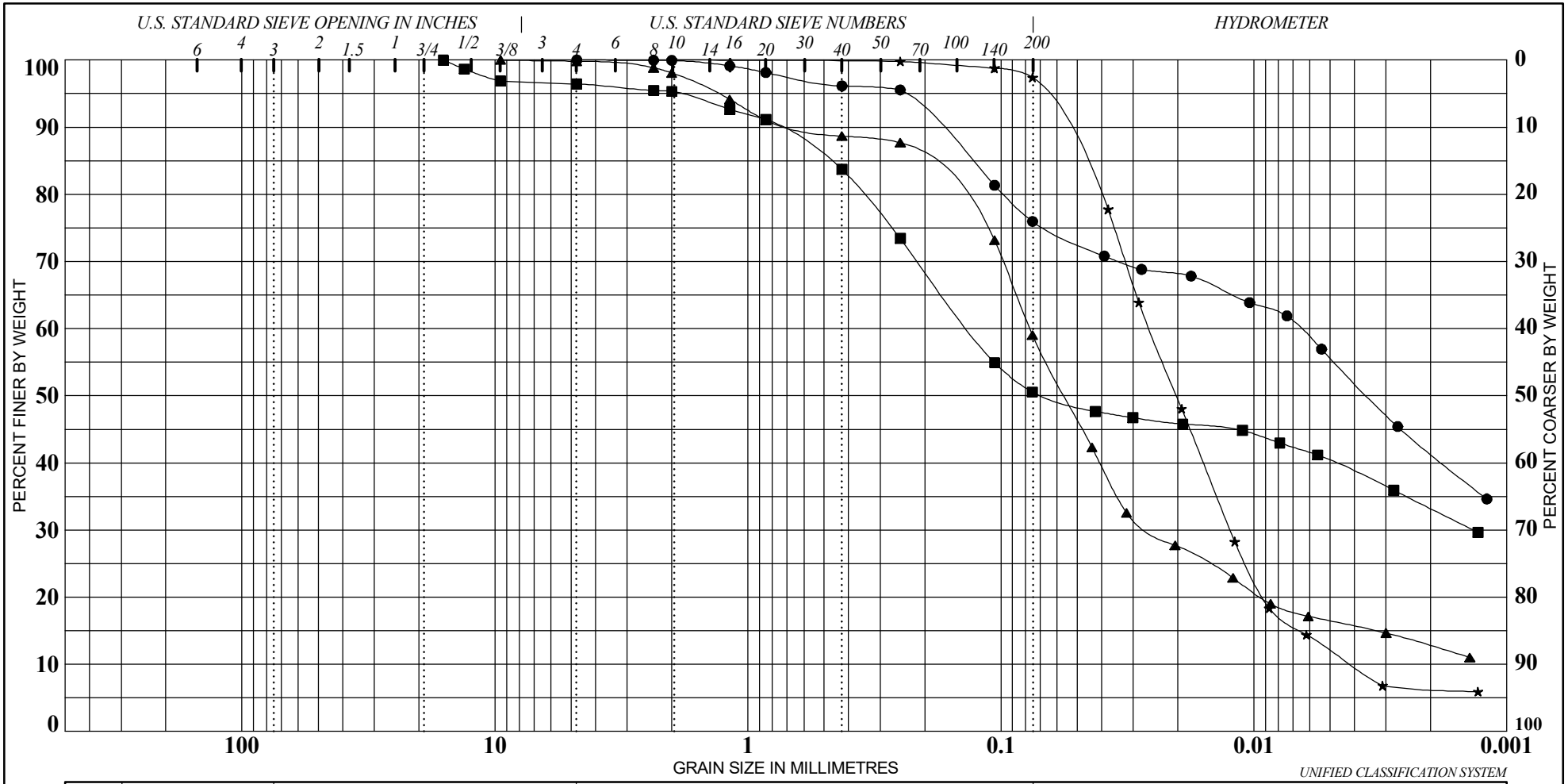
Location: 300 Pine Street, Bracebridge, Ontario

Project No.: 140022038

GRADATION CURVE (ASTM D422)

Figure: 1

Remarks:



UNIFIED CLASSIFICATION SYSTEM

BLDs	COBBLES	GRAVEL		SAND			SILT & CLAY	
		coarse	fine	coarse	medium	fine	SILT	CLAY

Sample	Depth (m)	Description	W%	W_L	W_P	I_P	%Gravel	%Sand	%Silt	%Clay
● BH PI-8	1.8	CLAY with SAND (CL)	31	32	16	16	0	24	35	41
■ BHMW PI-3	1.1	SANDY CLAY (CL)	31	29	14	15	4	46	17	33
▲ BHMW PI-3	4.9	SANDY SILTY CLAY (CL-ML)	22	19	15	4	0	41	46	13
★ BHMW PI-9	6.4	SILT (ML)	24	NP	NP	NP	0	3	91	6

Stantec

Project: Muskoka Algonquin Stage 1.3 - Bracebridge

Location: 300 Pine Street, Bracebridge, Ontario

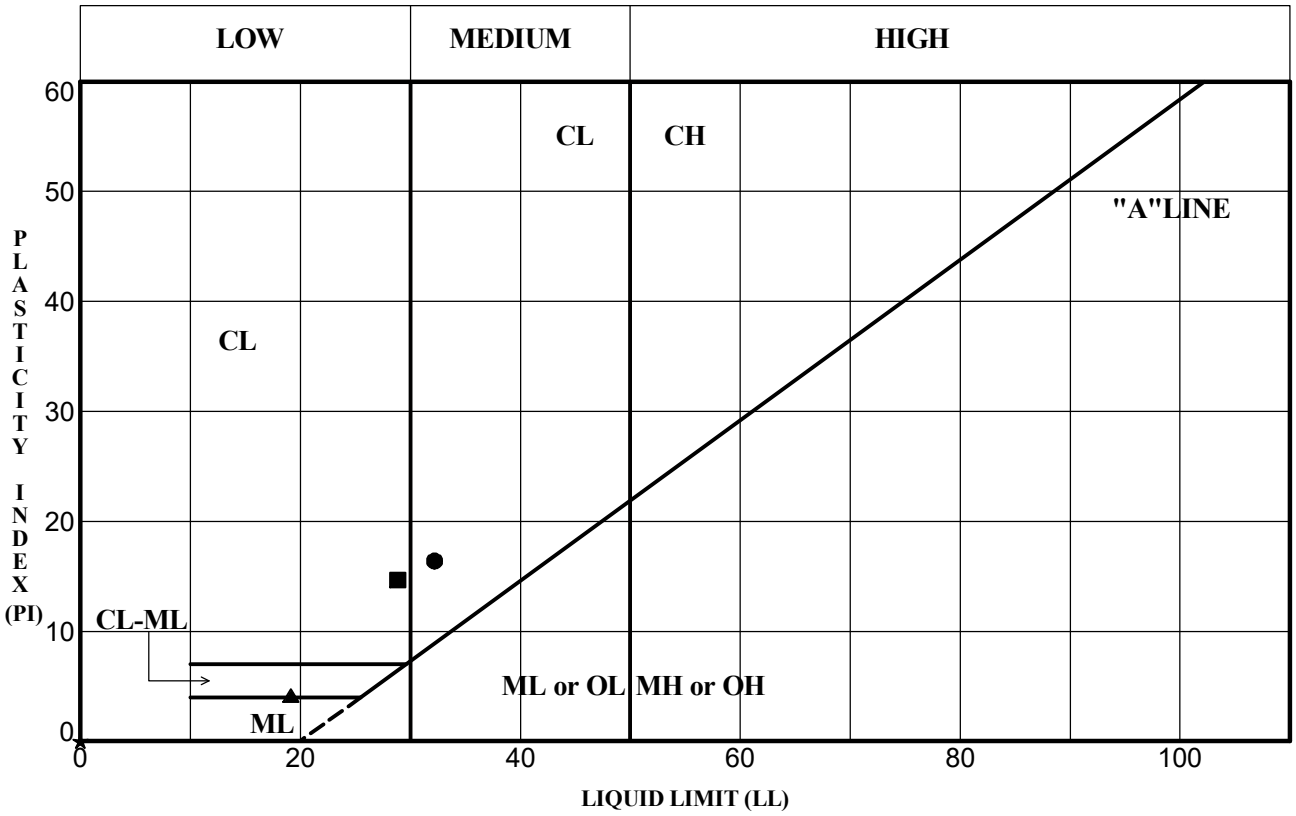
Project No.: 140022038

GRADATION CURVE (ASTM D422)

Figure: 2

Remarks:

PLASTICITY CHART



	Specimen	Depth (m)	LL	PL	PI	Fines	W%	Classification
●	BH PI-8	1.8	32	16	16	76	31	CLAY with SAND (CL)
■	BHMW PI-3	1.1	29	14	15	51	31	SANDY CLAY (CL)
▲	BHMW PI-3	4.9	19	15	4	59	22	SANDY SILTY CLAY (CL-ML)
★	BHMW PI-9	6.4	NP	NP	NP	97	24	SILT (ML)

Stantec

Project: Muskoka Algonquin Stage 1.3 - Bracebridge

Location: 300 Pine Street, Bracebridge, Ontario

Project No.: 140022038

ATTERBERG LIMITS
(ASTM D4318)

Figure: 3

Remarks:

STN13-ATTERBERG 140022038 (BRACEBRIDGE - SITE A).GPJ STANTEC MARKHAM DATA TEMPLATE 2015-05-20.GDT 12/7/23

AGAT Laboratories

2910 12TH STREET NE
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CLIENT NAME: STANTEC CONSULTING LTD
300-675 Cochrane Drive
MARKHAM, ON L3R0B8
(905) 444-7777

ATTENTION TO: Harpreet Singh

PROJECT: 140022038.801.201

AGAT WORK ORDER: 23T099309

ROCK ANALYSIS REVIEWED BY: Jewel Shibu, Lab Supervisor

SOIL ANALYSIS REVIEWED BY: Sukhwinder Randhawa, Inorganic Team Lead

DATE REPORTED: Dec 08, 2023

PAGES (INCLUDING COVER): 7

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (403) 735-2005

*Notes

Disclaimer:

- *All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.*
- *All samples will be disposed of within 30 days after receipt unless a Long Term Storage Agreement is signed and returned. Some specialty analysis may be exempt, please contact your Client Project Manager for details.*
- *AGAT's liability in connection with any delay, performance or non-performance of these services is only to the Client and does not extend to any other third party. Unless expressly agreed otherwise in writing, AGAT's liability is limited to the actual cost of the specific analysis or analyses included in the services.*
- *This Certificate shall not be reproduced except in full, without the written approval of the laboratory.*
- *The test results reported herewith relate only to the samples as received by the laboratory.*
- *Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, warranties of merchantability, fitness for a particular purpose, or non-infringement. AGAT assumes no responsibility for any errors or omissions in the guidelines contained in this document.*
- *All reportable information as specified by ISO/IEC 17025:2017 is available from AGAT Laboratories upon request.*
- *For environmental samples in the Province of Quebec: The analysis is performed on and results apply to samples as received. A temperature above 6°C upon receipt, as indicated in the Sample Reception Notification (SRN), could indicate the integrity of the samples has been compromised if the delay between sampling and submission to the laboratory could not be minimized.*

Member of: Association of Professional Engineers and Geoscientists of Alberta (APEGA)
Western Enviro-Agricultural Laboratory Association (WEALA)
Environmental Services Association of Alberta (ESAA)

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Certificate of Analysis

AGAT WORK ORDER: 23T099309

PROJECT: 140022038.801.201

CLIENT NAME: STANTEC CONSULTING LTD

ATTENTION TO: Harpreet Singh

SAMPLING SITE:

SAMPLED BY:

(284-042) Sulfide (CGY)

DATE RECEIVED: 2023-11-30

DATE REPORTED: 2023-12-08

				SAMPLE DESCRIPTION:	BH PI-8 SS4	BH PI-1 SS2	BH PI-4 SS3
				SAMPLE TYPE:	Soil	Soil	Soil
				DATE SAMPLED:	2023-11-30	2023-11-30	2023-11-30
Parameter	Unit	G / S	RDL		5506050	5506061	5506062
Sulfide	%		0.01		<0.01	<0.01	<0.01

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

5506050-5506062 Acid Soluble Sulfate Analysis completed at AGAT 2620 Calgary
Total Sulfur Analysis completed at AGAT 2215 Calgary

Analysis performed at AGAT Calgary (unless marked by *)

Certified By: Jewel Shibu

Results relate only to the items tested. Results apply to samples as received.

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Certificate of Analysis

AGAT WORK ORDER: 23T099309

PROJECT: 140022038.801.201

CLIENT NAME: STANTEC CONSULTING LTD

ATTENTION TO: Harpreet Singh

SAMPLING SITE:

SAMPLED BY:

Corrosivity Package

DATE RECEIVED: 2023-11-30

DATE REPORTED: 2023-12-08

		SAMPLE DESCRIPTION:		BH PI-8 SS4	BH PI-1 SS2	BH PI-4 SS3
		SAMPLE TYPE:		Soil	Soil	Soil
		DATE SAMPLED:		2023-11-30	2023-11-30	2023-11-30
Parameter	Unit	G / S	RDL	5506050	5506061	5506062
Chloride (2:1)	µg/g		2	<2	<2	<2
Sulphate (2:1)	µg/g		2	8	7	3
pH (2:1)	pH Units		NA	6.54	6.97	6.17
Electrical Conductivity (2:1)	mS/cm		0.005	0.035	0.033	0.015
Resistivity (2:1) (Calculated)	ohm.cm		1	28600	30300	66700
Redox Potential 1	mV		NA	309	224	242
Redox Potential 2	mV		NA	314	230	243
Redox Potential 3	mV		NA	319	229	239

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

5506050-5506062 EC, pH, Chloride and Sulphate were determined on the extract obtained from the 2:1 leaching procedure (2 parts DI water: 1 part soil). Resistivity is a calculated parameter.
Redox potential measured on as received sample. Due to the potential for rapid change in sample equilibrium chemistry with exposure to oxidative/reduction conditions laboratory results may differ from field measured results.
Redox potential measurement in soil is quite variable and non reproducible due in part, to the general heterogeneity of a given soil. It is also related to the introduction of increased oxygen into the sample after extraction. The interpretation of soil redox potential should be considered in terms of its general range rather than as an absolute measurement.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:



Results relate only to the items tested. Results apply to samples as received.

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Quality Assurance

CLIENT NAME: STANTEC CONSULTING LTD

AGAT WORK ORDER: 23T099309

PROJECT: 140022038.801.201

ATTENTION TO: Harpreet Singh

SAMPLING SITE:

SAMPLED BY:

Rock Analysis

RPT Date: Dec 08, 2023			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
(284-042) Sulfide (CGY)															
Total Sulfur	5506050	5506050	<0.01	<0.01	NA	< 0.01	100%	80%	120%						
Sulfate	5502237	5502237	<0.01	<0.01	NA	< 0.01	100%	80%	120%						

Comments: RPDs are calculated using raw analytical data and not the rounded duplicate values reported.
Duplicate/ Replicate NA: Results are less than 10X the RDL and RPD will not be calculated

(284-042) Sulfide (CGY)															
Sulfate	5506050	5506050	<0.01	<0.01	0%	< 0.01		80%	120%						

Comments: RPDs are calculated using raw analytical data and not the rounded duplicate values reported.
Duplicate/ Replicate NA: Results are less than 10X the RDL and RPD will not be calculated

Certified By:

Jewel Shibu

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Results relate only to the items tested. Results apply to samples as received.

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http://www.agatlabs.com

Quality Assurance

CLIENT NAME: STANTEC CONSULTING LTD

AGAT WORK ORDER: 23T099309

PROJECT: 140022038.801.201

ATTENTION TO: Harpreet Singh

SAMPLING SITE:

SAMPLED BY:

Soil Analysis

RPT Date: Dec 08, 2023			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Corrosivity Package															
Chloride (2:1)	5506050	5506050	<2	<2	NA	< 2	95%	70%	130%	96%	80%	120%	94%	70%	130%
Sulphate (2:1)	5506050	5506050	8	9	NA	< 2	99%	70%	130%	97%	80%	120%	99%	70%	130%
pH (2:1)	5506050	5506050	6.54	6.57	0.5%	NA	95%	80%	120%						
Electrical Conductivity (2:1)	5506050	5506050	0.035	0.037	5.6%	< 0.005	91%	80%	120%						
Redox Potential 1	5506050					NA	100%	90%	110%						

Comments: NA signifies Not Applicable.
pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.

Duplicate NA: results are under 5X the RDL and will not be calculated.

Certified By:



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Results relate only to the items tested. Results apply to samples as received.

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Method Summary

CLIENT NAME: STANTEC CONSULTING LTD

AGAT WORK ORDER: 23T099309

PROJECT: 140022038.801.201

ATTENTION TO: Harpreet Singh

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Chloride (2:1)	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Sulphate (2:1)	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
pH (2:1)	INOR 93-6031	modified from EPA 9045D and MCKEAGUE 3.11	PH METER
Electrical Conductivity (2:1)	INOR-93-6075	modified from MSA PART 3, CH 14 and SM 2510 B	PC TITRATE
Resistivity (2:1) (Calculated)	INOR-93-6036	McKeague 4.12, SM 2510 B,SSA #5 Part 3	CALCULATION
Redox Potential 1	INOR-93-6066	modified from G200-20, SM 2580 B	REDOX POTENTIAL ELECTRODE
Redox Potential 2	INOR-93-6066	modified from G200-20, SM 2580 B	REDOX POTENTIAL ELECTRODE
Redox Potential 3	INOR-93-6066	modified from G200-20, SM 2580 B	REDOX POTENTIAL ELECTRODE

Results relate only to the items tested. Results apply to samples as received.

AGAT Laboratories

Have feedback? Scan here for a quick survey!

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Report Information:

Company: STANTEC CONSULTING LTD
Contact: Manpreet Singh
Address: 300-675 Cochrane Drive
Markham, Ontario
Phone: 647-273-9487 Fax:
Reports to be sent to:
1. Email: Jordan.lee@stantec.com
2. Email: Gary.Thao@stantec.com
Brady.Sebnath@stantec.com

Project Information:

Project: 140022038.801.201
Site Location:
Sampled By:
AGAT Quote #: PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes ☑ No ☐
Company:
Contact:
Address:
Email:

Regulatory Requirements:

(Please check all applicable boxes)

☐ Regulation 153/04
Table _____ *Indicate One*
☐ Ind/Com
☐ Res/Park
☐ Agriculture
Soil Texture *(Check One)*
☐ Coarse
☐ Fine

☐ Regulation 406
Table _____ *Indicate One*

☐ Regulation 558

☐ CCME

☐ Sewer Use ☐ Sanitary ☐ Storm
_____ *Region*

☐ Prov. Water Quality Objectives (PWQO)

☐ Other
_____ *Indicate One*

Is this submission for a **Record of Site Condition?** ☐ Yes ☐ No

Report Guideline on *Certificate of Analysis* ☐ Yes ☐ No

Laboratory Use Only

Work Order #: 23T099309
Cooler Quantity: 1 Bag
Arrival Temperatures: 19.3 | 19.4 | 20.6
Custody Seal Intact: ☐ Yes ☐ No ☐ N/A
Notes: no ice

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

For 'Same Day' analysis, please contact your AGAT CPM

Sample Matrix Legend

GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI, DOC Y/N	O. Reg 153: Metals & Inorganics	O. Reg 153: Metals - ☐ CrVI, ☐ Hg, ☐ HWSB	O. Reg 153: BTEX, F1-F4 PHCs	VOC	PAHs	PCBs	PCBs: Aroclors ☐	O. Reg 558: Landfill Disposal Characterization TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	O. Reg 406: Regulation 406 SPLP Rainwater Leach SPLP: ☐ Metals ☐ VOCs ☐ SVOCs	O. Reg 406: Regulation 406 Characterization Package pH, ICPMS Metals, BTEX, F1-F4	Corrosivity: ☐ Moisture ☐ Sulphide						Potentially Hazardous or High Concentration (Y/N)
1. BMPT-8 SS4	30 NOV.	AM/PM	1	SOIL	7.5'												X	X	X	X	X		
2. BMPT-1, SS2	↓	AM/PM	1	SOIL	2.5'												X	X	X	X	X		
3. BMPT-4, SS3		AM/PM	1	SOIL	5'												X	X	X	X	X		
4.		AM/PM																					
5.		AM/PM																					
6.		AM/PM																					
7.		AM/PM																					
8.		AM/PM																					
9.		AM/PM																					
10.		AM/PM																					
11.		AM/PM																					

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
			OWNER	11/30/23	15:24

Page _____ of _____

N°: T-148757

Pink Copy - Client | Yellow Copy - AGAT | White Copy - AGAT

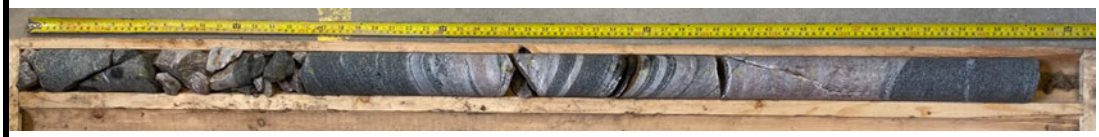
Document ID: DIV-76-1511.022

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APPENDIX E

E.1 ROCK CORE PHOTO

Stantec	**Project:**	Geotechnical Investigation - Proposed Hospital at Site A - 300 Pine Street		
	Project Number:	140022038		
	Location:	300 Pine Street, Bracebridge, ON		
	Borehole ID:	BH PI-10	**Depth (m):**	2.1 - 3.5 m



2.1 m ← RUN 1 → 3.5 m

APPENDIX F

F.1 NBCC SEISMIC HAZARD CALCULATION

Government of Canada / Gouvernement du Canada

2020 National Building Code of Canada Seismic Hazard Tool

This application provides seismic values for the design of buildings in Canada under Part 4 of the National Building Code of Canada (NBC) 2020 as prescribed in Article 1.1.3.1. of Division B of the NBC 2020.

Seismic Hazard Values

User requested values

Code edition	NBC 2020
Site designation X_S	X_D
Latitude (°)	45.044
Longitude (°)	-79.295

Please select one of the tabs below.

NBC 2020 | Additional Values | Plots | API | Background Information

The NBC 5% damped spectral acceleration values can be viewed in the NBC tab. Additional hazard values for your site can be found below.

The 5%-damped spectral acceleration ($S_a(T)$, where T is the period, in s) and peak ground acceleration (PGA) values are given in units of acceleration due to gravity (g, 9.81 m/s^2). Peak ground velocity (PGV) is given in m/s. Probability is expressed in terms of percent (%) exceedance in 50 years.

By default, all probabilities for the user-specified site designation are shown. Other site designations can be selected from the respective drop-down menu in the table. In low hazard regions, a minimum value of 0.001g for T ≤ 2.0s and of 0.0001g for T > 2.0s is assigned. Further information on the calculation of seismic hazard is provided in the *Background Information* tab.

Site Designation: XD	Probability: All	$S_a(0.05)$	$S_a(0.1)$	$S_a(0.2)$	$S_a(0.3)$	$S_a(0.5)$	$S_a(1.0)$	$S_a(2.0)$	$S_a(5.0)$	$S_a(10.0)$	PGA	PGV
X_D	2	0.206	0.26	0.286	0.302	0.296	0.181	0.0875	0.0234	0.00737	0.153	0.188
X_D	2.5	0.184	0.233	0.258	0.272	0.267	0.161	0.0772	0.0203	0.00641	0.139	0.166
X_D	3.5	0.153	0.196	0.217	0.229	0.224	0.134	0.0633	0.0162	0.00512	0.117	0.136
X_D	5	0.124	0.16	0.178	0.188	0.184	0.108	0.0504	0.0125	0.00396	0.0958	0.108
X_D	7	0.0999	0.13	0.146	0.154	0.15	0.0872	0.0398	0.00957	0.00304	0.0784	0.0857
X_D	10	0.078	0.103	0.116	0.122	0.118	0.0677	0.0303	0.00699	0.00222	0.0621	0.0656
X_D	14	0.0606	0.0813	0.0917	0.0964	0.0927	0.052	0.0227	0.00501	0.00159	0.049	0.0497
X_D	20	0.0454	0.0617	0.07	0.0733	0.0698	0.0381	0.016	0.00337	0.00106	0.0372	0.0358
X_D	30	0.0313	0.0436	0.0494	0.0515	0.0479	0.0252	0.01	0.00196	0.000603	0.0262	0.0233
X_D	40	0.0232	0.0327	0.0372	0.0385	0.0351	0.0176	0.0067	0.00123	0.000371	0.0196	0.0164

Download CSV

← Go back to the seismic hazard calculator form

Date modified: 2021-04-06

Stantec

Memo

To:	Hellen Scott Stantec Consulting Ltd.	From:	Marla Larson, Lisa Uskov Stantec Consulting Ltd.
File:	140022038	Date:	December 1, 2023

Reference: **Bracebridge Hospital Preliminary Natural Heritage Screening – Site A (300 Pine Street) and Site C (1975 Muskoka Beach Road)**

INTRODUCTION

Muskoka Algonquin Healthcare (MAHC) is proposing the construction of a new hospital building along Highway 11 at 300 Pine Street in Bracebridge, Ontario (Site A) or alternatively at 1975 Muskoka Beach Road (Site C) across from Muskoka Brewing Company in Bracebridge, Ontario.

Stantec Consulting Ltd. (Stantec) conducted a preliminary natural heritage screening, including a desktop review and site reconnaissance field visit (October 17 and 18, 2023) to identify natural heritage features on the Subject Properties and lands within 120 m (hereafter Adjacent Lands). The Subject Properties and Adjacent Lands are hereafter collectively referred to as the Study Areas. The purpose of the desktop review was to identify natural and anthropogenic vegetation and wildlife habitat features to support a general assessment of their significance.

This memo provides a summary of the results of the preliminary screening.

NATURAL HERITAGE POLICY CONTEXT

The following sections discuss legislation and polices that are relevant to the Study Areas. These, along with other background information and data, were used to identify natural features that require consideration through the planning and design process, and which may be constraints to development. Legislation and policy are presented under separate headers for the federal, provincial and municipal planning context.

FEDERAL CONTEXT

The Fisheries Act, 1985

The Fisheries Act, 1985 (amended on August 28, 2019) is the main federal law governing fisheries in Canada and is administered by Fisheries and Oceans Canada (DFO). The Fisheries Act provides for the management and control of fisheries, the conservation and protection of fish, the protection of fish habitat and pollution prevention. Projects that may impact fish, fish habitat, aquatic species at risk (SAR) and aquatic invasive species may be subject to DFO review. The Fisheries Act prohibits causing the death of fish and the harmful alteration, disruption or destruction (HADD) of fish habitat, unless authorized by the Minister of Fisheries, Oceans and the Canadian Coast Guard. Conditions and circumstances for projects to be exempt from review are listed on DFO's Fish and Fish Habitat Protection Program web pages. Following guidance and criteria provided on DFO's website regarding mitigation, waterbody types and codes of practice, proponents determine whether their projects in or near water will require review by DFO. DFO review is requested through the submission of a 'Request for Review' (RfR) form. Following completion of their review, DFO can proceed in two ways: 1) issue a Letter of Advice indicating that the proposed work complies with the Fisheries Act or, 2) refer the project to the Regulatory Review Unit for site specific review. If the project can avoid impacts to fish and fish habitat, project approval is not required. If impacts that cause a HADD cannot be

avoided, proponents must apply for a Fisheries Act Authorization, and may be required to develop a habitat offsetting or compensation plan.

Migratory Birds Convention Act, 1994 and Migratory Birds Regulation, 2022

The Migratory Birds Convention Act, 1994 (MBCA) prohibits the killing or capturing of migratory birds, as well as the damage, destruction, removal, or disturbance of their nests. The Migratory Birds Regulation, 2022 (MBR), further defines when nests of migratory bird species are protected, with special provisions in place for bird species that reuse their nests (e.g., Pileated Woodpecker, Great Blue Heron).

Most bird species in Canada are protected under the MBCA, as defined by Article I, which names the families and subfamilies of birds protected, and provides clarification of which species are included. In southern Ontario, migratory birds generally nest between April 1 and August 31. Environment and Climate Change Canada (ECCC) can issue permits allowing the destruction of nests for scientific, agricultural, or health and safety purposes. New development and site alterations do not qualify as a permitted activity under the MBCA and failure to comply with the MBCA/MBR could result in a charge.

PROVINCIAL CONTEXT

The Planning Act / Provincial Policy Statement

The Provincial Policy Statement (PPS; MMAH 2020) was issued under Section 3 of the Planning Act, 1990 (PA) and came into effect in 1996, with the most recent revision coming into effect on May 1, 2020. The Planning Act requires that decisions made by planning authorities are consistent with the policy statements of the PPS, which includes policies on development and land use patterns, resources and public health and safety. Section 2.1 of the PPS deals with natural heritage and requires that natural heritage systems are identified in certain ecoregions. This includes Ecoregion 5E, where the Study Area is located.

According to Section 2.1.5 of the PPS, development and site alteration are not permitted in the following features, unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions:

a) Significant Woodlands

b) Significant Valleylands

c) Significant Wildlife Habitat

d) Significant Areas of Natural and Scientific Interest

e) Coastal wetlands that are not subject to policy 2.1.4(b)

Development and site alteration are not permitted in the following features, except in accordance with provincial and federal requirements:

a) Habitat of endangered or threatened species

b) Fish habitat

Development and site alteration are not permitted on lands that are adjacent to the natural heritage features and areas identified above unless the ecological function of the Adjacent Lands has been evaluated and it has been demonstrated that there will be no negative impacts on the natural features or on their ecological functions.

Endangered Species Act, 2007

The Endangered Species Act, 2007 (ESA) protects species designated as threatened, endangered, or extirpated on the Species at Risk List in Ontario (SARO). The ESA prohibits the killing, harming, harassing, or possessing protected species, as well as prohibiting any damage or destruction to the habitat of the listed species. Listed species are referred to as Species at Risk (SAR) and are provided with general habitat protection under the ESA to protect areas that species depend on to carry out their life processes, such as reproduction, rearing, hibernation, migration or feeding. Some species are also protected by detailed habitat regulations that go beyond the general habitat protection to define the extent and character of protected habitats.

Activities that may impact a protected species or its habitat require the prior issuance of a permit from the Ministry of the Environment, Conservation and Parks (MECP), unless the activities are applicable under O. Reg. 242/08, O. Reg. 830/21, or O. Reg. 829/21. These regulations identify activities that are exempt from the permitting requirements of the ESA and are subject to rigorous controls outside the permit process, including registration of the activity and preparation of a mitigation plan. Activities that are not exempt under these regulations require a complete permit application process.

Fish and Wildlife Conservation Act, 1997

The provincial Fish and Wildlife Conservation Act, 1997 (FWCA) provides protection of wildlife in Ontario including fish, furbearing mammals, game wildlife and specially protected wildlife through regulations for hunting, trapping, and fishing practices. Game and specially protected mammals, birds, reptiles, amphibians and invertebrates are listed on Schedules 1-11 of the FWCA. Definitions provided for hunting include capturing or harassing wildlife (Section 5.0) and would include activities that collect or handle wildlife for inventories or other scientific purposes, or to relocate wildlife out of harm's way (e.g., during construction activities), including individuals and eggs. Sections 7.0 and 8.0 also provide protection for nest and eggs of specified bird species including raptors, and dens of furbearing animals, and beaver dams. Under the FWCA, the Minister has the authority to authorize activities that would otherwise be prohibited such as the safe capture of wildlife and removal of nests, dens and dams, and also to impose conditions on an authorization.

MUNICIPAL PLANNING CONTEXT: THE CORPORATION OF THE TOWN OF BRACEBRIDGE, OFFICIAL PLAN

The Town of Bracebridge Official Plan (2013) (OP) recognizes Natural Environmental Features (NEF), also known as Natural Heritage Features (NHF), and their associated ecological functions as part of a Natural Heritage System (NHS). Within the OP, NHF are defined as features and areas which are important for environmental and social values. NHF considered significant at the provincial, district or local level include:

- Habitat of endangered and threatened species
- Significant wildlife habitat
- Fish habitat

- Deer wintering areas
- Muskoka Heritage Areas
- Provincially significant and other wetlands
- Areas of natural and scientific interest (ANSI's)

BACKGROUND SCREENING

The following background documents and sources of information were consulted during the screening:

- The Corporation of the Town of Bracebridge Official Plan (April 2013)
- Ontario GeoHub datasets (Ontario Ministry of Natural Resources and Forestry 2023d)
- Natural Heritage Information Centre (NHIC) database (Ontario Ministry of Natural Resources and Forestry 2023c)
- Atlas of the Mammals of Ontario (Dobbyn 1994)
- Ontario Reptile and Amphibian Atlas (Ontario Nature 2020)
- Ontario Breeding Bird Atlas (Bird Studies Canada, Environment Canada's Canadian Wildlife Service, Ontario Nature, Ontario Field Ornithologists and Ontario Ministry of Natural Resources 2006)
- Species at Risk in Ontario List (database) (Ontario Ministry of Natural Resources and Forestry 2023a)
- DFO Aquatic Species at Risk Map (Fisheries and Oceans Canada 2023)
- eBird Canada (eBird 2023)
- iNaturalist (iNaturalist 2023a)
- Odonata of Ontario (iNaturalist 2023b)
- Ontario Butterfly Atlas (Toronto Entomologists' Association 2023)
- Ontario Moth Atlas (Toronto Entomologists' Association 2023)
- The Tree Atlas (Ontario Ministry of Natural Resources and Forestry 2023b)

Although the above resources are useful for identifying potential species of interest for the Study Area, exact locations of species occurrences are not available. The accuracy of data records ranges from 1 km² to municipal boundaries or watershed.

VEGETATION COMMUNITIES

A high-level classification of vegetation communities was completed via aerial photo interpretation and field verification (for the Subject Property only) using the Ecological Land Classification (ELC) system for the Great-Lakes St. Lawrence Region (Banton, et al. 2009).

The Town of Bracebridge Official Plan (2013) did not identify any NEF in Site A; and identifies the wetland feature in Site C (discussed further below) as 'wetland' in Appendix A.

SITE A – 300 PINE STREET

The Study Area is composed predominantly of an aggregate pit and deciduous or mixed deciduous forest dominated by sugar maple, ash, elm, oak, beech and hemlock. Maintained hydro lines with forb-dominated vegetation intersect the north Adjacent Lands.

SITE C – 1975 MUSKOKA BEACH ROAD

The Study Area is composed predominantly of deciduous or mixed deciduous forest dominated by sugar maple, beech, alder, tamarack, oak, and hemlock, as well as mixed meadow and meadow marsh habitat. A large unevaluated wetland feature occurs in the northwest half of the Study Area, mainly composed of cattails and other graminoids.

SPECIES AT RISK

For this assessment, SAR are species listed as Threatened or Endangered on the SARO list. The SAR screening included a review of available background sources, preliminary habitat characterization using vegetation community classification, and incidental observations during the field reconnaissance. Table 1 identifies SAR with existing records or overlapping ranges and a preliminary assessment of suitable habitat in the Study Area.

Table 1: Species at Risk Identified as Potentially Present in the Study Areas During the Preliminary Screening

Common Name	Scientific Name	SARO Status	Suitable Habitat Identified During Preliminary Screening – Site A	Suitable Habitat Identified During Preliminary Screening – Site C
Bank Swallow	*Riparia riparia*	Threatened	Yes	No
Blanding's Turtle	*Emydoidea blandingi*	Threatened	No	Yes
Bobolink	*Dolichonyx oryzivorus*	Threatened	No	Yes
Chimney Swift	*Chaetura pelagica*	Threatened	No	No
Eastern Meadowlark	*Sturnella magna*	Threatened	No	Yes
Eastern Whip-poor-will	*Antrostomus vociferus*	Threatened	Yes	Yes
Eastern Wolf	*Canis sp. cf. lycaon*	Threatened	Yes	Yes

Common Name	Scientific Name	SARO Status	Suitable Habitat Identified During Preliminary Screening – Site A	Suitable Habitat Identified During Preliminary Screening – Site C
Least Bittern	*Ixobrychus exilis*	Threatened	No	Yes
Little Brown Myotis	*Myotis lucifugus*	Endangered	Yes	Yes
Northern Myotis	*Myotis septentrionalis*	Endangered	Yes	Yes
Tri-colored Bat	*Perimyotis subflavus*	Endangered	Yes	Yes

SIGNIFICANT WILDLIFE HABITAT

The Significant Wildlife Habitat Criteria Schedules for Ecoregion 5E (Ontario Ministry of Natural Resources and Forestry 2015) supports the PPS by providing ecoregion-specific criteria for Significant Wildlife Habitat (SWH). The following categories of SWH are recognized for the ecoregion:

- Seasonal concentration of animals
- Rare vegetation communities
- Specialized habitat for wildlife
- Habitat for Species of Conservation Concern
- Animal movement corridors

Species of Conservation Concern (SOCC) include species that are listed as Special Concern (SC) on the SARO list, terrestrial species listed as Threatened or Endangered on Schedule 1 of the federal *Species at Risk Act* (SARA), or provincially rare (with a Provincial S-rank of S1 to S3).

Provincial sub-national ranks (S-ranks) are used by the NHIC to set protection priorities for rare species and vegetation communities. They are based on the number of factors such as abundance, distribution, population trends and threats in Ontario and are not legal designations. Provincial S-ranks are defined as follows:

S1: Critically imperiled; usually fewer than 5 occurrences
S2: Imperiled; usually fewer than 20 occurrences
S3: Vulnerable; usually fewer than 100 occurrences
S4: Apparently secure; uncommon but not rare, usually more than 100 occurrences
S5: Secure, common, widespread and abundant

SITE A – 300 PINE STREET

During the preliminary screening, suitable habitat within the Study Area was identified that may support the following candidate SWH:

- Bat maternity colonies (cavity trees identified in Study Area)
- Snake hibernaculum (rock piles with potential subterranean access identified in Study Area)
- Colonially nesting bird breeding habitat (Bank and Cliff)

- Special concern and rare wildlife species
- Habitat for up to 4 SOCC (Canada Warbler, Eastern Wood-Pewee, Wood Thrush and Monarch)

SITE C – 1975 MUSKOKA BEACH ROAD

During the preliminary screening, suitable habitat within the Study Area was identified that may support the following candidate SWH:

- Bat maternity colonies (cavity trees identified within Study Area)
- Raptor wintering area
- Snake hibernaculum (rock piles with potential subterranean access identified within Study Area)
- Turtle overwintering habitat
- Amphibian breeding habitat (woodland)
- Amphibian breeding habitat (wetland)
- Marsh breeding habitat
- Special concern and rare wildlife species
- Amphibian movement corridors
- Habitat for up to 6 SOCC (Canada Warbler, Eastern Wood-Pewee, Midland Painted Turtle, Monarch, Snapping Turtle, and Wood Thrush)

Other notable findings include a potential coyote den in the southern edge of the Study Area, sand surrounding den opening contained deer and coyote tracks.

FISH HABITAT

SITE A – 300 PINE STREET

The background review did not identify any watercourses overlapping the Study Area (**Figure 1**).

SITE C – 1975 MUSKOKA BEACH ROAD

The background review identified one mapped stream connecting three small waterbodies located to the north and west of the Study Area, within environmentally protected areas and an unevaluated wetland (**Figure 2**).

SUMMARY AND CLOSURE

SITE A – 300 PINE STREET

Constraints identified during the preliminary natural heritage screening include:

- Potential habitat for 6 SAR
- Potentially suitable habitat for 4 SWH categories

Potential constraints are present throughout the Subject Property, as both woodland and meadow habitat (such as that found under hydro lines) could potentially support SAR or SWH. Specific site locations with potential constraints identified during the preliminary screening are potential bat maternity colonies throughout the forested habitat in the Study Area, potential snake hibernaculum near the west property boundary.

Reference: Bracebridge Hospital Preliminary Natural Heritage Screening – Site A (300 Pine Street) and Site C (1975 Muskoka Beach Road)

SITE C – 1975 MUSKOKA BEACH ROAD

Constraints identified during the preliminary natural heritage screening include:

- Potential habitat for 9 SAR
- Potentially suitable habitat for 8 SWH categories
- Potential fish habitat.

Potential constraints are present throughout the Subject Property, as both woodland, wetland, and meadow habitat could potentially support SAR or SWH. Specific site locations with potential constraints identified during the preliminary screening are potential bat maternity colonies throughout the forested habitat in the Study Area, potential snake hibernaculum located towards the northern boundary of the Study Area. Significant constraints are anticipated to occur within the amphibian breeding habitat and marsh habitat within the graminoid marsh/wetland in the northwest half of the Subject Property.

Based on our current knowledge and experience, a list of studies that may be required for the Study Area prior to permitting and site plan approval are presented below. This list is subject to change based on the project footprint and new information as it becomes available. It is recommended that a pre-consultation with the Town of Bracebridge is undertaken to confirm the requirements.

- Breeding bird surveys (2 visits in June-July)
- Marsh callback surveys (3 visits in May-July)
- Amphibian call surveys (3 visits in April-June)
- Botanical inventory (3 visits in April-September)
- Fish habitat assessment (1 visit in April-August)
- Bat acoustic monitoring (2 visits/ ARU deployment in June/July)
- Snake emergence surveys (5 visits in April-May)

CLOSURE

Please note that all information contained herein is based on the preliminary site screening and should not be considered a complete and comprehensive study or presentation of results. Additional constraints may be identified during the course of future studies. Please do not hesitate to contact the undersigned with any questions or concerns.

Stantec Consulting Ltd.

Digitally signed by Larson, Marla
Date: 2023.12.01 12:55:16 -05'00'

Marla Larson B.Sc.
Terrestrial Ecologist

Mobile: 226-962-0319
Marla.Larson@stantec.com

Digitally signed by Uskov, Lisa
Date: 2023.12.01 13:20:16 -05'00'

Lisa Uskov Tech. Dipl.
Terrestrial Ecologist

Mobile: 647 212 6181
Lisa.Uskov@stantec.com

Attachment: Figures

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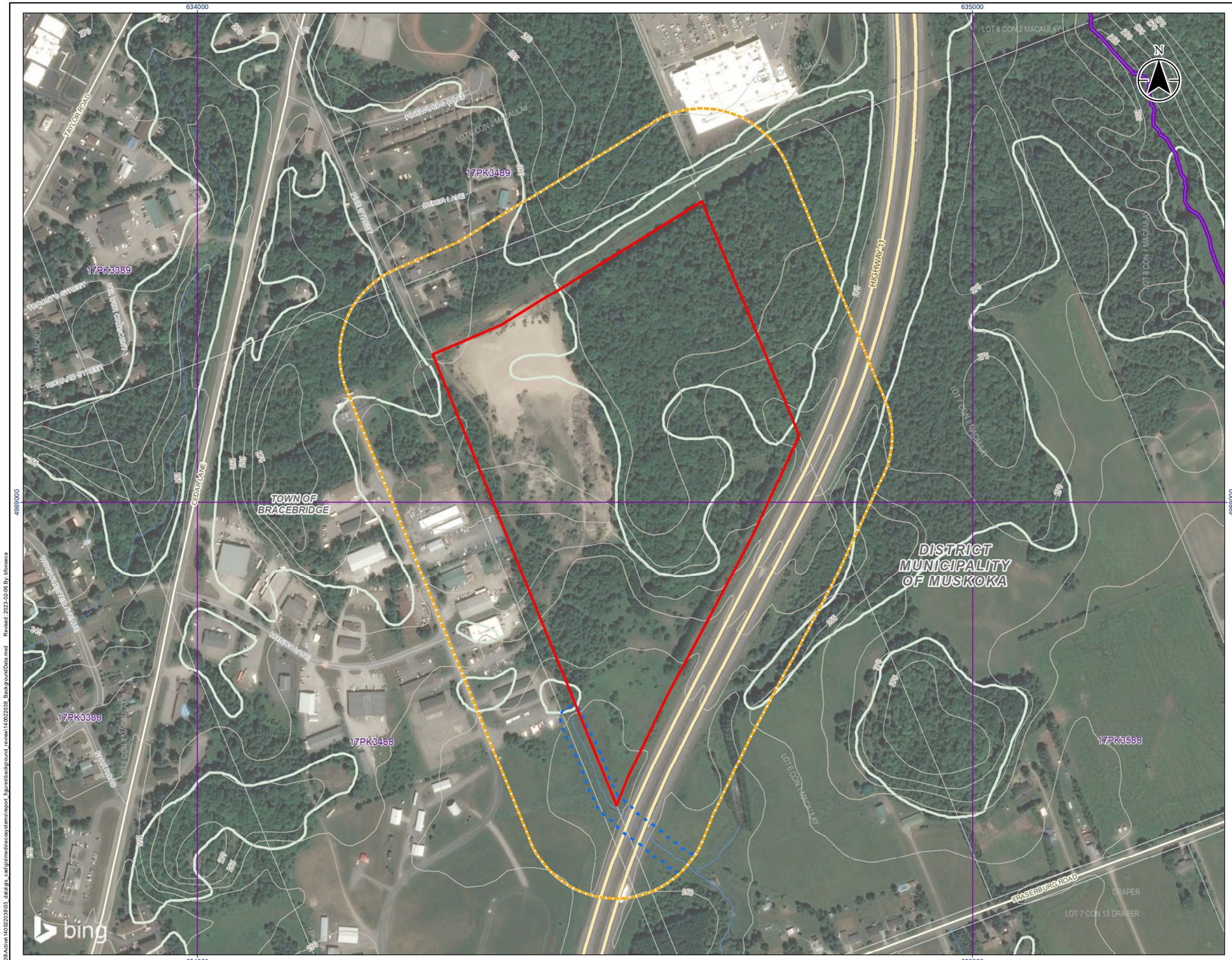
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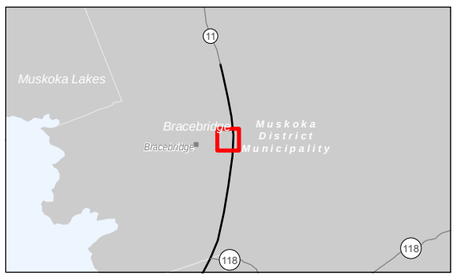
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- Study Area (120 m)
- Thermal Regime, Cold
- Hydro Line
- Watercourse (Intermittent)
- Watercourse (Permanent)
- Waterbody 15 m Buffer
- Wooded Area
- Lot
- Municipal Boundary, Upper
- Municipal Boundary, Lower
- 1 km UTM Grid

0 100 200 m

1:5,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2023.
3. Orthoimagery © 2023 Microsoft Corporation © 2022 Maxar ©CNES (2022) Distribution Airbus DS



Project Location
Muskoka, ON

140022038 REV4
Prepared by BF on 2023-02-06
Technical Review by DH on 2023-02-06

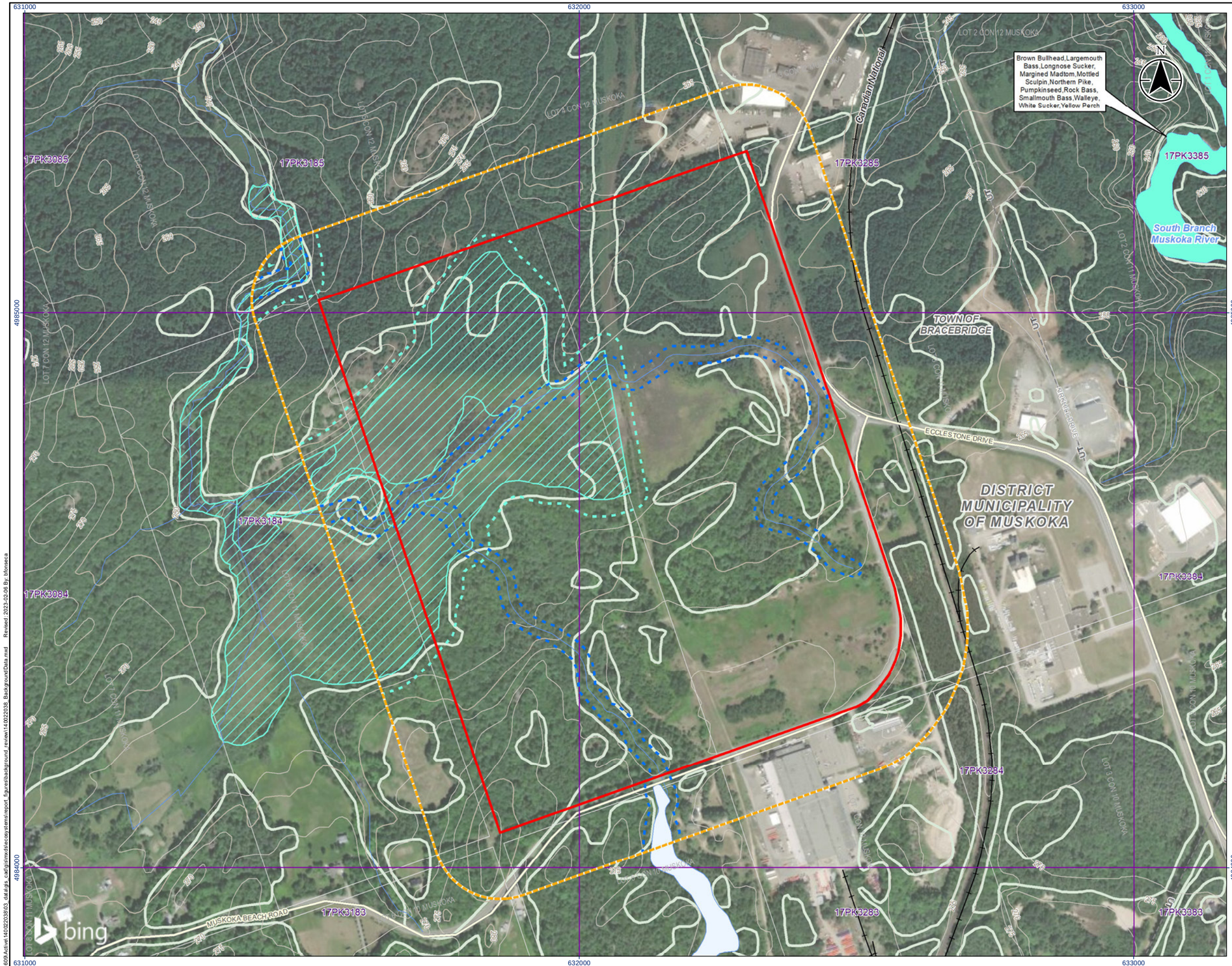
Client/Project
MUSKOKA ALGONQUIN HEALTHCARE
MAHC HOSPITAL REVELOPMENT

Figure No.
1

Title
Preliminary Due Diligence Natural Environment Screening Site: A - Fowler Construction Property

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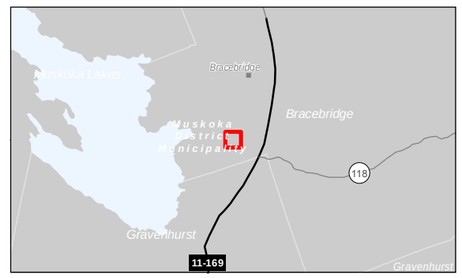
- Site Boundary (Approximate)
- Study Area (120 m)
- Railway
- Unknown Transmission Line
- Watercourse (Permanent)
- Waterbody 15 m Buffer
- Thermal Regime, Cool
- Waterbody
- Wetland, Unevaluated
- Wetland 30 m Buffer
- Wooded Area
- Lot
- Municipal Boundary, Upper
- Municipal Boundary, Lower
- 1 km UTM Grid

0 100 200 m

1:7,000 (At original document size of 11x17)

Notes

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3. Orthoimagery © 2023 Microsoft Corporation © 2022 Maxar ©CNES (2022) Distribution Airbus DS



Project Location
Muskoka, ON

140022038 REV4
Prepared by BF on 2023-02-06
Technical Review by DH on 2023-02-06

Client/Project
MUSKOKA ALGONQUIN HEALTHCARE
MAHC HOSPITAL REVELOPMENT

Figure No.
2

Title
Preliminary Due Diligence Natural Environment Screening Site: C - Muskoka Royale Lands

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Stantec Consulting Ltd.
300W-675 Cochrane Drive
Markham ON L3R 0B8

March 21, 2024

File: 140022038

Attention: Muskoka Algonquin Healthcare
South Muskoka Memorial Hospital

Reference: Site Infrastructure Review – 300 Pine Street, Town of Bracebridge ON

As requested, Stantec Consulting Ltd. (Stantec) has completed a site infrastructure review of the property at 300 Pine Street in the Town of Bracebridge (Town), referred to herein as the 'Site'. The Site, depicted in the aerial figure below, is approximately 18 ha in size and is located between Highway 11 and Cedar Lane, east of Gray Road. A hydro corridor traverses the Site along the northern boundary.

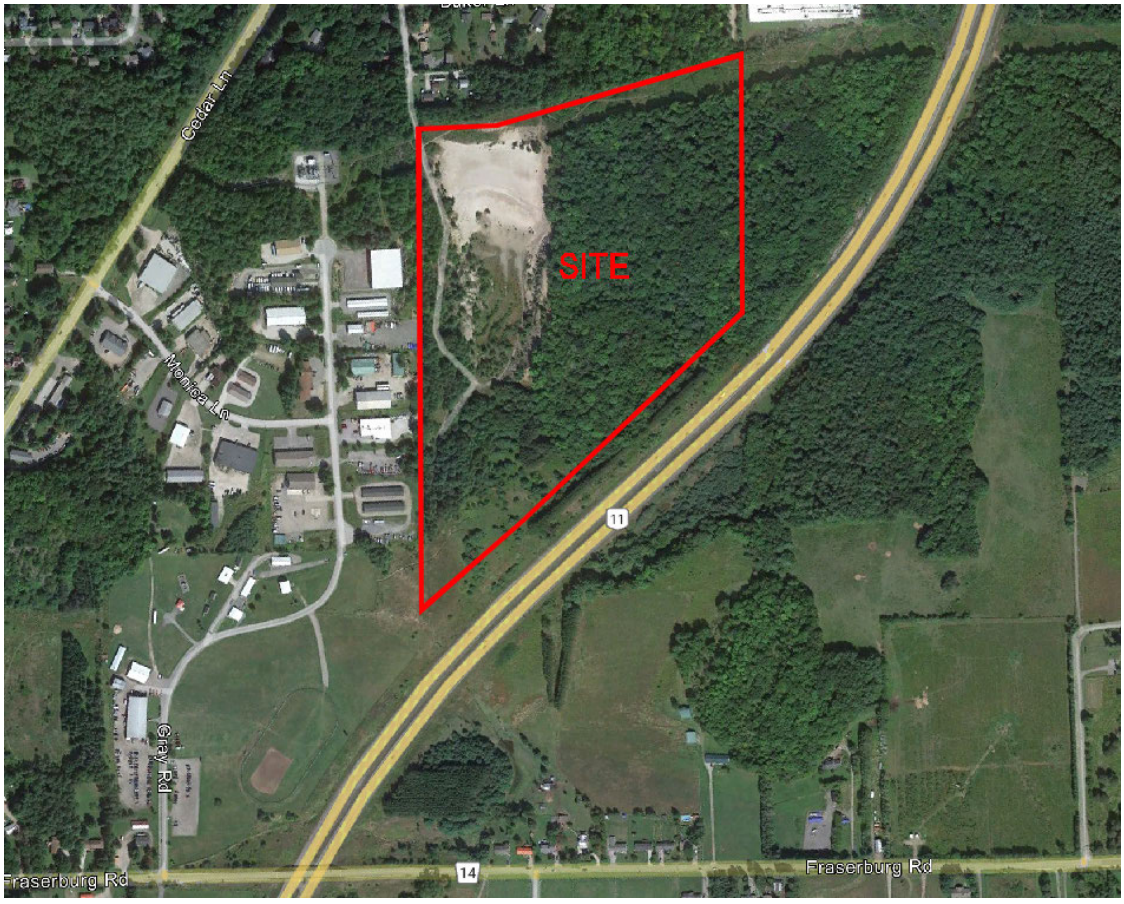


Figure 1: Site Location Plan

The Site is being considered for a proposed hospital development as depicted below with driveway access connections to the private commercial laneway at the northeast (Depot Lane) and Monica Lane to the west. As the entirety of the western portion of the Site is a former gravel pit and the eastern portion is a valley with a watercourse, the development will be concentrated along the center portion of the Site. [redacted] This information was relayed to us by the consultant team as preliminary minimums that would allow for the planned function level of the proposed hospital. The site statistics have varied through the life of the project, and the conclusions of this report should be reviewed against the final cemented site statistics once available.



Figure 2: Site Concept Plan

As part of the review, the following documents were referenced:

1. Contour files and existing sewer infrastructure data obtained from the District of Muskoka
2. Muskoka New Developments W&WW Model – Project No. 11149488-MEM-71 1st, prepared by GHD, September 2021
3. Concept Site Plan, Stantec Consulting Ltd, September 14, 2023

Reference: Site Infrastructure Review – 300 Pine Street, Town of Bracebridge ON

The figure below provides an overview of the existing servicing infrastructure in the vicinity of the Site.

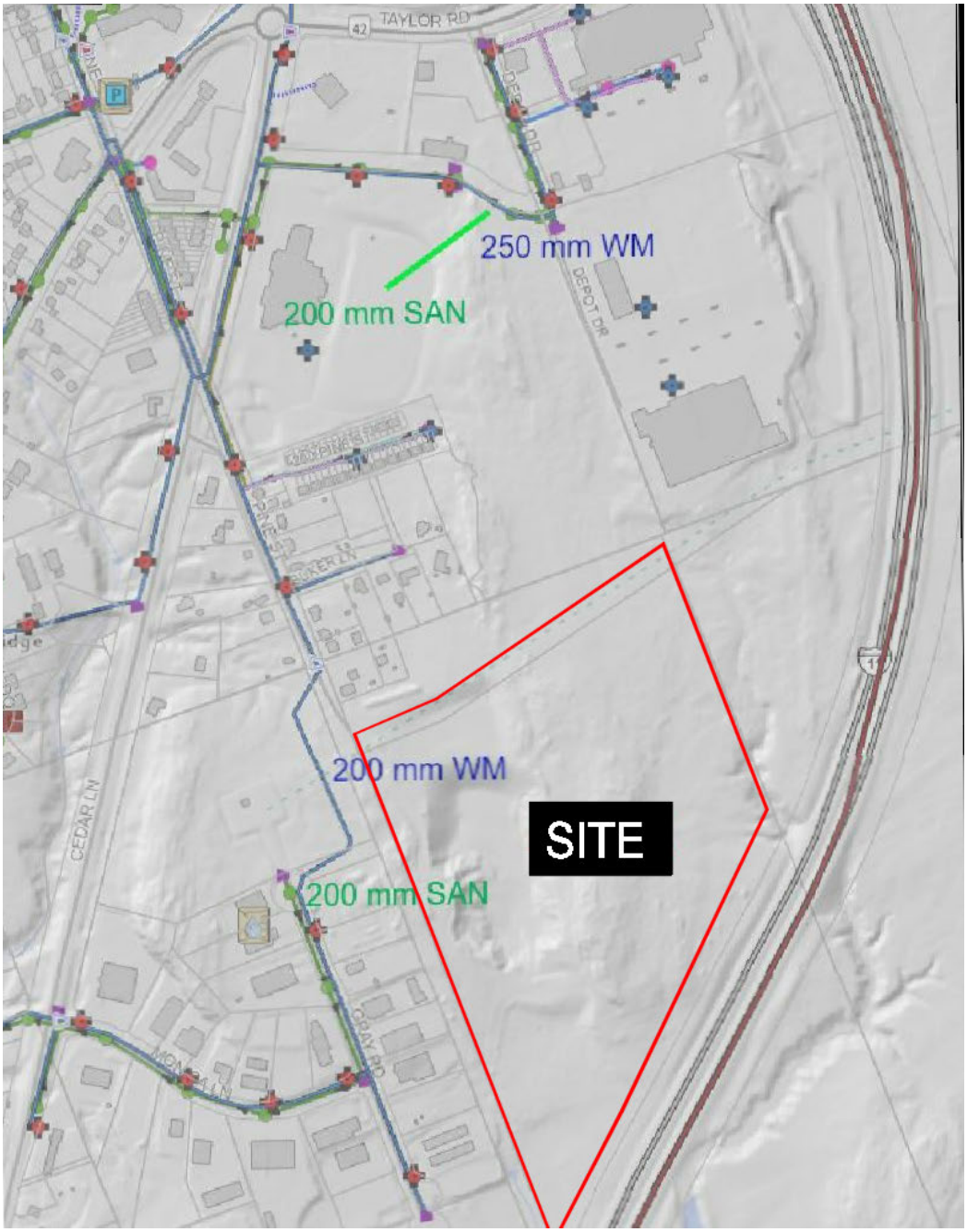


Figure 3: Nearby Servicing Infrastructure

Based on available background documents, the following is provided for review and consideration:

1 Civil

1.1 Grading And Earthworks

In current conditions, extreme grade variations exist within the Site. A perched area in the eastern half sits approximately 10 meters above the eastern property line. An approximately 20 meter deep hole presides within the western half of the Site. The drop from the perched area to this depression is close to 30 meters. The general site gradient is southerly at a vertical relief of close to 30 meters across the property. [redacted]

The most cost effective grading scheme for the proposed hospital is to restrict the footprint of the development only to the area needed for the function of the facility to minimize fill, and to keep the elevations across the majority of the developed land at least 1 meter above bedrock to allow room for servicing under the building slab and around the site to minimize bedrock excavation. [redacted]

1.2 Storm

From the available background documentation, no existing stormwater quantity or quality controls were located on the Site. Per Google Maps Aerial Imagery, there are two existing culverts crossing Highway 11 South that are presumed to convey runoff generated by the Site.

1.3 Sanitary

As shown on **Figure 3**, the closest sanitary sewer is the existing 200 mm sewer approximately 130 m west of the Site on Gray Road which continues west on Monica Lane. This sewer system is upstream of a number of pumping stations prior to discharge into the Lagoon Lane Wastewater Treatment Plant (WWTP). The next closest system is approximately 330 m to the north on Pine Street. This connection option would require crossing the hydro easement along the northern boundary which would trigger additional approval stages and also necessitate pumping of sewage as the area in question is close to 15 m higher than the Site. The recommended sanitary outlet is the 200 mm sewer at Gray Road and Monica Lane. This option requires approximately 140 m of offsite municipal sanitary construction. In order to get sufficient cover for the proposed sewer located north of the gravel pit, the area will need either to be filled to approximately

274.0m, or to install a pump and force main to convey sewage through pressure. A conceptual overview of the sanitary servicing has been provided on **Plan C-101** in **Attachment A**.

According to the available preliminary site statistics, a peak site sewage flow of 17.6 L/s is anticipated. The district had modelling conducted by GHD in July 2023 to review the impact of the introduction of this flow into the existing downstream municipal infrastructure. The study concluded that two (2) pump stations (Woodchester SPS and Muskoka SPS) downstream of the Site do not have the reserve capacity to handle the additional flow. These two pump stations would require upgrades to service the proposed development. The details of these upgrades would require additional study and are beyond the scope of this review. Furthermore, the GHD analysis was based on the preliminary minimum site statistics required for the functioning of the hospital. The analysis results should be reviewed against flows based on final and cemented site statistics once available. The sanitary flow design sheet has been provided in **Attachment C**. The GDH technical memorandum has been included in **Attachment F**.

1.4 Watermain

As shown on **Figure 3**, the closest watermain is the existing 200 mm main approximately 50 m west of the Site that runs through an easement leading to Gray Road. Healthcare facilities normally require two (2) water connections to separate mains on separate streets isolated by a valve chamber in between for redundancy. The closest separate main is the existing 250 mm watermain approximately 400 m north in commercial land, and connection to this system would require crossing the hydro easement along the northern boundary and trigger associated approval stages. The recommended watermain servicing scheme is a connection to the existing 200 mm watermain in the nearby easement to the west near Gray Road and a secondary connection to the existing 200 mm watermain at south of Gray Road for redundancy. A valve chamber would be installed on the existing watermain between the two connection points to create isolation. The district requires the main water line into the Site to be split into separate domestic and fire feeds at property line. Approximately 170 m of offsite municipal watermain construction is required to service the development. A conceptual overview of the water servicing has been provided on **Plan C-101** in **Attachment A**.

According to the available preliminary site statistics, a total Maximum Day Water Demand + Fire Flow of 125.0 L/s is anticipated. The district had modelling conducted by GHD in July 2023 to review the impact of the introduced load on the existing municipal water infrastructure. The study concluded that the existing municipal system does not have the capacity to support the development under fire flow conditions. The recommended mitigation is the use of onsite private storage to increase fire flow capacity. The details and sizing of this storage system would require additional study and are beyond the scope of this review. Furthermore, the GHD analysis was based on the preliminary minimum site statistics required for the functioning of the hospital. The analysis results should be reviewed against flows based on final and cemented site statistics once available. The water demand calculation sheets have been provided in **Attachment D**. The GDH technical memorandum has been included in **Attachment F**.

2 Stormwater Management Criteria

The stormwater management (SWM) criteria for the proposed Site was taken from the following background documents. Relevant excerpts are provided in **Attachment F**.

- The District Municipality of Muskoka Engineering Design Criteria and Standards Manual, prepared by the District Municipality of Muskoka, dated January 2023;

- Muskoka Official Plan, prepared by the District Municipality of Muskoka, dated March 2023;

- Low Impact Development Stormwater Management Guidance Manual (DRAFT), prepared by the Ministry of the Environment, Conservation and Parks, dated January 2022; and

- Stormwater Management Planning and Design Manual, prepared by the Ministry of Conservation and Parks (MECP, formerly MOE), dated March 2003.

2.1 Quantity Control

Per the District Municipality of Muskoka Engineering Design Criteria and Standards Manual, the stormwater quantity control is to be approached using source controls, conveyance controls, and end-of-pipe controls to achieve the following:

- Provide stormwater quantity controls as required to control post-development flows to pre-development levels for all storm events up to and including the 100 Year storm event;
- Provide safe conveyance of stormwater flows in excess of the 100 Year storm event via an emergency spillway designed with suitable erosion protection; and
- Except in extenuating circumstances, incorporate Low Impact Development (LID) principles, such as rainwater harvesting, constructed wetlands, bioretention swales, green roofs, permeable surfaces, clean water collection systems, and the preservation and enhancement of native vegetation cover, to achieve stormwater quantity control objectives.

Stormwater facilities are to be designed in accordance with the preferred criteria specified in the Ministry of the Environment, Conservation and Parks (MECP, formerly MOE) SWM Planning and Design Manual (2003).

A portion of the proposed site is located within a Ministry of Transportation (MTO) Controlled Area. As such, the proposed Site development, specifically the stormwater management controls, must adhere to the following documents:

- MTO Stormwater Management Requirements for Land Development Proposals, prepared by the Ontario Ministry of Transportation Standards and Contracts Branch within the Highway Design Office, dated 2009 (References Updated April 2022); and

- The MTO Drainage Management Manual Part 3, prepared by the Ministry of Transportation Ontario Drainage and Hydrology Section Transportation Engineering Branch Quality and Standards Division, dated 1997.

MTO drainage standards align with those noted in the District Municipality of Muskoka's Engineering Design Criteria and Standards Manual (noted above), and follow the same design criteria for stormwater facilities as noted in the MECP's Stormwater Management Planning and Design Manual except for the following:

- The MTO does not recognise any benefit from the attenuation of stormwater runoff using parking lot or roof top storage, where the control is achieved through an orifice device or a roof top control device;

- The MTO does not accept the location of an infiltration facility, within a proposed land development area, where it may impact the structural integrity of the highway sub-grade; and

- In general, MTO does not accept the benefits from roof leader disconnection and cisterns if the continuing functioning and long-term reliability cannot be guaranteed.

To align with both Municipal and MTO design criteria, it is likely that a stormwater management pond will be utilized as the primary stormwater management infrastructure on the Site.

2.2 Quality Treatment

Per the MECP SWMPDM (2003), the stormwater quality treatment strategy for the proposed Site should achieve the following:

- Provide stormwater quality control to an Enhanced (formerly Level 1) standard of treatment (i.e., 80% TSS removal); and
- Where feasible, incorporate LID principles including treatment train measures to achieve water quality objectives.

2.3 Erosion Control

Per the Muskoka Official Plan, the stormwater management strategy for the proposed Site shall minimize changes in erosion. In accordance with the MECP SWMPGM (2003), erosion control will be provided via detention of the 25 mm design storm over a period of at least 24 hours.

2.4 Water Balance

Per the Muskoka Official Plan, the stormwater management strategy for the proposed Site shall minimize changes in water balance. As such the water balance strategy will attempt to replicate as closely as possible existing hydrologic conditions by maintaining a balance between infiltration, runoff, and evapotranspiration. On Sites in the Muskoka Region, a typical water balance target is 5 mm across the Site; this retention target has been utilized for costing purposes and is to be refined through Site design.

In addition, recent guidance provided by the Draft LID SWM Guidance Manual (MECP, 2022), has quantified a satisfactory retention volume equivalent to the region-specific 90th percentile storm event. The retained runoff volume target is independent of municipality-specific and/or climate adjusted onsite required detention volumes required to achieve stormwater quantity control. Stormwater retention strategies may consist of stormwater reuse, infiltration, or evapotranspiration. Per Figure 3.3 of the Draft LID SWM Guidance Manual (MECP, 2022), the 90th percentile storm event is equivalent to a rainfall depth range of 27 mm to 28 mm in the Town of Bracebridge. It is suggested that retention of the 90th percentile storm event be considered within the water balance strategy for the proposed Site to ensure that the strategy is robust against projected future climate variance and to incorporate a level of sustainability within the Site infrastructure.

2.5 Flow Conveyance

Per Section 4.2 of the District Municipality of Muskoka Engineering Design Criteria and Standards Manual, drainage systems are to be designed to convey the year of the storm associated with the site road classifications without surcharge. Runoff rates in excess of the design capacity of drainage systems shall be conveyed via roadways, swales, walkways, drainage easements, and in special circumstances the storm sewer system, to a sufficient outlet to prevent unacceptable flooding damage to private property.

Furthermore, all new developments must demonstrate that the stormwater generated onsite is directed to a sufficient outlet such as a lake, river or permanently flowing watercourse. A sufficient outlet may also include a public right-of-way with prior approval from the Town of Bracebridge. An easement must be provided in favour of the Town of Bracebridge for any drainage that is directed over private land.

As the roadways within the proposed site are classified as industrial/commercial, the flow conveyance design standards listed in **Table 2.1** are applicable.

Table 2.1: Design Storm (Years) Conveyance Requirements

Road Classification	Bridges/Major Culverts	Road Culverts	Storm Sewers	Ditches/Channels
Industrial/Commercial	1:100	1:10	1:5	1:10

It is recommended that land adjacent to roadways be reserved for conveyance ditches/channels to maintain existing drainage patterns and minimize the use of subsurface infrastructure.

3 Stormwater Management Strategy

The proposed SWM plan is a high-level assessment of potential SWM controls that can be implemented on site to achieve the required criteria while conforming to the site constraints and considerations described above.

3.1 Quantity Control

Per the current Site Plan (**Attachment B**), increased stormwater runoff will be generated when existing pervious areas (e.g., woodlands) are replaced with predominantly impervious areas (e.g., paved or roof areas) which will require stormwater quantity control. Stormwater quantity control typically takes the form of stormwater infrastructure designed to capture and slowly release the excess stormwater. The Site could utilize traditional stormwater infrastructure such as roof control flow drains, surface ponding, and a SWM pond. Based on the available geotechnical information for external adjacent lands, bedrock elevations were recorded at near existing ground surface elevations. Therefore, it is presumed that the same geotechnical condition exists for the Site. Given the potential presence of bedrock near existing ground, a below ground SWM strategy (i.e., underground tank) is not recommended for quantity control. Therefore, quantity control is recommended to be provided by a SWM pond.

Furthermore, it is noted that a portion of the proposed site is located within a Ministry of Transportation (MTO) Controlled Area. Underground stormwater quantity control systems are not permitted within MTO Controlled Areas; therefore, the stormwater quantity control strategy must be above ground. The potential for incorporation of surface-based LIDs as part of a quantity control treatment train strategy with a SWM pond will be further evaluated pending completion of the Site geotechnical and hydrogeological investigations.

The existing Site survey indicates that a natural peak in the topography occurs along the median of the property such that drainage generated by the Site will drain to the east and west. Per the grading plan provided in **Attachment A**, it is recommended that the existing drainage pattern be maintained in the proposed condition in order to minimize the use of underground stormwater conveyance systems. To align with this development strategy, a potential SWM quantity control strategy would be to direct surface drainage to two SWM ponds located at the east and west limits of the Site. To maximize the available active storage volume, the SWM ponds are proposed to be dry pond facilities that will provide quantity control and erosion control only.

Through assessing the Site Plan, two locations were identified within the Site has locations for potential SWM ponds. The first pond (herein referred to as the East SWM Dry Pond) is located at the northeast corner of the property. The second pond (herein referred to as the West SWM Dry Pond) is located at the southwest corner of the property (**Drawing C-101**, **Attachment A**). The SWM ponds are discussed in further detail below.

3.1.1 EAST SWM DRY POND

The East SWM Dry Pond block is approximately 0.25 ha in size and treats a contributing drainage area of 3.52 ha. To approximate a high-level SWM pond configuration, the following assumptions were made:

- The dry pond active storage depth is assumed to be 2.0 m;
- The dry pond is assumed to have a freeboard depth of 0.5 m; and
- The dry pond outlet invert is assumed to be flush with the bottom of pond elevation of 276.50 and to promote positive drainage of the active storage volume to the receiving natural channel.

The resulting top of SWM pond elevation is estimated to be 279.00 m (high-level approximation and subject to further refinement). As the surrounding existing grades within the potential pond block range from 276.00 m to 278.00 m, extensive fill works are not anticipated for the construction of a SWM pond. Next steps should include an overall site cut/fill analysis to confirm earthworks requirements for the Site. As demonstrated by the calculations provided in **Attachment E**, the anticipated storage volumes to achieve stormwater quality treatment and quantity control, respectively, are as follows:

- 1,247 m^3 required active storage volume.

3.1.2 WEST SWM POND

The West SWM Pond block is approximately 0.32 ha in size and treats a contributing drainage area of 3.75 ha. To approximate a high-level SWM pond configuration, the following assumptions were made:

- The dry pond active storage depth is assumed to be 2.0 m;
- The dry pond is assumed to have a freeboard depth of 0.5 m; and
- The dry pond outlet invert is assumed to be flush with the bottom of pond elevation of 270.00 and to promote positive drainage of the active storage volume to the receiving natural channel.

The resulting top of SWM pond elevation is estimated to be minimum 272.50 m (high-level approximation and subject to further refinement). As the surrounding existing grades within the potential pond block range from 277.00 m to 282.50 m, extensive fill works are not anticipated for the construction of a SWM pond. Next steps should include an overall site cut/fill analysis to confirm earthworks requirements for the SWM Pond. As demonstrated by the calculations provided in **Attachment E**, the anticipated storage volumes to achieve stormwater quality treatment and quantity control, respectively, are as follows:

- 1,283 m^3 required active storage volume.

3.2 Quality Treatment

Stormwater quality treatment is required to remove pollutants such as suspended solids and oil from stormwater generated by the Site. The bulk of stormwater quality treatment for runoff discharging from the two dry ponds can be provided by manufactured treatment devices such as oil-grit separators (OGS) to meet Municipality and MECP requirements, with a treatment train approach providing an additional polishing of stormwater runoff via low impact development (LID) techniques or Manufactured Treatment Devices (MTDs).

It is proposed to install one MTD device at the downstream end of each dry pond. It is presumed that Stormceptor EFO12 units (or approved equivalent) will be sufficient to treat runoff discharging from the dry ponds.

Per **Drawing C-101**, road runoff from a portion of the proposed road connecting the Site to Gray Road will drain southwest via uncontrolled overland flow. A 0.11 ha bioretention area is proposed at the southwest corner of the Site to capture the uncontrolled runoff and provide quality treatment. Erosion Control

3.3 Erosion Control

Erosion control is recommended to be achieved by the SWM dry ponds and a downstream orifice control.

3.4 Water Balance

Should site conditions allow, pending the completion of Site geotechnical and hydrogeological investigations, the use of open bottom surface LIDs such as bioretention cells, rain gardens, and enhanced grass swales is preferred. For example, an enhanced bioswale receiving stormwater roof runoff can provide infiltration and filtration as well as conveyance and would reduce the storage volume requirement for the SWM Ponds. However, based on the inferred high bedrock elevation, it is unclear whether surface-based LIDs are feasible. Where possible, the use of surface-based LIDs that can be combined with the stormwater quantity control infrastructure is recommended.

As described in **Section 2.4**, it is suggested that retention of the 5 mm event be carried for costing purposes within the water balance strategy for the proposed Site which is a volume of 397 m^3 (5 mm over the Site area of 7.93 ha).

While it is understood that the target is to minimize changes in water balance (i.e., achieve pre-development infiltration volumes), due to high presumed high bedrock, anticipated servicing constraints, and poor soil conditions, a best-efforts approach to providing infiltration is likely the most feasible.

Based on the current Site Plan, a conceptual stormwater management strategy has been developed as follows. It is noted that this strategy is preliminary in nature and that additional studies as described in **Section 2.4** are required to confirm the feasibility of the strategy.

The stormwater strategy includes:

- The use of localized inlets and swales to capture and convey stormwater runoff;
- The use of two SWM dry ponds within the northeast and southwest corners of the Site to provide stormwater quantity control and erosion control;
- The use of infiltration-based LIDs where feasible to provide retention of stormwater runoff; and
- The use of Oil-Grit Separator (OGS) units to provide stormwater quality pre-treatment upstream of infiltration LIDs (should they be feasible) and outfalls.

As described in **Section 3.4**, it is suggested that retention of the 90th percentile storm event be considered within the water balance strategy for the proposed Site. This is conservatively assumed as a 28 mm rainfall event over the Site area (7.93 ha), equivalent to a 2,220 m^3 required retention volume.

4 Climate Change

Due to Climate Change, it is expected that rainfall events will have increased intensity in the near future. An evaluation of the stormwater impacts of Climate Change on the Bracebridge Hospital development should be completed. The analysis should consider stormwater flow conveyance ensuring that the hospital building and critical infrastructure such as the oxygen/fuel tanks, helipad, etc. are located away from major overland flow routes and outside of the floodplain associated with the watercourse along the to the northern boundary of the Site.

It is recommended that analysis for predicted 2050 and 2080 storm events be considered. The analysis should consider alternative pricing for additional onsite stormwater management conveyance, detention, and retention controls.

Specifically, stormwater management systems should be designed to safely convey proposed, future climate change adjusted, peak flows and follow mitigation recommendations of climate risk and resilience assessments carried out at the next stage of development.

Further to this, stormwater management systems should be designed to safely detain stormwater onsite by attenuating proposed, future climate change adjusted, peak flows to existing allowable release rates

for all storm events up to and including the 100 Year event and follow mitigation recommendations of climate risk and resilience assessments carried out at the next stage of development.

In addition, stormwater management systems should be designed to safely retain stormwater runoff onsite such that the changes from the existing condition water balance are minimized. It is recommended to utilize on-site LID practices to achieve sufficient stormwater retention where site conditions allow; however, it is noted that the use of LIDs will be applied where feasible regardless of the Site sustainability metrics to achieve the water balance criteria as specified by municipal and provincial regulations.

It is also noted that the District of Muskoka is working towards the implementation of a “climate change lens” as the approval authority on Planning Act applications and as a commenting agency to maximize resiliency of ecosystems and communities, manage the risks associated with climate change and provide sustainable natural environmental services for future generations of residents and visitors to Muskoka. As such, the implementation of the climate change lens may result in:

- The implementation of green infrastructure (LIDs)
- Increased setbacks for development adjacent to wetlands, lakes, rivers, headwater areas, and groundwater recharge areas;
- Retention of natural vegetation; and
- More stringent requirements for stormwater management and flood abatement.

5 Conclusions and Recommendations

- [redacted]
- Approximately 140 m of offsite municipal sanitary construction would be required to service the Site. North of the gravel pit will need either to be filled to approximately 274.0m, or to install a pump and force main to convey sewage through pressure. Two (2) existing downstream pumping stations will need to be upgraded to service the Site for sanitary;
- Approximately 170 m of offsite municipal watermain construction would be required to service the Site for domestic and fire support. Onsite storage will be required for supplementary fire protection, as the municipal system does not have the capacity to provide full fire protection for the proposed hospital;
- There is no existing stormwater infrastructure within proximity to the site;
- Stormwater quantity control will be required to control all design events up to and including the 100 Year storm, plus erosion control. This can be achieved through implementation of two SWM dry ponds;

- Stormwater quality treatment is required to meet Enhanced Level 1 controls, which can be provided by a treatment train consisting of OGS units and LIDs; and

- Water Balance requirements will need to be addressed via completion of a Hydrogeological Investigation to confirm if soils are suitable for infiltration.

Reference: Site Infrastructure Review – 300 Pine Street, Town of Bracebridge ON

Should you have any questions, please contact the undersigned.

Regards,

STANTEC CONSULTING LTD.



Hellen Scott, P.Eng.
Senior Associate, Community Development
Phone: 647-808-7594
hellen.scott@stantec.com

Attachments:

Attachment A – Engineering Drawings

Attachment B – Site Plan

Attachment C – Sanitary Calculations

Attachment D – Water Demand Calculations

Attachment E – SWM Calculations

Attachment F – Background Information

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ATTACHMENT A ENGINEERING DRAWINGS



Stantec

300 - 675 Cochrane Drive West Tower
Markham, Ontario L3R 0B8
Tel. 905.944.7777
www.stantec.com

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Legend

- 282.00 — PROPOSED ELEVATION
- 272.00 — EXISTING ELEVATION TO MATCH
- OVERLAND FLOW
- EXISTING WATERMAIN
- PROPOSED WATERMAIN
- EXISTING STORM SEWER
- PROPOSED STORM SEWER/CULVERT
- PROPOSED SWALE
- EXISTING SANITARY SEWER
- PROPOSED SANITARY SEWER
- PROPOSED SANITARY MANHOLE
- PROPOSED STORM MANHOLE

Issued	By	Appd.	YY.MM.DD
File Name:	PF	-	PF	23.10.04
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

Client/Project
MUSKOKA ALGONQUIN HEALTHCARE

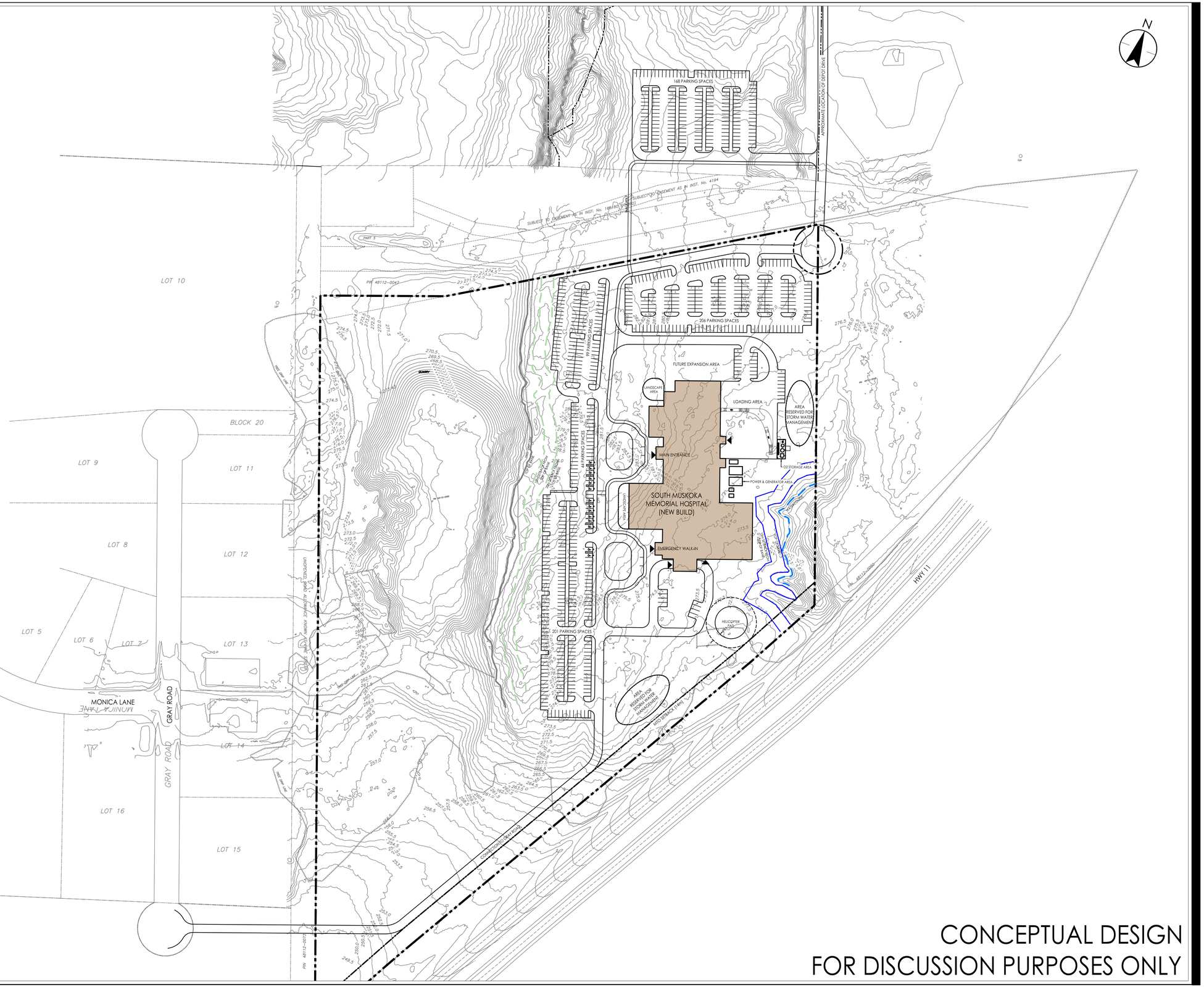
SOUTH MUSKOKA MEMORIAL HOSPITAL
300 PINE STREET
Bracebridge, Ontario

Title
CONCEPTUAL GRADING AND SERVICING PLAN

Project No. 140022028
Scale 1:1250 (0, 12.5, 37.5, 62.5m)
Drawing No. C-101
Sheet
Revision
of

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2024/02/21 10:53:44 By: Chen Lindsay
ORIGINAL SHEET - ARCH D

ATTACHMENT B SITE PLAN



CONCEPTUAL DESIGN
FOR DISCUSSION PURPOSES ONLY

Stantec

Stantec
600-171 Queens Avenue
London ON N6A 5J7
Tel. 519-645-2007
www.stantec.com

Liability Note

The Contractor shall verify and be responsible for all dimensions. DO NOT scale the drawing - any errors or omissions shall be reported to Stantec without delay.

Notes

1. THIS IS A COMPILED PLAN AND SHOULD NOT BE CONSIDERED A PLAN OF SURVEY.
2. ONTARIO BASE MAPPING USED FOR AREAS AND DIMENSIONS. LEGAL PLAN REQUIRED FOR PRECISE CALCULATIONS.
3. CONCEPT PLAN IS PRELIMINARY AND HAS NOT BEEN REVIEWED BY THE LOCAL MUNICIPALITY.
4. ZONING BY LAW AMENDMENT MAY BE REQUIRED.

Revision	By	Appd.	YY.MM.DD

Issued	By	Appd.	YY.MM.DD

File Name: 140022038_r-sp_pine_street	RT Dwn.	HS Chkd.	RT Dsgn.	24.02.13 YY.MM.DD

Permit-Seal

Client/Project

MUSKOKA ALGONQUIN HEALTHCARE

SOUTH MUSKOKA MEMORIAL HOSPITAL

Bracebridge, ON Canada

Title

CONCEPTUAL SITE PLAN
300 PINE STREET

Project No.	Scale	
140022038	HORZ – 1 : 1500 (15 0 30m)	
Drawing No.	Sheet	Revision
1	1 of 1	0

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2024-2-13 4:39 PM by: Turner, Rich

ORIGINAL SHEET - ANSI D

ATTACHMENT C SANITARY DEMAND CALCULATIONS

ESTIMATE of PROPOSED SANITARY FLOW Project #140022038

Muskoka Algonquin Healthcare
Muskoka, Ontario

Program Details:
Patient Tower

Total Number of Beds		=	79	**beds**

TOTAL DESIGN POPULATION = 150

Average Daily Dry Weather Flow

Average Daily Dry Weather Flow =		**1,800**	litres/bed/day *
for a Total Equivalent Population of	**150**	persons	
the Average Daily Dry Weather Flow is:		**270,000**	litres/day
	or,	**3.1**	litres/second

Sanitary Flow Peaking Factor

Harmon Peaking Factor (PF) = 1 + (14/(4+(P/1000)^1/2))
= 4.19

Infiltration Allowance (Site Area Basis)

Inflow/Infiltration allowance calculated on the basis of		**0.28**	L/s/ha of Site Area **
for a total site development area of		**16.20**	Ha.,
the Infiltration Allowance is:		**4.54**	litres/second

Sanitary Design Flow - Proposed Development

Sanitary Design Flow

= **17.6** **litres/second** **(B)**

* Per Table 3-2 of MECP Guidelines
** Per Engineering Design Criteria and Standards Manual - Musoka, dated June 2019

ATTACHMENT D WATER DEMAND CALCULATIONS

PRELIMINARY ESTIMATE of Expected Water Demand

Muskoka Algonquin Healthcare

Muskoka, Ontario

21-Dec-22

Project #140020034

Hospital

Development Details:

	Unit Type	Info	
Patient Tower	Institutional	79	beds

Flow Calculation

Institutional:

Flow Rate =	**1,800**	litres/bed/day *		
For a Number of beds of	**79**	beds		
The total flow is:	**142,200**	litres/day		
Applying a peaking factor of	**4.90**	(maximum day)		
Maximum Day Demand =	**696,780**	litres/day		
or,	**484**	litres/minute	**(A)**	
or,	**8.06**	litres/s		
Fire Flow Demand **	7,000	litres/minute	**(B)**	
Total Flow = (A) + (B) =	**7,484**	**litres/minute**		**(maximum day demand plus fire flow)**
or	125	litres/s		

Check peak hour demand:

Institutional & Industrial:

The total flow is:	**142,200**	litres/day	
or,	**99**	litres/minute	
Applying a peaking factor of	**7.40**	(peak hour)	
Peak Hour Demand =	**731**	litres/minute	
Total Peak Hour Demand =	**731**	litres/minute	

Total water demand (on basis of maximum day demand plus fire flow) = **7,484** **litres/minute**

PRELIMINARY ESTIMATE of Required Fire Flow ***25-Jan-22***
Fire Underwriters Survey "Water Supply for Public Fire Protection", 1999
Muskoka Algonquin Healthcare
Muskoka, Ontario *Project #140020034*

Proposed Hospital Building

F = 220 · C · √A

where,

F = the required fire flow in litres per minute

C = 0.6 for fire resistive construction (fully protected frame, floors, roof)

= **0.60**

A =

The total floor area in square metres (including all storeys, but excluding basements at least 50% below grade) in the building being considered. Note: for fire-resistive buildings, consider the two largest adjoining floors plus 50% of each of any floors immediately above them up to eight, when the vertical openings are inadequately protected. If the vertical openings and exterior vertical communications are properly protected (one hour rating), consider only the area of the largest floor plus 25% of each of the two immediately adjoining floors. *

* **vertical openings and exterior vertical communications properly protected (minimum one hour rating):**

Ground Floor	**7,500**	sq.m.	(Largest floor)		
Level 2	**7,500**	sq.m.	(1st adjoining floor	@	25%
Level 3	**7,500**	sq.m.	(2nd adjoining floo	@	25%

A = **11,250** **sq.m.**

F = 220 · (C) · √(A)

= **14,001** **Lpm**

= **14,000** **Lpm** (Rounded to the nearest 1,000 L/min)

The value obtained above may be reduced by as much as 25% for occupancies having a low contents fire hazard or may be increased by up to 25% surcharge for occupancies having a high fire hazard.

Low Hazard - Hospital **25%**

Apply a reduction of **25%** , or **-3,500** **Lpm**

F = **10,500** **Lpm**

The value obtained above may be reduced by up to 50% for complete automatic sprinkler protection depending upon the adequacy of the system. The credit for the system will be a maximum of 30% for an adequately designed system conforming to NFPA 13 and other NFPA sprinkler standards. Additional credit of up to 10% may be granted if the water supply is standard for both the system and fire department hose lines required.

***Assumption: NFPA 13 sprinkler system**

Apply a reduction of **30%** **(compliance assumed)**, or **-3,150** **Lpm**

Reduction = **-3,150** **Lpm**

To the value obtained, a percentage should be added for structures exposed within 45 metres:

North side	-	>45	m	-	**0%**
East side	-	>45	m	-	**0%**
South side	-	>45	m	-	**0%**
West side	-	>45	m	-	**0%**
					0% (not to exceed 75%)

Increase = **0** **Lpm**

F = 10,500 Lpm
-3,150
0
7,350 **Lpm**

= **7,000** **Lpm** (Rounded to the nearest 1,000 L/min)

= 1849 USGPM

ATTACHMENT E SWM CALCULATIONS

Project Name: 300 Pine Due Diligence
Project #: 140022038
Location: Town of Bracebridge
Date: Feb 2024

CURVE NUMBER CALCULATION

Stantec

SCS TR-55 Table 2-2c - Runoff Curve Numbers For Other Agricultural Lands

Cover Description	Curve Numbers for Hydrologic Soil Group			
	A	B	C	D
Pasture (Poor)	68	79	86	89
Pasture (Fair)	49	69	79	84
Pasture (Good)	39	61	74	80
Meadow	30	58	71	78
Brush (Poor)	48	76	77	83
Brush (Fair)	35	56	70	77
Brush (Good)	30	48	65	73
Woods (Poor)	45	66	77	83
Woods (Fair)	36	60	73	79
Woods (Good)	30	55	70	77

SCS TR-55 Table 2-2a - Runoff Curve Numbers for Urban Areas

Cover Description	Curve Numbers for Hydrologic Soil Group			
	A	B	C	D
Open Space (lawns, parks, golf courses, cemeteries)				
Poor Condition (grass cover < 50%)	68	79	86	89
Fair Condition (grass cover 50% to 75%)	49	69	79	84
Good Condition (grass cover > 75%)	39	61	74	80
Impervious Areas				
Paved parking lots, roofs, driveways	98	98	98	98
Streets and Roads				
Paved; curbs and storm sewers	98	98	98	98
Paved; open ditches	83	89	92	93
Gravel	76	85	89	91
Dirt	72	82	97	89
Urban Districts				
Commercial and business	89	92	94	95
Industrial	81	88	91	93
Residential districts by average lot size				
1/8 acre or less	77	85	90	92
1/4 acre	61	75	83	87
1/3 acre	57	72	81	86
1/2 acre	54	70	80	85
1 acre	51	68	79	84
2 acre	46	65	77	82
Developing urban areas				
Newly graded areas	77	86	91	94

EXISTING CONDITIONS

Catchment 101 (To East)

Land Cover	Land Cover Area (ha) A	B	C	D	Total Area (ha)	Weighted CN
Woods (Good)				4.26	4.26	77
				TOTAL	**4.26**	**77**

Catchment 102 (To West)

Land Cover	Land Cover Area (ha) A	B	C	D	Total Area (ha)	Weighted CN
Woods (Good)				2.14	2.14	77
				TOTAL	**2.14**	**77**

Catchment 201(To East Pond)

Land Cover	Land Cover Area (ha) A	B	C	D	Total Area (ha)	Weighted CN
Good Condition (grass cover > 75%)				0.81	0.81	19
Commercial and business				2.70	2.70	73
				TOTAL	**3.52**	**92**

Catchment 202 (To West Pond)

Land Cover	Land Cover Area (ha) A	B	C	D	Total Area (ha)	Weighted CN
Good Condition (grass cover > 75%)				1.66	1.66	35
Commercial and business				2.09	2.09	53
					3.75	**88**

Project Name: 300 Pine Due Diligence
Project #: 140022038
Location: Town of Bracebridge
Date: Feb 2024

PROPOSED CONDITION
WEIGHTED RUNOFF COEFFICIENT CALCULATION

Catchment 201 (To East Pond)

Land Use	Area (ha)	Runoff Coefficient	TIMP	XIMP	Weighted TIMP	Weighted XIMP
Commercial and Business	2.70	0.90	0.94	0.01	0.73	0.01
Pervious[1]	0.81	0.60	0.61	0.01	0.14	0.00
TOTAL	**3.52**		**-**		**0.87**	**0.01**

Catchment 202 (To South Pond)

Land Use	Area (ha)	Runoff Coefficient	TIMP	XIMP	Weighted TIMP	Weighted XIMP
Commercial and Business	2.09	0.90	0.94	0.01	0.53	0.01
Pervious[1]	1.66	0.60	0.61	0.01	0.27	0.00
TOTAL	**3.75**		**-**		**0.80**	**0.01**

1. Pervious runoff coefficient conservatively assumed as 0.60 to account for anticipated hardscaped areas (e.g., patios, walkways, etc.) that will be incorporated into pervious areas.

Project Name: 300 Pine Due Diligence
Project #: 140022038
Project Location: Town of Bracebridge
Prepared By: SV
Date: Feb 2024

EAST POND
PERMANENT POOL AND EXT DET. CALCULATION

Stantec

Extended Detention Sizing Calculations

Landuse	Area (ha)	C (Runoff Coef.)	C (weighted value)	Imperviousness (%)	Imperviousness (Weighted Value)
Impervious	2.70	0.90	2.43	94	255
Pervious	0.81	0.60	0.49	61	50
Total	3.52		**0.83**		**87%**

* Runoff coef. values from MTO Drainage Manual Design Chart 1.07
** Assumed C values
*** Assumed percent impervious (I) converted from C values based on Simple Method, C = 0.05 + 0.009(I); (Schueler, 1987)

Protection Level	Enhanced	Choose Level Enhanced (80%), Normal (70%) or Basic (60%)
Pond Type	Wet Pond	Choose Infiltration, Wet Pond, Wetland, Hybrid, or Dry Pond (Basic Only)
Imperviousness %	87	
MOECC 2003 Table 3.2 Volume	85 m^3/ha	
	45 m^3/ha	Less 40 m^3/ha for active storage

Protection and Pond Type	Active Pond *		Est. Release Rate (m^3/s)
	MOE Guideline (m^3)	Extended Detention (m^3)	
Enhanced Wet Pond	141	782	0.014

Note: *-the greater of the MOE Guideline and the Extended Detention Runoff is used as the Active Pond volume
The extended detention volume has been calculated using the modeled Chicago 4-hour 25 mm event.

RV = 22.22 mm >>>> (For minimum of 24 hr extended detention)

Project Name: 300 Pine Due Diligence
Project #: 140022038
Location: Town of Bracebridge
Prepared By: SV
Date: Feb 2024

WEST POND
PERMANENT POOL AND EXT. DET. CALCULATION

Stantec

Extended Detention Sizing Calculations

Landuse	Area (ha)	C (Runoff Coef.)	C (weighted value)	Imperviousness (%)	Imperviousness (Weighted Value)
Impervious	2.09	0.90	1.88	94	197
Pervious	1.66	0.60	0.99	61	101
Total	3.75		**0.77**		**80%**

* Runoff coef. values from MTO Drainage Manual Design Chart 1.07
** Assumed C values
*** Assumed percent impervious (I) converted from C values based on Simple Method, C = 0.05 + 0.009(I); (Schueler, 1987)

Protection Level	Enhanced	Choose Level Enhanced (80%), Normal (70%) or Basic (60%)
Pond Type	Wet Pond	Choose Infiltration, Wet Pond, Wetland, Hybrid, or Dry Pond (Basic Only)
Imperviousness %	80	
MOECC 2003 Table 3.2 Volume	85 m^3/ha	
	45 m^3/ha	Less 40 m^3/ha for active storage

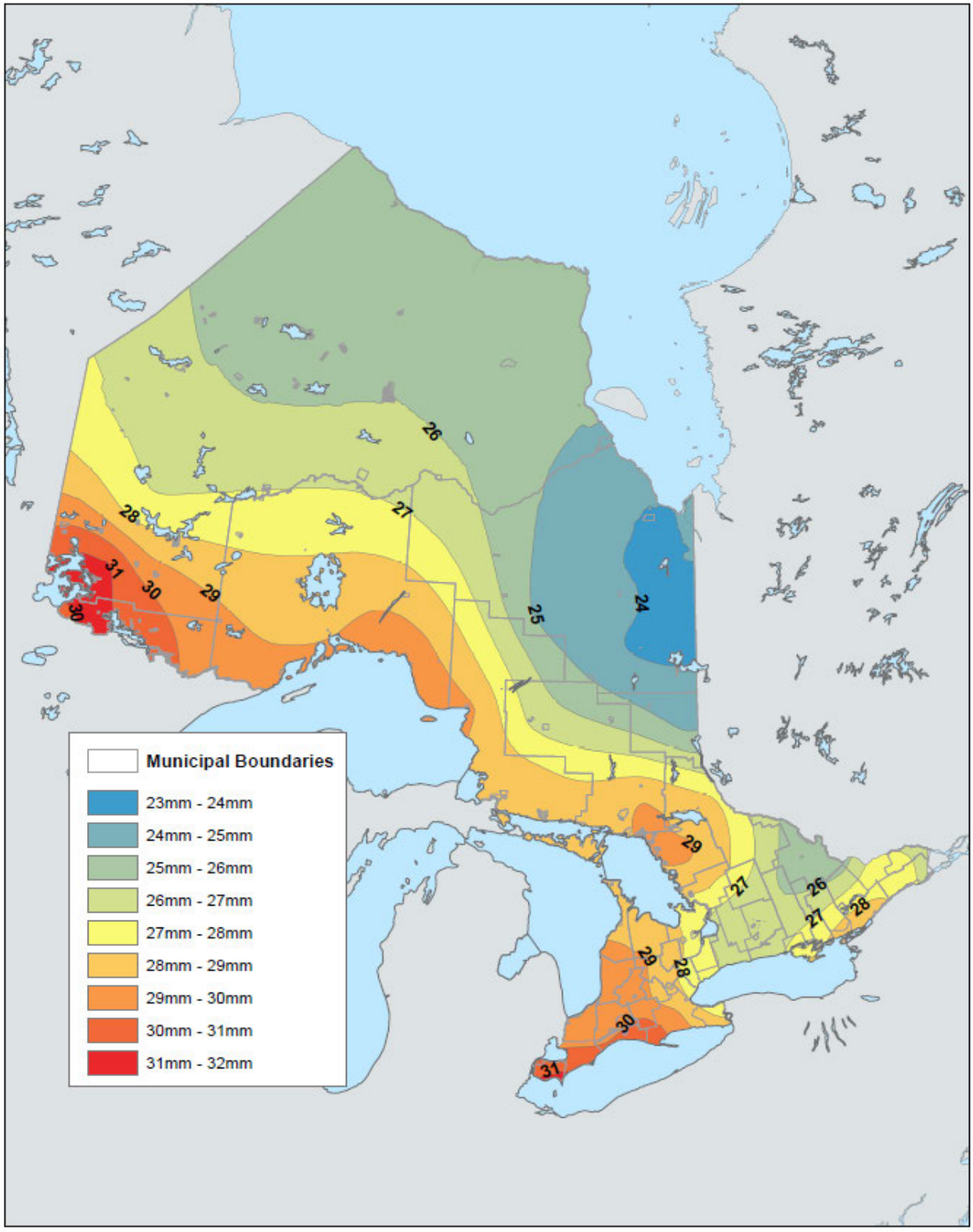
Protection and Pond Type	Active Pond *		Est. Release Rate (m^3/s)
	MOE Guideline (m^3)	Extended Detention (m^3)	
Enhanced Wet Pond	150	723	0.013

Note: *-the greater of the MOE Guideline and the Extended Detention Runoff is used as the Active Pond volume
The extended detention volume has been calculated using the modeled Chicago 4-hour 25 mm event.

RV = 19.29 mm >>>> (For minimum of 24 hr extended detention)

ATTACHMENT F BACKGROUND INFORMATION

Figure 3.3 - Regionally Specific 90th Percentile Precipitation Event Runoff Volume Control Target – Precipitation Isohyets



- security system,
- communication and SCADA system complying with the District Sewage Pumping Station Control Narrative and layout drawings, and compatible with existing system.

Location

The location of sewage pumping stations shall be approved in advance by the District and shall accommodate growth plans outlined in the Official Plans of the District and Area Municipalities.

Wet Wells

Precast concrete wet wells shall include frost straps as per OPSD 701.100, lockable stainless steel access hatches complete with thief hatch providing sufficient opening size to replace pumps, lifting davits for removing pumps and confined space entry equipment. Travel restraint bases as per District specifications and Approved Products List.

Watertight covers shall be provided on wet wells located in areas susceptible to flooding and/or vandalism. The top of the cover shall be at least 0.3m above finished grade. Vents will require filters to reduce odour. The elevation of the vents shall be above Regional storm flood lines as determined by the appropriate authority and illustrated on the plan and profile drawings. Wet wells shall be accessible to maintenance vehicles and equipment and be positioned in a suitable location to allow for venting.

Approved Products List

The products specified in Appendix C shall be utilized in the sanitary sewage system. All requested substitutions, or products for purposes not listed, shall be approved by the District prior to construction.

3.7 Storm Sewer Systems and Storm Water Management

3.7.1 General

District storm sewers and ditches are generally designed to convey run-off from the right-of-way of a District Road only. Where necessary, contributing flows from development sites are to be controlled in accordance with the criteria in this section prior to entering the District storm system.

General conveyance of storm water:

- Rural roads - ditches and culverts shall be provided for conveyance of storm water flow to outlet(s);
- Urban roads with curbs and gutters - provide storm sewers and catchment points equipped with catchbasins.

In general, re-grading within any District right-of-way to support adjacent development will not be permitted, unless it can be demonstrated to the satisfaction of the Commissioner there is a net benefit to an existing situation.

3.7.2 Storm Water Management Requirements

- A storm water management report which addresses quality and quantity control in accordance with Ministry requirements will be required for all developments other than one single family residential dwelling. The report shall illustrate appropriate storm water management techniques and design flows;
- Post-Development flows must be equal to or less than Pre-Development levels for all storm events up to and including the 100 year event. Safe overland conveyance of flows from storms in excess of the 100 year event must be incorporated into the design;
- “Enhanced” level of water quality treatment (80% TSS removal) is to be provided prior to discharging from a site, in accordance with Ministry requirements,
- LID principles, including treatment train measures, shall be employed to achieve water quality and quantity objectives.

3.7.3 Design Flows

Design flows shall be calculated in accordance with the Ministry’s current version of the Stormwater Management Planning and Design Manual, and with the Design Guidelines for Sewage Works, and the following;

- Design storms are to be modelled for 2, 5 10, 25 and 100 year design storms;
- Storm event criteria used in design shall be in accordance with The District’s current Muskoka Rainfall Data - Intensity-Duration-Frequency Values in Appendix D;
- Use of the Rational, or Modified Rational Method, to calculate runoff is to be limited to drainage areas less than 5 ha, in general. Accordingly, the Rational Method shall be used for sizing storm sewer pipes in residential development areas for a 5 year return period storm event, at maximum 80% capacity in a subcritical condition;
- Urban commercial developments on local roads shall utilize a 10 year return period storm event for a minor system;
- Runoff from larger, complex drainage areas for stormwater management design and storage requirements is to be calculated using software programs such as OTTHYMO, MIDDUS or OTTSWMM, as appropriate. The designer shall justify their software selection in their design report;
- Pipe sizing shall be based on actual flow velocity as calculated using the Manning formula, Q = (1/n)AR2/3S1/2, with a minimum velocity of

0.75 metres per second and a maximum velocity of 6.0 m/s during the design event.

3.7.4 Gravity Storm Sewer Pipe Design Minimum Sewer Sizes

The following lists the minimum pipe sizes allowable;

- Single catch basin lead 300mm
- Double catch basin lead 375mm
- Storm sewer main 300mm

Minimum Pipe Slope

The minimum pipe slope shall be 0.5%. Proposed lower slopes may be considered for large diameter trunk sewers or where constraints necessitate and shall require approval by the District or Area Municipality prior to construction.

Location

Sewers shall be located in accordance with the Area Municipality's standard locations. Where local municipal standards for sewer installation locations are not available or when installation is located within a District roadway, installation shall be in accordance with DMM 102. The preferred location of the sewer main is in the centre of the driving lane. The sewer must have a minimum horizontal separation of 2.5 m (edge to edge) and a minimum vertical separation of 0.5 m (bottom of pipe to top of pipe) from any watermain as per Ministry design criteria. Where sewer is constructed in bedrock a common trench design may be permitted in accordance with DMM 210 or 211 so long as the minimum vertical separation of 0.5m (bottom of pipe to top of pipe) between the watermain and sewer is maintained. All non-standard sewer locations will require individual approval by the District and Area Municipality.

A 2.0m horizontal separation between the sanitary sewer and storm sewer will be permitted to allow for common trench construction as long as the inverts of both sewers are relatively at the same elevation. Should the sewer inverts vary by more than 1.0 meter, a 3.0 meter separation shall be maintained.

Depth

The sewer obvert shall be constructed a minimum of 1.2 m below the finished grade. Where frost cover requirements cannot be satisfied, insulation requirements shall be in accordance with OPSD. Approval of the reduced cover must be obtained from The District prior to construction. Applicants shall consider the minimum basement elevations in the adjacent

lands if footing or similar private drains are to be connected to the storm sewer system.

Installation

Sewers shall be installed in accordance with the appropriate OPSD. Bedding class and material shall be confirmed in the geotechnical investigation.

Maintenance Holes/Catch Basins

- Maintenance Holes are required at all junctions, changes in grade, pipe size, pipe material or alignment. All maintenance holes and catch basins shall include frost straps conforming to OPSD 701.100 and be designed according to the following criteria:
- Spacing shall be determined based on inlet capacity of grates.
- The maximum spacing between maintenance holes shall be 110 m for sewers less than 300mm diameter, 120m for sewers 300mm to 900mm diameter and 150m for sewers 975mm to 1350mm diameter.
- The maximum spacing between catch basins shall be 110 m for road gradients between 0.0 and 3.0%, 90 m for road gradients between 3.0 and 4.5% and 75 m for road gradients greater than 4.5%.
- Drops through maintenance holes shall match the incoming and outgoing sewer slopes and be in accordance with the following:

Minimum drop on 0° turn	= 0.01 m
Minimum drop on 1° to 45° turn	= 0.03 m
Minimum drop on 45° to 90° turn	= 0.06 m
Maximum drop (without drop structure)	= 0.30 m

- At maintenance holes where pipe sizes change, the above criteria shall be altered such that the obverts of the pipe are matched.
- Prefabricated internal drop structures are required in maintenance holes where the difference in invert elevation is greater than 0.60 m.
- A minimum 1500 mm diameter maintenance hole is required when there is an internal drop structure.
- Grade adjustment rings shall be in accordance with the Approved Products List and shall not exceed 0.3m in height.
- When a PVC or HDPE sewer is installed into a new maintenance hole a sealing boot is required in accordance with the Approved Products List.
- Catch basin and storm maintenance holes shall include sumps with a minimum depth of 0.6m.

Catchment Points

- The design for catch basin location and type shall take into consideration the lot areas, lot grades, road widths and road grades. Design Consultant shall complete inlet grate review and confirm appropriate inlets types and catch basin spacing to suit.
- Road grading shall be assessed for efficient drainage of storm water to provide safe passage of vehicles.
- At street intersections, catch basins shall be located immediately upstream of sidewalk or pedestrian crosswalks.
- Catch basins shall be located upstream of the curb depression for any driveway and shall not be located within the driveway entrance area.
- Catch basins, inlet grates and connections shall provide for the expected maximum flow.
- Double catch basins are to be provided where flows are to be collected from two directions.
- Catch basin grates shall be to OPSD 400.010.
- Ditch inlet catch basins shall be designed to allow intake of expected flow rates at 50% blockage from debris.

Outfall Structures

All outfalls shall include a headwall to OPSD 804.030 or 804.040 as appropriate and include grating to OPSD 804.050. Design Consultant shall be responsible for confirming suitable erosion protection measures are included at the outfall and downstream of the outfall.

3.7.5 Storm Sewer Laterals

Residential

All residential connections shall utilize materials listed on the current Approved Products list in Appendix C and be in accordance with OPSD 1006.010. The minimum diameter

within the road allowance shall be 135 mm. The minimum cover at street line shall be

1.20 m, unless circumstances require otherwise. Services with less than the minimum cover shall be insulated in accordance with OPSD. Connections directly into maintenance holes shall be minimized and reviewed on an individual basis.

Commercial / Industrial

All commercial or industrial connections shall utilize materials listed on the current Approved Products list in Appendix C. The minimum diameter within the road allowance shall be 150 mm and installed in accordance with OPSD

1006.010. The minimum cover at street line shall be 1.20 m, unless circumstances require otherwise. Services with less than the minimum cover shall be insulated in accordance with OPSD. A maintenance hole will be required at the main for all services exceeding 150 mm diameter.

Approved Products List

The products specified in Appendix C shall be utilized in the storm sewage system. All requested substitutions, or products for purposes not listed, shall be approved by the District prior to construction.

4 Storm Drainage and Stormwater Management

4.1 General

Generally, storm drainage shall be accommodated by a system of curb and gutters as well as storm sewers, with the exception of rural roadways or estate residential subdivisions, where an open ditch and culvert system may be permitted with prior approval from the Director of Public Works.

4.2 Design Flows

Drainage systems are to be designed to convey the year of storm shown in Table 4.1 without surcharge. Runoff rates in excess of the design capacity of drainage systems shall be conveyed via roadways, swales, walkways, drainage easements, etc… and in special circumstances the storm sewer system, to a sufficient outlet to prevent unacceptable flooding damage to private property. Flood lines shall not extend onto private property unless a drainage easement is provided in favour of the Area Municipality.

All new developments must demonstrate that the stormwater generated onsite is directed to a sufficient outlet such as a lake, river or permanently flowing watercourse. Sufficient outlet may also include a public right-of-way with prior approval from the Area Municipality. An easement must be provided in favour of the Area Municipality for any drainage that is directed over private land.

The designer shall provide calculations for the conveyance capacity of the downstream conveyance routes to demonstrate that upstream, downstream and adjacent landowners do not incur significant adverse impacts, including increased runoff volumes, and that the flow is conveyed in a safe manner.

Table 4.1 – Design Storms (Years)

Road Classification	Bridges/Major Culverts	Road Culverts	Storm Sewers	Ditches/ Channels
Urban	1:100	1:25	1:10	1:25
Suburban	1:100	1:10	1:5	1:10
Ind./Comm	1:100	1:10	1:5	1:10
Rural	1:100	1:10	n/a	1:5
Seasonal	1:50	1:5	n/a	1:5

The design flows used to size the storm drainage systems are to be calculated using the Rational Method, or approved equivalent.

The average rainfall intensity for the Site is to be derived from the MTO web-based IDF Curve Look Up application.

Composite runoff coefficients are to be developed in accordance with the MTO Drainage Management Manual.

4.3 Culvert Design

Culverts shall be sized by the MTO conventional culvert design method, or equivalent approved by the Director of Public Works.

4.4 Open Ditch Design

Open ditches shall be designed at a minimum of 0.15m below the sub-grade of the roadway. Where this cannot be achieved, a sub-drain may be provided under the invert of the ditch and day-lighted once the minimum depth can be attained.

The minimum ditch grade shall be 1.0% and the maximum 10%, and shall be suitably protected against erosion based on flow velocities, to the satisfaction of the Area Municipality.

The minimum ditch protection on all ditches shall be 100mm of topsoil and seed and mulch.

4.5 Storm Sewer Design

The full flow capacity of the storm sewer shall be determined by Manning's Formula. Roughness coefficients, minimum/maximum flow velocities, and minimum/maximum pipe slopes shall be in accordance with MOE Design Guidelines for Sewage Works, 2008.

The minimum pipe size is 250 mm.

The minimum depth of cover shall be 1.2 m to the obvert of the sewer, provided that there are no conflicts with utility crossings. Where sufficient cover does not exist, the Area Municipality may consider shallower insulated sewers on an individual basis.

The maximum height of fill is not to exceed OPSD unless pipe strength design calculations are provided for approval by the Area Municipality.

Storm sewers shall generally be located as per the typical road cross-sections. Where storm sewers are located in easements, the easement width shall be a minimum of 5.0 m.

Manholes

Manholes shall be as per OPSD 701 and be pre-benched up to springline, to the satisfaction of the Area Municipality. Sumps shall be provided in lieu of benching when catchbasin manholes are used. Location and spacing shall be in accordance with MOE **Design Guidelines for Sewage Works, 2008.**

All new manholes within an asphalt roadway shall include a self-adjustable autostable frame. Structures outside roadways or existing frame and grates in base asphalt which require adjustment may use lift rings. A minimum of one to a maximum of three adjustment units (Moduloc) shall be installed on the top of the structure. The maximum vertical adjustment of manholes via Moduloc shall not exceed 300 mm. Any adjustment exceeding this amount shall consist of precast concrete riser sections.

Catchbasins

Catchbasins shall be as per OPSD 705 and located upstream of pedestrian crossings. The maximum spacing shall be in accordance with MOE Design Guidelines for Sewage Works, 2008.

When adjusting the top elevation of catchbasins, a minimum of one to a maximum of three adjustment units shall be installed on the top of the structure. The maximum vertical adjustment of shall not exceed 300 mm. Any adjustment exceeding this amount shall consist of precast concrete riser sections.

Leads shall connect to manholes where possible and be minimum 250 mm for single catchbasins and minimum 300 mm for double catchbasins.

Foundation Drainage System

A foundation drainage system is to be provided for each residential lot in the urban and suburban area and consist of either:

- A sump pump discharging to an underground storm sewer service connection; or
- A sump pump discharging to an Area Municipality ditch; or
- A gravity connection to the storm sewer, provided the 100 year hydraulic gradeline is a minimum of 0.5 m below the finished basement floor elevation of the dwelling; or
- A sump pump or gravity connection to a third pipe (foundation drain) collection system that is separate from the storm sewer system, which discharges to a sufficient outlet such as a valley or hillside.

The owner of any sump pump drain that discharges to a Area Municipality ditch is solely responsible for its operation and maintenance. The Area Municipality shall not be liable for any damage to such drain that occurs during regular ditch maintenance.

Storm Service Connections

Single 100mm PVC DR28 service connections for residential lots shall be constructed in accordance with OPSD 1006.010 or 1006.020. Connections for commercial, institutional or multiple use will be considered on an individual basis.

Where a sump pump discharges to a storm service connection, a 25mm air gap shall be provided at the building such that there is no direct connection between the building sump pump outlet and the storm service.

Roof leaders shall not be connected to the storm sewer system and shall discharge to the ground surface onto erosion proof splash pads, and flows shall be directed away from the building in such a way as to prevent ponding or seepage into the foundation weeping tile. Further, roof leader discharge shall not cause an icing condition on municipal sidewalks.

Private Drain

Direct connection from any private storm drain, roof drain, sump pump, etc. to a municipal storm sewer or culvert is not permitted unless prior approval has been received from the Director of Public Works. Where such connection has been granted by the Area Municipality, the applicant is responsible for installing proper back-up devices. The Area Municipality shall not be held responsible for damages caused by water backing up into private drains.

Testing

All newly installed PVC and polyethylene storm sewers shall be subjected to deflection testing in accordance with OPSS 410. Deflection testing is not required for concrete storm sewers.

All newly installed storm sewers shall be subjected to a CCTV Inspection in accordance with OPSS 409. The Consulting Engineer shall review the DVD’s and reports prior to submitting to the Area Municipality, to ensure completeness, accuracy and that no deficiencies exist.

All manholes and catchbasins shall be visually inspected by the Area Municipality for deficiencies.

Any sections of sewer or service connections which fail to meet the requirements shall be repaired or replaced at the direction of the Area Municipality.

Approvals

All new sewers require an Environmental Compliance Approval (ECA) from the Ministry prior to construction, a copy of which shall be provided to the Area Municipality prior to construction.

4.6 Stormwater Management Facilities

All stormwater management facilities are to be designed to ensure that post-development peak flows do not exceed pre-development levels for storm events up to and including the 1:100 year event. An emergency spillway shall be provided and designed with suitable erosion protection given the velocities associated with the uncontrolled flow.

All stormwater management facilities are to be designed in accordance with the preferred criteria listed in the Ministry of the Environment “Stormwater Management Planning and Design Manual”.

Maintenance access is required to the inlet and outlet structures, forebays, and emergency spillways. Where possible, the maintenance access is to be looped to provide two access points to all key features. When this is not possible, dead end access may be provided with a turning area with a 13m centreline turning radius.

Water Quality Treatment Units

Consideration will be given to the use of oil/grit separators or other stormwater quality treatment unit where a stormwater management pond is not practical. These should be used in conjunction with additional quality control measures to provide a treatment train approach. Supporting calculations shall be provided to the Area Municipality for approval.

Operations and Maintenance Manual

A detailed operations and maintenance manual shall be required as part of the design of each stormwater management facility, including inspection checklists, maintenance description and frequency, etc.

4.7 Sediment Control

Temporary sediment controls are required for any construction project and must be detailed on a Sediment Control and Construction Mitigation Plan. The controls should be designed using a phased approach whenever feasible to minimize the exposed area of the site at any given time. There must also be a contingency plan for repair, replacement and upgrading of control measures as required to achieve adequate performance at all times.

Protection of all potentially affected storm drain inlets and catchbasins shall be accounted for in the design.

Construction Access Mats shall be installed at all exits from the site, and shall be designed and maintained to remove most of the sediment accumulated on construction vehicle tires.

Effluent from site dewatering operations must be adequately treated prior to discharge into receiving water bodies, ditches or storm sewers.

i) Where **development** exists within the setbacks identified in Sections C2.6.4.2 e) and f), **individual on-site sewage services** and building setbacks are improved or not further reduced;

ii) Where new or updated **individual on-site sewage services** are required to support the proposal, the requirements of Section C2.6.7.1 a) ii) and iii) shall apply;

iii) Section C2.6.7.1 a) iv) is implemented; and

iv) Section C2.6.7.1 b) is applied at the Area Municipality's discretion.

b) Where the setback requirements cannot be met due to insufficient lot depth or the existence of terrain or soil conditions which make other locations on the lot more suitable, or where existing buffers or stormwater management practices do not satisfy the requirements outlined in this Plan, an overall net improvement shall be achieved through on-site phosphorus management and impact mitigation measures in accordance with the standard protection policies of this Plan.

C3 CLIMATE CHANGE

a) Muskoka's climate is changing. Muskoka is predicted to expect hotter, drier summers with more heat waves and more intense rainfall events, and warmer and milder winters. These changes will impact how the District of Muskoka and Area Municipalities plan for **development** and **redevelopment**, **infrastructure** and the public realm to ensure the area remains resilient to changing climate from economic, health, social, emergency services and environmental perspectives;

b) The District of Muskoka recognizes that sustaining and restoring the resistance to and resilience of communities and ecosystems will be required to address local climate change impacts. The District of Muskoka understands that through the implementation of appropriate policies, climate change mitigation, adaptation and resiliency of Muskoka can be improved.

c) The District of Muskoka shall work toward the implementation of a "climate change lens" as the approval authority on Planning Act applications and as a commenting agency to maximize resiliency of ecosystems and communities, manage the risks associated with climate change and provide sustainable natural environmental services for future generations of residents and visitors to Muskoka. Considerations shall include but are not limited to:

i) Reduction of greenhouse gas emissions;

ii) Improvement of air quality;

iii) Promotion of compact form;

iv) Efforts to limit the dispersal of the population and travel times between housing, employment, and amenities and services;

v) Use of **green infrastructure**;

vi) Promotion of design to:

1. Maximize energy efficiency and conservation including consideration of the mitigating effects of vegetation; and

2. Maximize opportunities for the use of renewable and alternative energy sources and systems;

vii) Identification and mitigation of existing hazards which may be compounded or aggravated

by climate change, including flood prone areas and wildland fire areas; and

viii) Identification of natural heritage features that have become more **sensitive** to **development** pressures due to climate change.

d) The implementation of the climate change lens may result in:

i) Requiring resiliency measures such as:

1. Improved **floodplain** mapping and increased restrictions for **redevelopment** of existing structures;
2. Increased setbacks for **development** adjacent to **wetland**s, lakes, rivers, headwater areas and groundwater recharge areas;
3. Retention of natural vegetation;
4. More stringent requirements for stormwater management and flood abatement, and
5. Provisions to increase the resilience of power and data grids.

ii) Establishing more stringent standards for built **infrastructure**; and

iii) Increased energy efficiency through:

1. The use of energy sources that reduce or avoid greenhouse gas emissions;
2. Use of passive solar design principles; and
3. Use of net-zero design principles to reduce or eliminate energy demand by built **infrastructure**.

C4 STORMWATER MANAGEMENT

a) It is acknowledged that stormwater management is a shared responsibility between the Province, District of Muskoka and Area Municipalities. The following policies are intended to provide a framework for Area Municipal Official Plans and to apply directly to any stormwater management facility that has the potential to impact a District interest such as District-owned **infrastructure** and **recreation**al water quality. Planning for stormwater management shall:

i) Minimize, or, where possible, prevent increases in contaminant loads;

ii) Minimize changes in water balance and erosion;

iii) Not increase risks to human health and safety and property damage;

iv) Maximize the extent and function of vegetative and pervious surfaces;

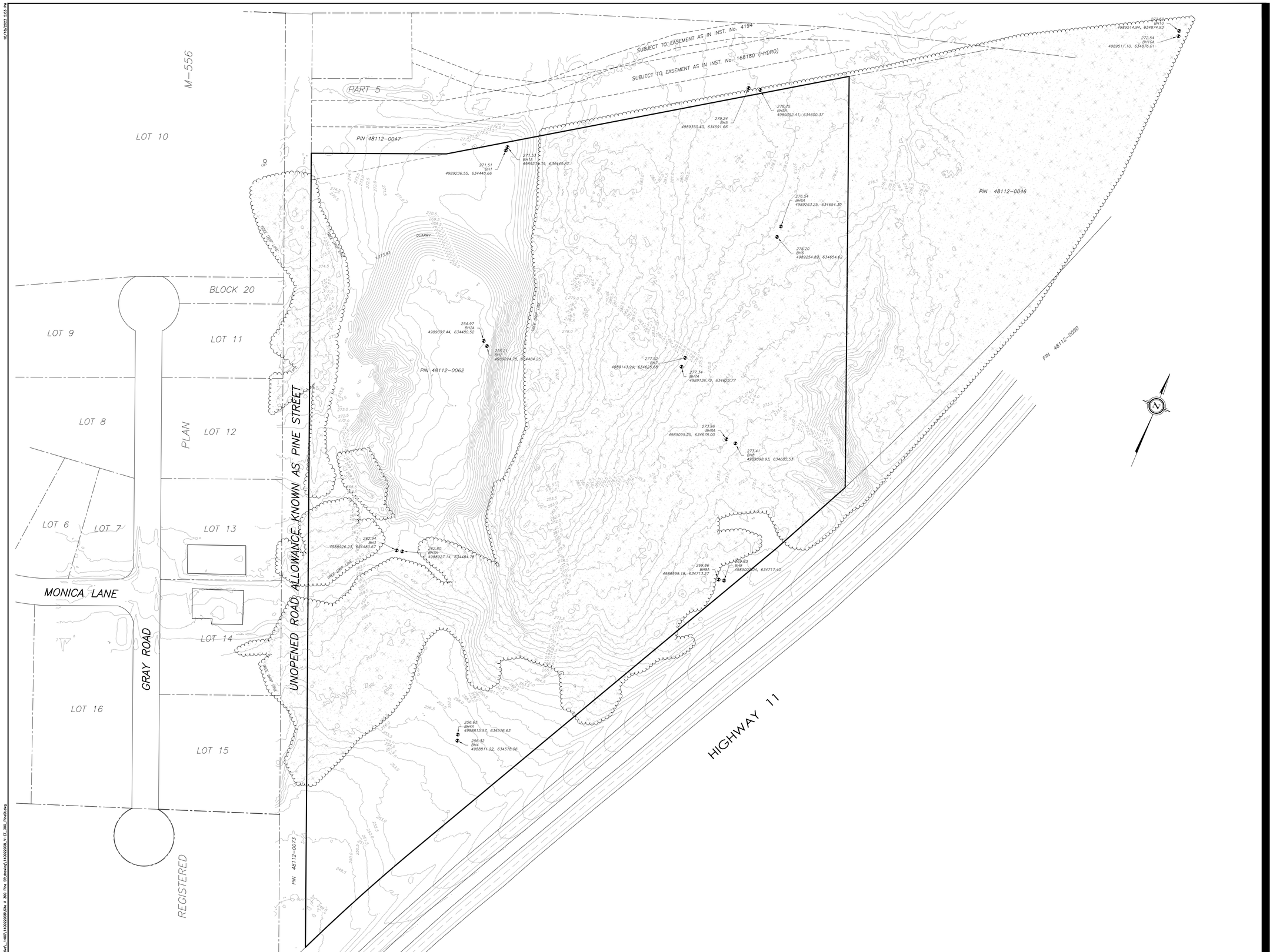
v) Promote stormwater management best practices, including stormwater attenuation and re-use, and low impact **development**; and

vi) Consider the impacts of climate change in the design of stormwater facilities.

b) In order to control flooding, ponding, erosion and sedimentation and to protect water quality and aquatic habitat or other natural habitat that depend on watercourses and other water bodies for their existence, stormwater management plans shall generally be required for any major **development**. Stormwater management shall be undertaken in accordance with Provincial, District of Muskoka or Area Municipal guidelines, strategies or plans.

c) Except in extenuating circumstances proposals for **development** or **redevelopment** shall provide for a low impact **development** approach to stormwater management which may include

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CAUTION

THIS IS NOT A PLAN OF SURVEY AND SHALL NOT BE USED EXCEPT FOR THE PURPOSE INDICATED IN THE TITLE BLOCK.

UTILITIES SHOWN ARE FOR DISCUSSION PURPOSES ONLY AND PRIOR TO CONSTRUCTION SHOULD BE CONFIRMED BY A CONTRACTOR.

VERTICAL DATUM

ELEVATIONS ARE GEODETIC, REFERRED TO CGVD-1928:1978 AND DERIVED FROM GNSS OBSERVATIONS USING A REAL-TIME CORRECTION SERVICE.

DRAWING COORDINATES

UTM ZONE 17, NAD83 (CSRS)
CAUTION: DRAWING COORDINATES HAVE BEEN SCALED TO GROUND LEVEL DISTANCES BASED ON THE APPROXIMATE CENTROID OF THE PARCEL.

CONTOUR NOTE

CONTOURS DISPLAYED ARE DERIVED FROM 2022 LIDAR DATA SOURCED FROM THE DISTRICT MUNICIPALITY OF MUSKOKA .

LEGAL DESCRIPTION

PART OF LOT 6 CON 1 MACAULAY PT 1 35R-3456 EXCEPT PT 1-5 35R-8356 AND PART 1-4 35R-7976; BRACEBRIDGE ; THE DISTRICT MUNICIPALITY OF MUSKOKA.

DESIGNATED AS PIN 48112-0062

TOTAL PARCEL AREA: 18.057 Ha.

BOREHOLE NOTE

BOREHOLES SHOWN REPRESENT AS-STAKED LOCATIONS AND DO NOT REPRESENT THE ACTUAL DRILLED LOCATION.

Revision	By	Appd	YYYY.MM.DD
Issued	BR	MM	OCTOBER 18, 2023
	Dwn.	Chk.	YYYY.MM.DD

Client/Project Logo

Client/Project
MUSKOKA ALGONQUIN HEALTHCARE

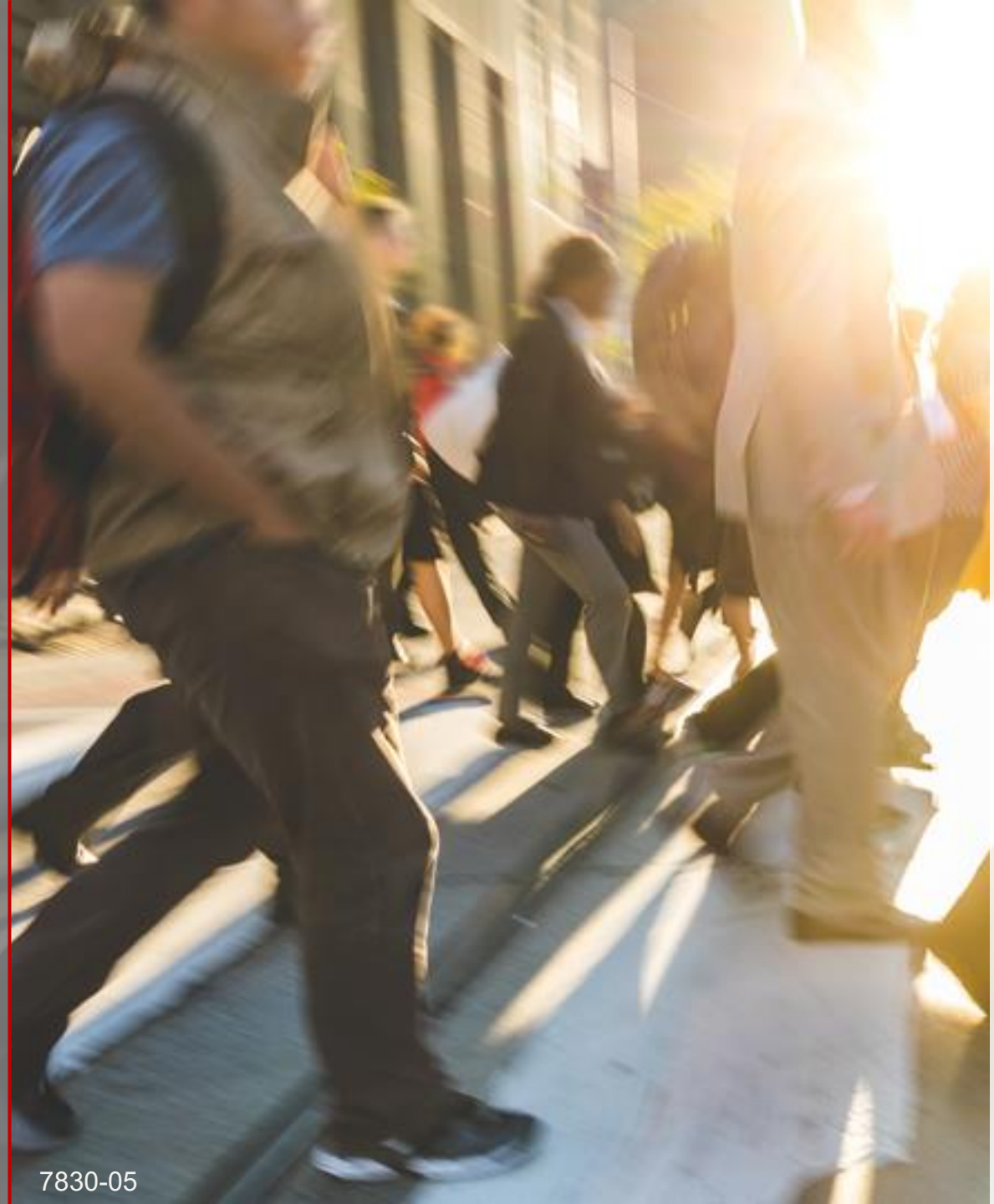
MUSKOKA ALGONQUIN STAGE 1.3

300 PINE STREET, BRACEBRIDGE

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BRACEBRIDGE HOSPITAL FUNCTIONAL PROGRAM

URBAN TRANSPORTATION CONSIDERATIONS

Prepared For:
Stantec Architecture Ltd.

February 2024

BA Group

7830-05

Introduction

BA Group is retained by Stantec Architecture to undertake a due diligence exercise that highlights the transportation constraints and opportunities associated with the future Bracebridge Hospital site.

This report provides an overview of the following:

- Site Context – Existing Site
- Proposed Expansion and Development Changes
- Proposed 300 Pine Street Site
  - Area Transportation Context
  - Site Plan Context
  - MTO Approvals
- Key Findings and Conclusions



Existing Site Context



Figure 1: Existing Hospital Location

Site Location

The Bracebridge Hospital is located at 75 Ann Street in Bracebridge, an urban area in the South Muskoka Region.

The existing site is generally bounded by Liddard Street to the north, existing residential to the east and west, and Ann Street to the south.

Existing Site Context

Building and Services

- 138,401 ft^2 (12,858 m^2) of Building Gross Floor Area (BGFA)
- 59 beds: 43 acute health care beds and 16 complex continuing care beds
- Emergency department, intensive care unit, and a various outpatient programs and services

Staff / Employees

- 438 Full-time Equivalent (FTE)

Patient Activity

- 65,188 annual visits per year



Proposed Hospital Expansion Statistics

The future hospital statistics have been provided by Stantec Architecture Ltd and Muskoka Algonquin Healthcare.



Existing Vehicle Parking

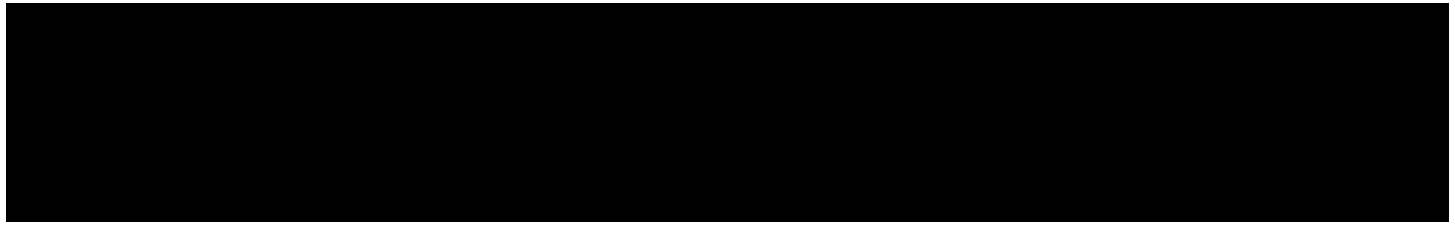
Parking Data Collection

- On October 17 and 18 of 2023, field visits were conducted by BA Group to collect parking data, including the current supply and demand.
- The parking demands were found to be consistent between the two surveyed days, with the hospital parking lots currently operating between 76% and 84% utilization.

Table 2: Existing Hospital Parking Demand Summary

Date	Parking Supply	Max Parking Demand	Total Utilization
Tuesday, October 17, 2023	249	189	76%
Wednesday, October 18, 2023		209	84%

Future Vehicle Parking



- Using the above site statistics and comparing to similar hospitals, the future parking demands is anticipated to be in the range of 400 – 500 parking spaces.
- We recommend that the parking analyses be updated to calculate the future parking demands of the site once the functional program is further refined.

Table 3: Forecasted Hospital Expansion (Ultimate) Parking Demand

Variable	Existing Site	Ultimate Site	Existing Parking Demand	Future Parking Demand
[redacted]				

300 Pine Street

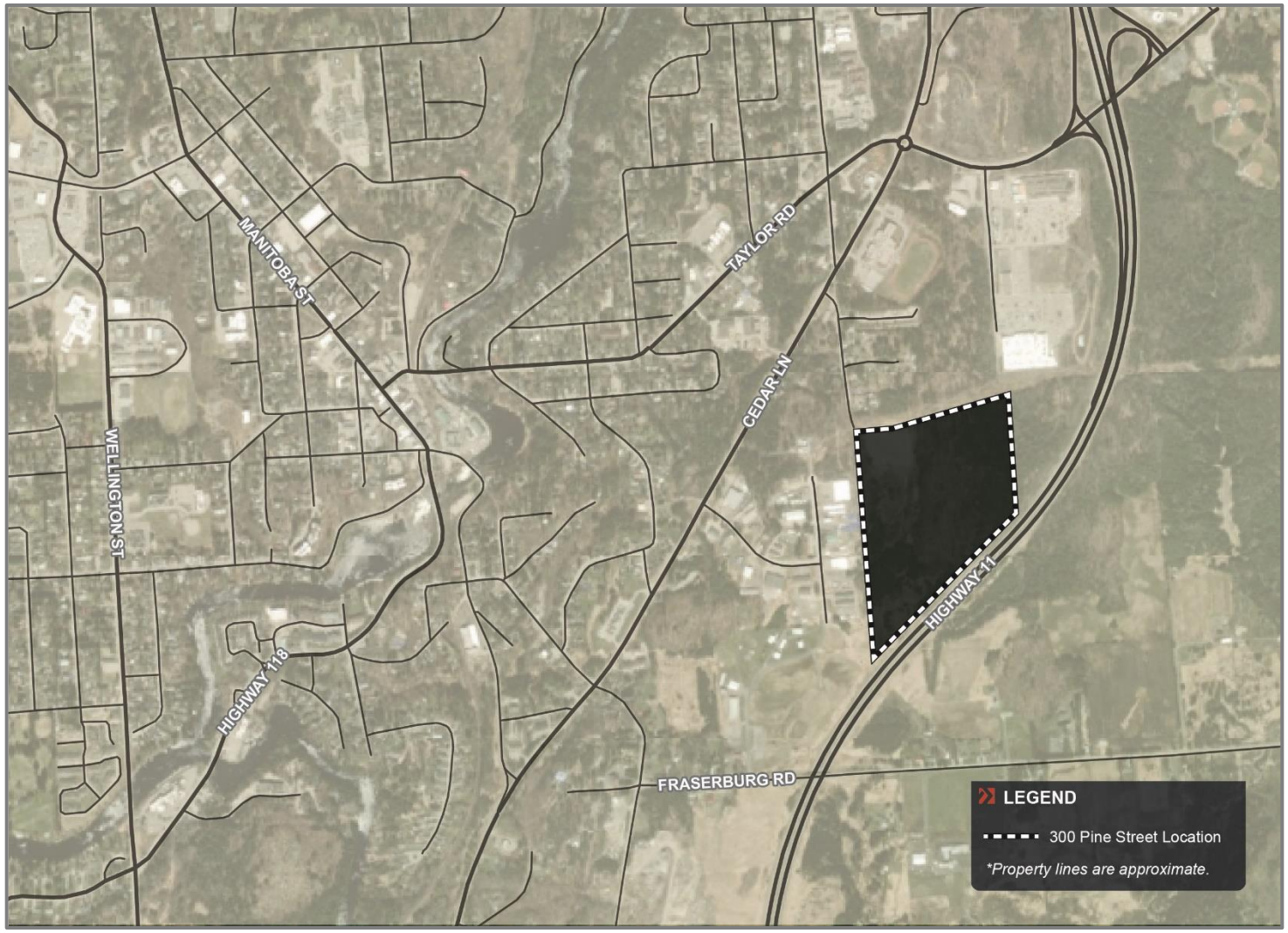


Figure 2: 300 Pine Street



Figure 3: Road Context

Existing Roadways

The classifications of the existing roadways surrounding the site were taken from the Bracebridge Official Plan and are described below:

- **Highway 11** is identified as a provincial highway, which connects to Highway 400 in Barrie
- **Taylor Road** is identified as an arterial roadway and currently includes a two-lane cross-section with paved shoulders. The intersection with Depot Drive is signalized with auxiliary turn lanes in all directions.
- **Cedar Lane** is identified as an arterial roadway and currently includes a two-lane cross-section with paved shoulders
- **Pine Street** is identified as a municipal – year-round road and currently includes a two-lane cross-section with paved shoulders
- **Depot Drive** is identified as a private road and currently includes a two-lane cross-section with curbs on both sides
- **Gray Road** is identified as a municipal – year-round road and currently includes a two-lane cross-section with paved shoulders

Planned Road Improvements

Per the Bracebridge Official Plan, there is a proposed road that is planned to connect Depot Drive, Pine Street, and Gray Road.

This site does not have frontage on an existing or planned collector or higher order road system that would be typical for this type of land use.

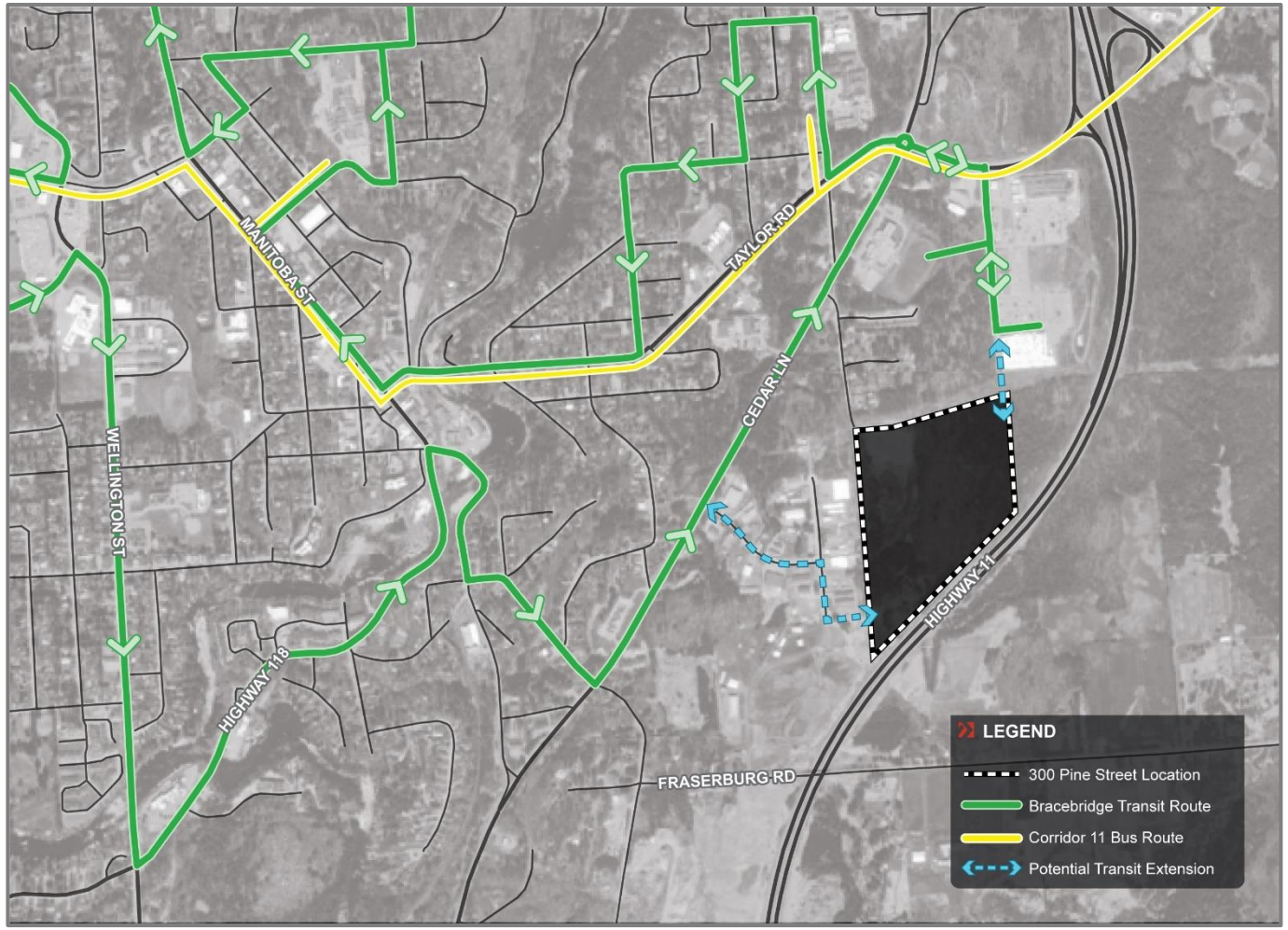


Figure 4: Transit Context

Existing Transit Network

- **Bracebridge Transit** operates one public transit bus route within the Town's urban core that spans 22 kilometers and operates on a 60-minute return schedule. There are several transit stops located in close proximity to the 300 Pine Street site, including three along Depot Drive and one at the intersection of Cedar Lane and Monica Lane.
- **Bracebridge Mobility** is a service provided for those who are unable to use the Bracebridge Transit due to mobility. It operates within the Bracebridge Transit service area and is a door-to-door service.
- **Corridor 11** route runs during the week between Huntsville and Orillia, with stops in Port Sydney, Bracebridge, Gravenhurst, Kilworthy, and Washago.

Future Transit Network

Consideration should be given to extend the Bracebridge Transit and Corridor 11 routes through the hospital campus to provide transit service to staff and visitors. This site does not have frontage on a collector or higher order road system that would be typical for this type of land use.

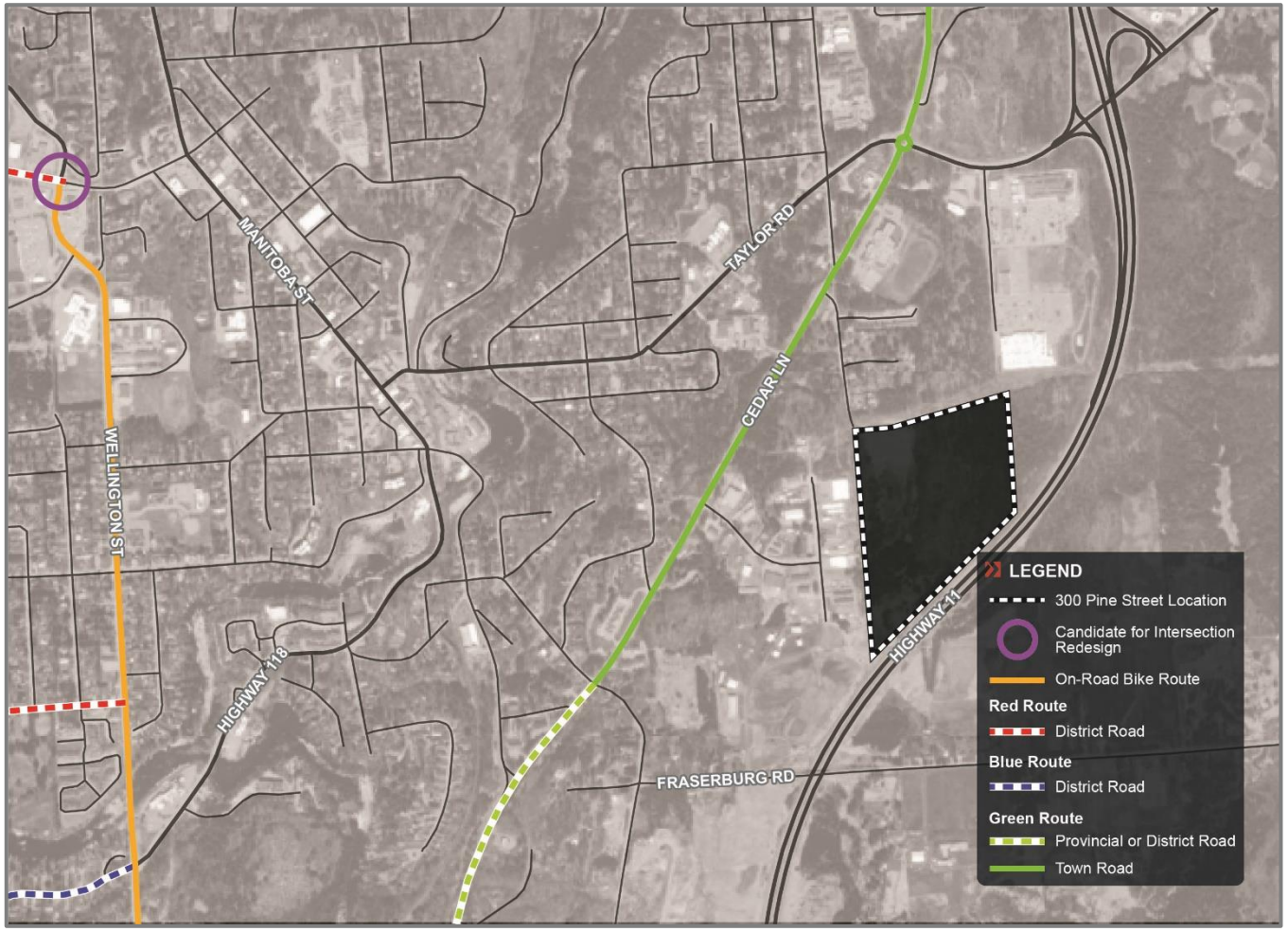


Figure 5: Active Transportation Context

Existing Active Transportation Network

Within the vicinity of the 300 Pine Street site, there is a sidewalk along the east side of Depot Drive, which provides access to the existing commercial development south of Taylor Road.

Planned Active Transportation Network

Per the Bracebridge Plan for Walking and Cycling (2014), the planned on-road bike routes are part of the long-term projects for the Town and are described below:

- **Cedar Lane** is proposed to be part of the future green route, which is planned to run between Highway 117 in the north and Muskoka Beach Road in the south

The Site is not currently well served by active transportation facilities, nor are there plans that will significantly improve them in the future. However, as the site is centrally located within the town, visitors and staff would be more willing to take active modes of transportation, and thus, the Hospital should support facilities that accommodate pedestrians and cyclists. It is unclear whether accessible standards can be met for pedestrians on this site (the ability to regrade to an acceptable standard is unknown).

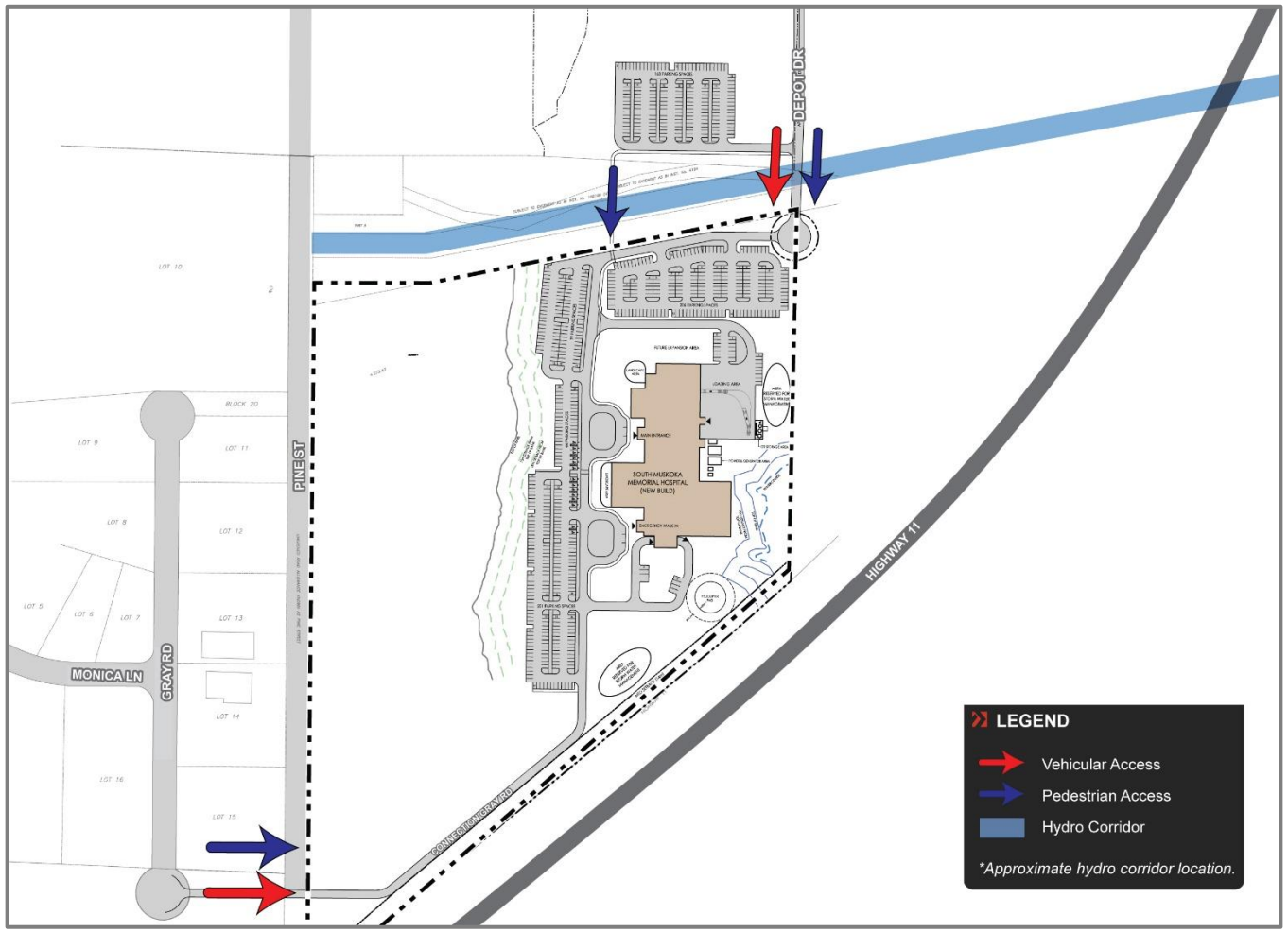


Figure 6: Site Access

Proposed Access

The proposed site at 300 Pine Street provides the following site accesses:

- Depot Drive (private roadway)
- Gray Road (local roadway)

[redacted]

Hydro Corridor

[redacted]

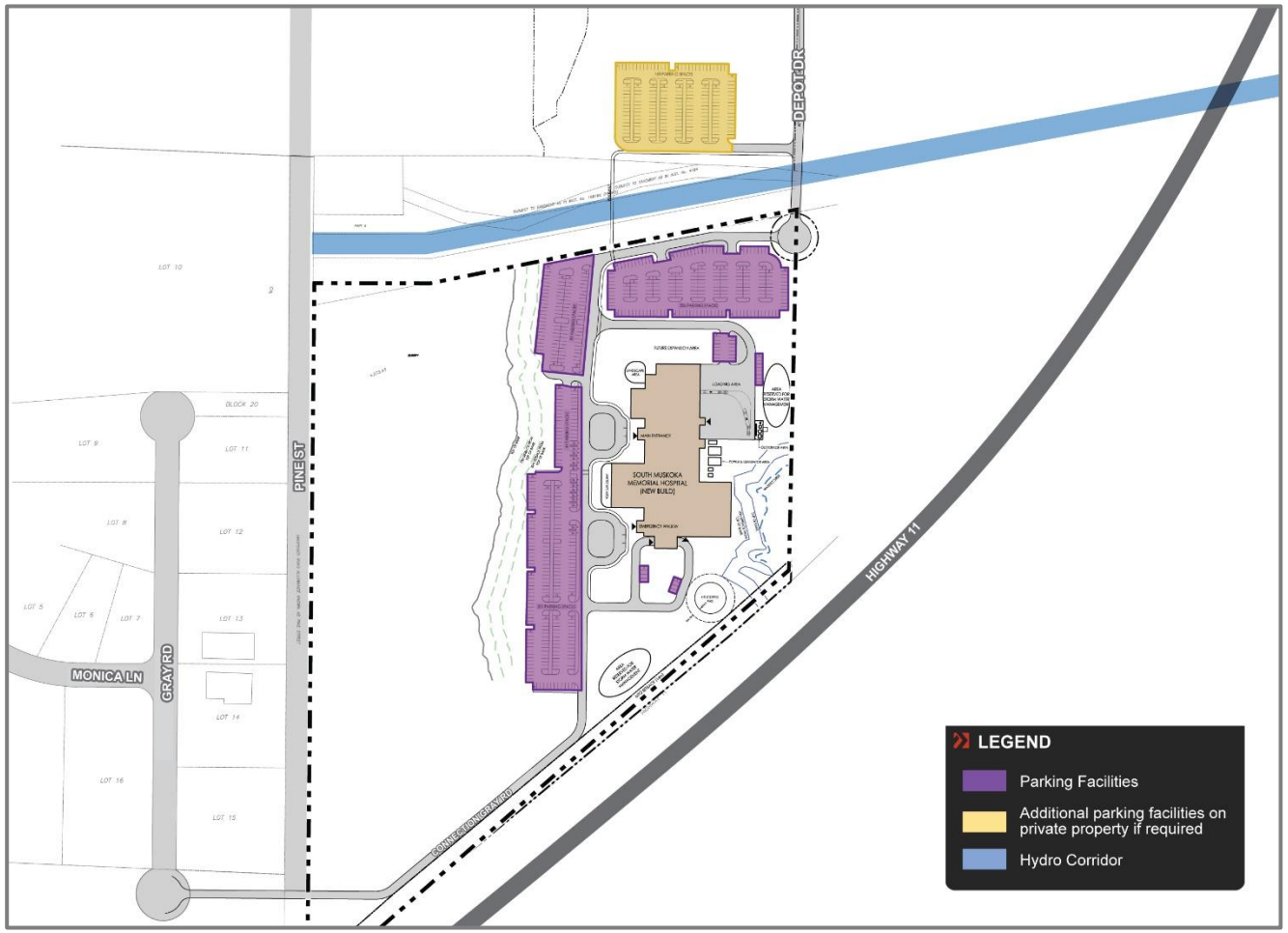


Figure 7: Parking Facilities

Minimum Parking Requirements

As per Section 5.17 of the Town of Bracebridge Zoning By-law 2016-088, the minimum parking supply for Hospitals is 3 car parking spaces for every four beds. Based on the information provided, the future hospital will include 18 beds, and thus, per the by-law, will require a minimum of 14 vehicle parking spaces. The parking needs of the hospital are expected to significantly exceed the Zoning requirements.

Proposed Parking Supply and Facilities

The proposed hospital expansion provides all parking access off Depot Drive and Gray Road. The latest site plan includes 550 parking spaces, provided in surface parking lots on the hospital property in addition to 168 surface parking spaces on the adjacent school board property. There are 14 accessible parking spaces, located outside the main entrance and emergency department.

Based on the parking analyses and current functional program, the proposed site plan can accommodate the projected parking demands on site. Based on the land use, it is recommended to provide 4-5% of the total parking supply as accessible spaces. These spaces should be conveniently located in close proximity to the main entrance and emergency department.

Parking control should be explored as the site plan continues to undergo refinement.

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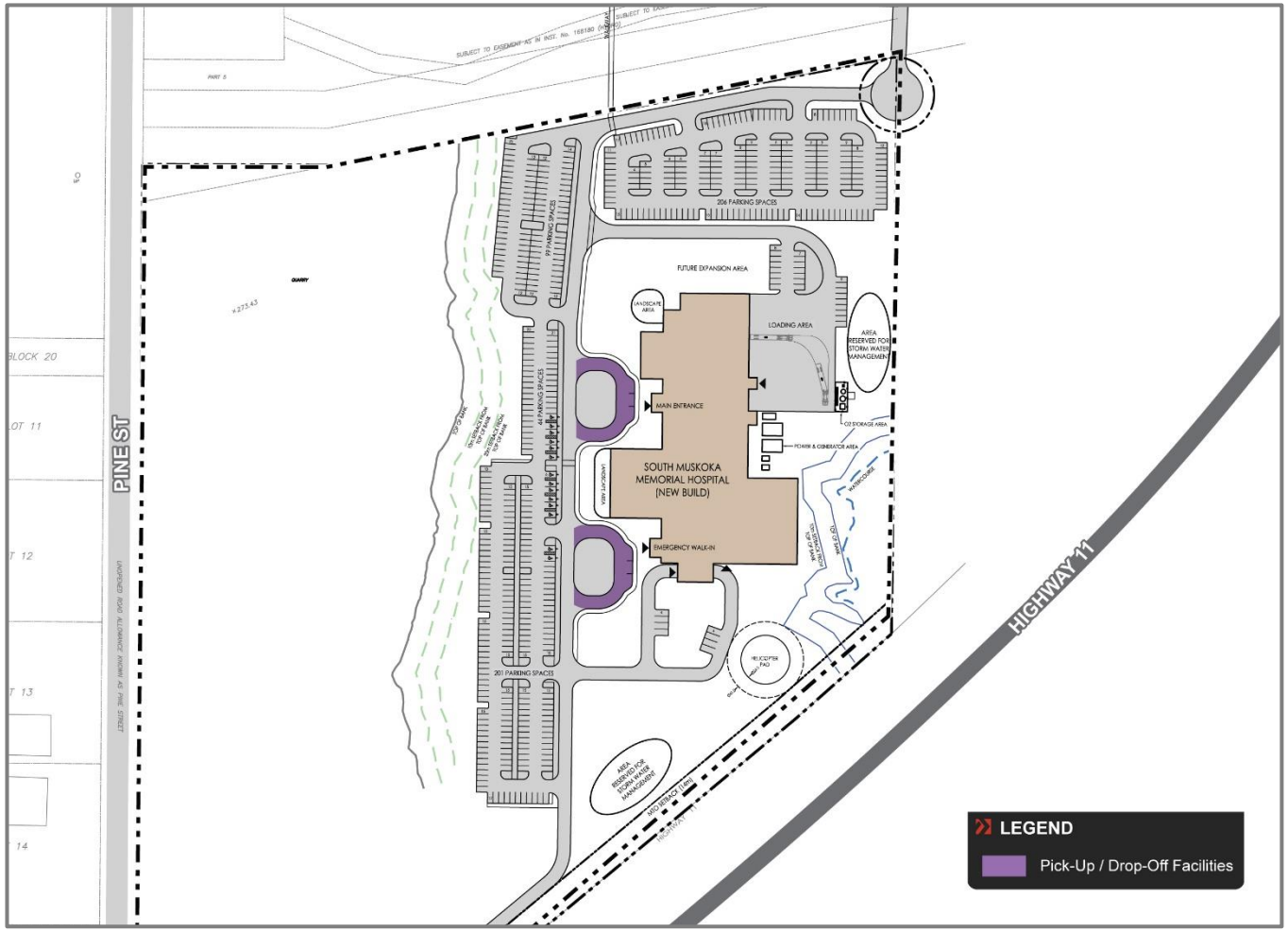


Figure 8: Pick-up / Drop-off Facilities

Proposed Pick-up / Drop-off (PUDO) Facilities

The 300 Pine Street site is proposed to include two PUDO loops: one outside the main hospital entrance and one outside the emergency department. Each PUDO loop can accommodate approximately 11 parked passenger vehicles, based on the length of each drop off. The functional requirements for design vehicles were not assessed in detail for this concept.

The functional requirements of the PUDO loops must consider parked vehicles while allowing sufficient space for other vehicles to maneuver around it. The needs for any additional design vehicle (i.e., fire route, specialized transit, ambulance) should be considered as part of subsequent concept plans.

[redacted]

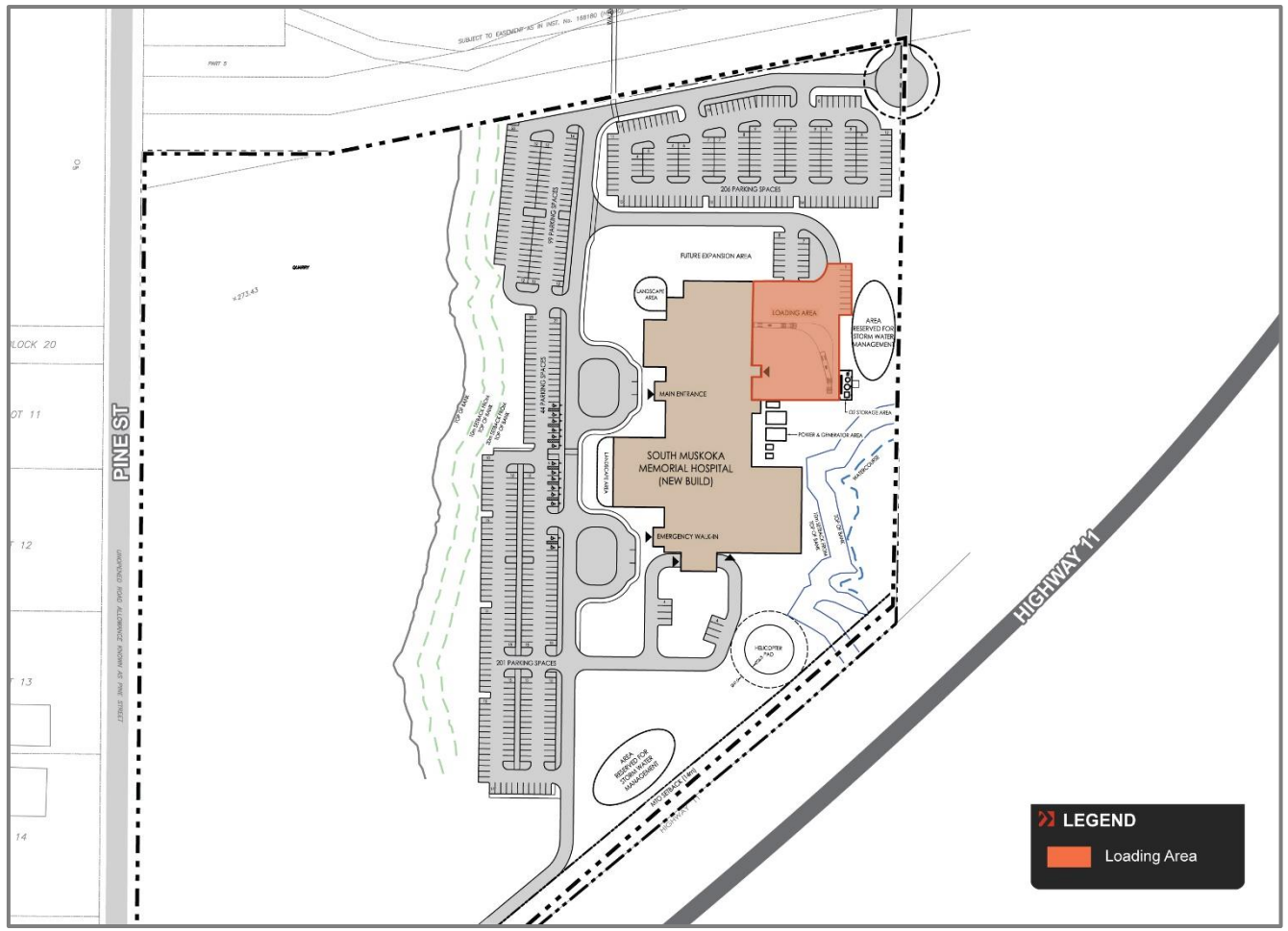


Figure 9: Loading Facilities

Minimum Loading Requirements

As per Section 5.2 of the Town of Bracebridge Zoning By-law 2016-088, the minimum loading supply and dimension requirements for the site is provided below.

Table 4: Zoning By-law 2016-088 Loading Requirements

Minimum Supply	Min. Length	Min. Width	Min. Vertical Clearance
2 loading spaces	9.0 metres	3.5 metres	4.0 metres

Notwithstanding the above By-law requirements, the functional program defines the specific needs of the future hospital. Other considerations includes linen trailer storage (typically an additional soiled dock) and refueling (Medigas and diesel). This site must accommodate meals on wheels, contractor parking, and landscape and snow removal vehicles per the functional program.

The loading needs of the hospital exceed the Zoning requirements.

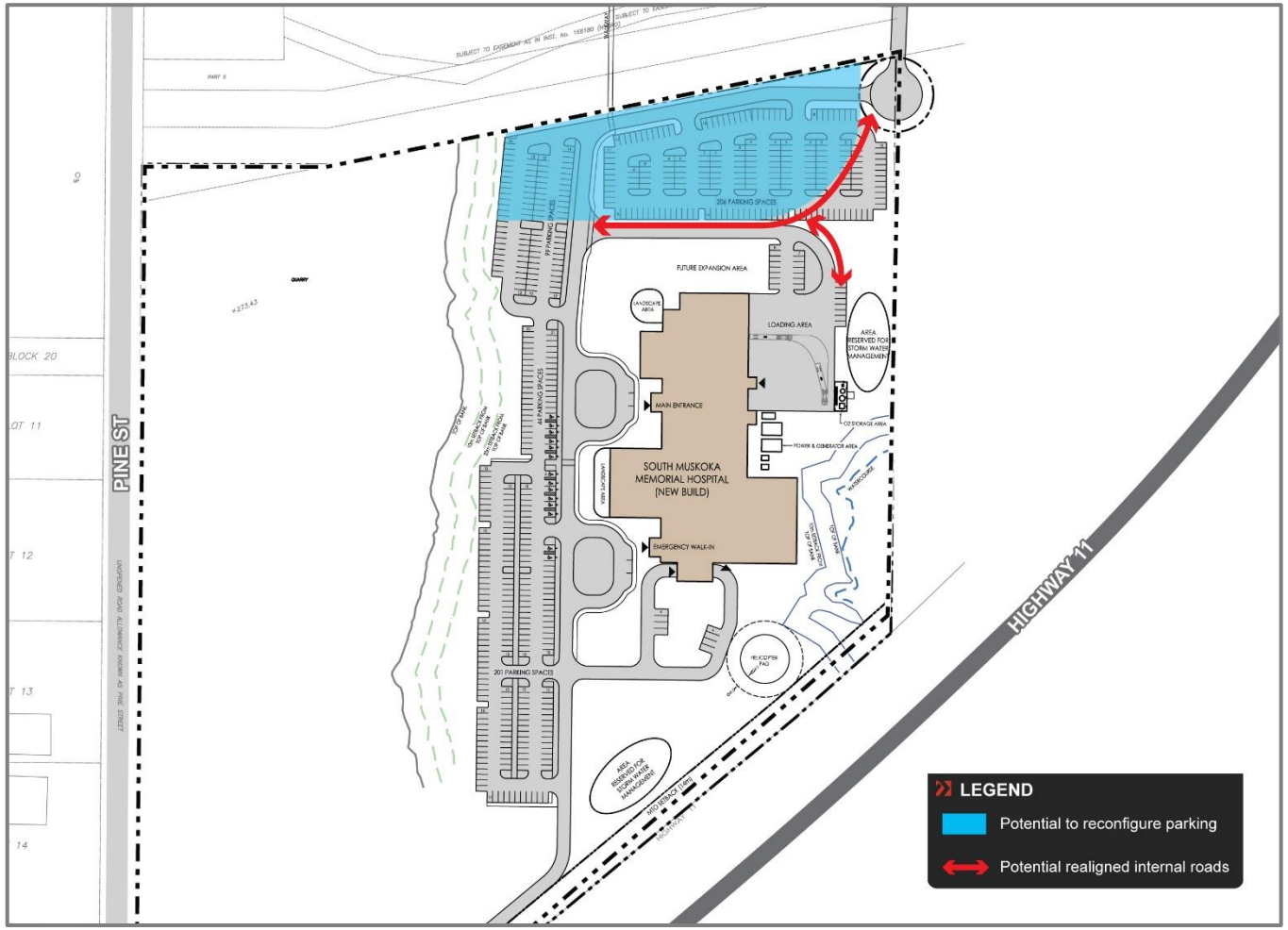


Figure 10: Site Plan Considerations

Site Plan Considerations

As the site plan undergoes further refinement, there's the potential to assess various options with regards to the internal site circulation. Particularly on the north side of the property, the location of the drive aisles can be explored to best accommodate the future needs of the hospital. Figure 10 depicts one potential solution, which brings the internal drive aisle closer to the loading area, thus creating a shorter distance for trucks to manoeuver through the site to access the loading area. This would also eliminate the northern east – west drive aisle allowing it to be repurposed into additional parking.

It is recommended to continue to explore various internal site circulation options as the site plan undergoes refinement.

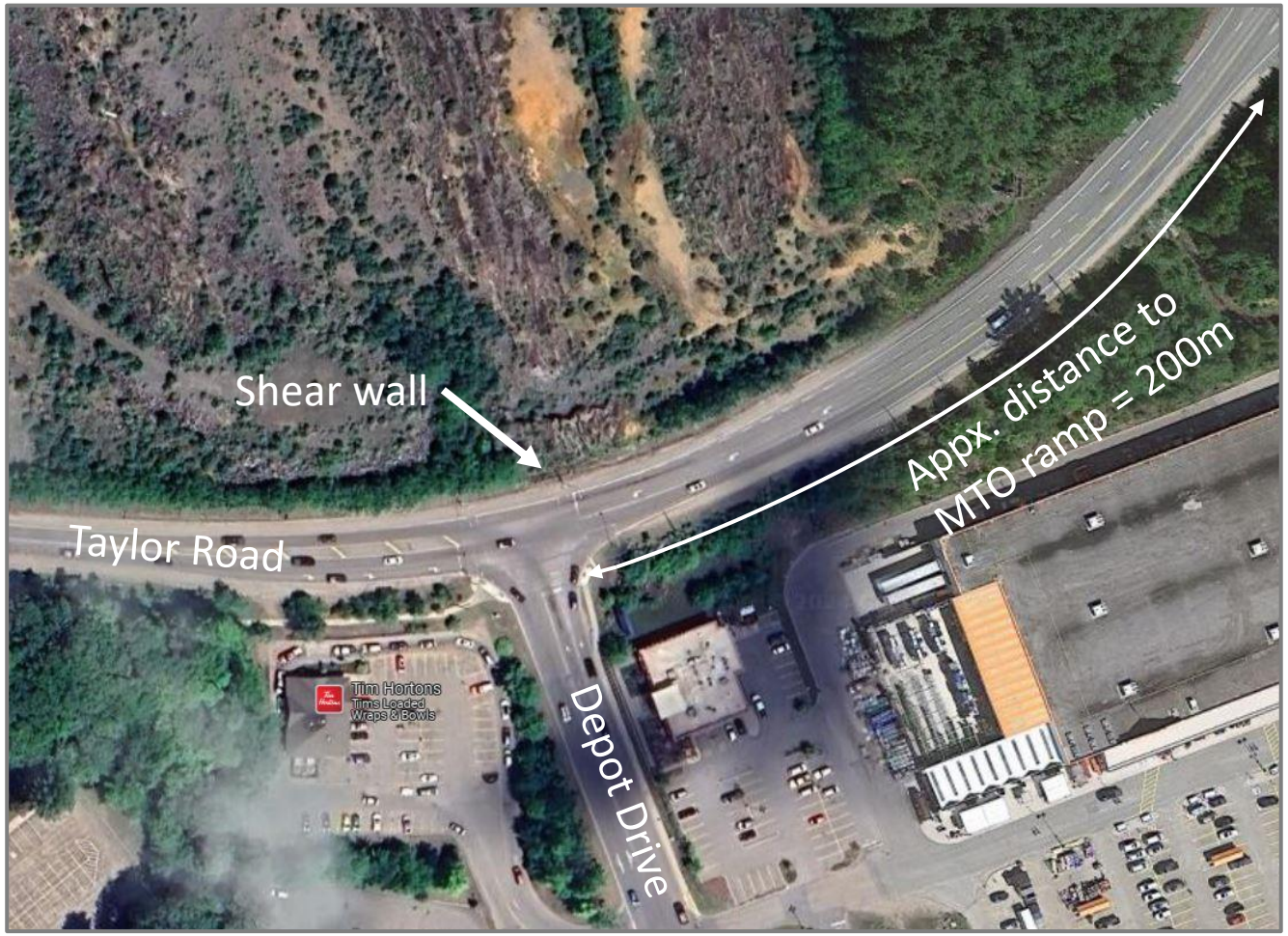


Figure 11: Off-Site Road Improvements

Potential Off-Site Road Improvements

To accommodate the projected increase in traffic due to the future hospital, off-site road improvements may be required, including, but not limited to:

- Upgrading Depot Drive to municipal standards
- Geometric upgrades at the Taylor Road / Depot Drive intersection. These may include dual westbound left turn lanes, extending the westbound left storage lane, or extending the eastbound right turn storage lane.

[redacted]

Off-site roadway improvements noted above are not based on any traffic analyses. It is recommended that a detailed traffic assessment be undertaken at the next stage of development.

Ministry of Transportation of Ontario (MTO) Approval

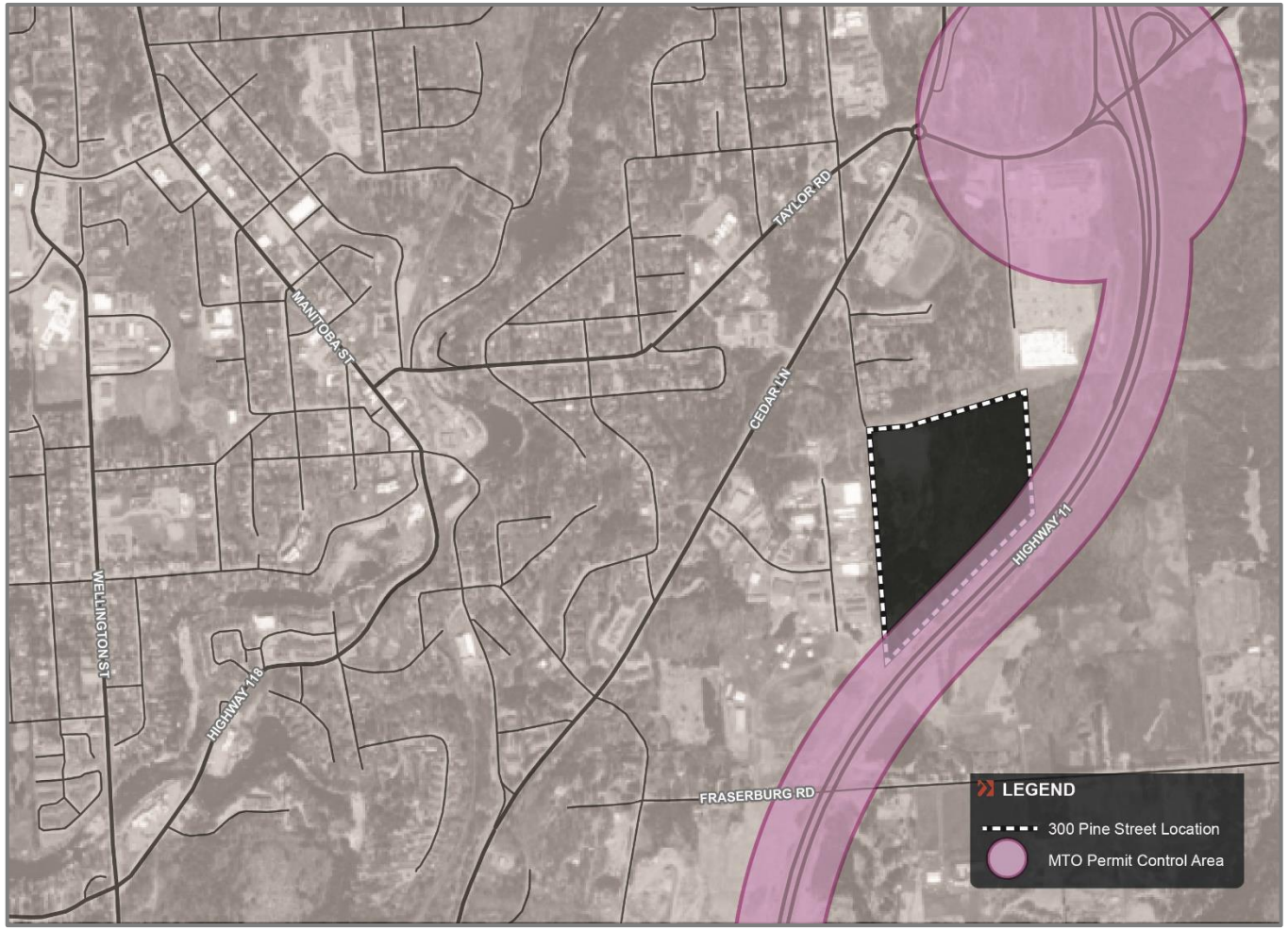


Figure 12: MTO Permit Control Area

In addition to the Town of Bracebridge and District of Muskoka, the Ministry of Transportation of Ontario (MTO) will be a permitting agency / approvals body that will have jurisdiction over the subject hospital expansion if the 300 Pine Street site is selected as the site is located within the MTO's permit control area.

For any site within MTO's permit control area, MTO's approval will be required on several different technical areas, including signage, lighting, traffic impact, and drainage.

[redacted]

Due Diligence Transportation Findings (1/2)

Table 5: Due Diligence Transportation Findings

Criteria	300 Pine Street
Address	No frontage on an existing or planned collector or higher order road system
Off-Site Road Improvements	Off-site road improvements may be required, including: • Upgrading Depot Drive to municipal standards • Geometric upgrades at the Taylor Road / Depot Drive intersection. These may include dual westbound left turn lanes, extending the westbound left storage lane, or extending the eastbound right turn storage lane. [redacted] It is recommended that a detailed traffic assessment be undertaken at the next stage of development.
Transit	Consideration should be given to extend the Bracebridge Transit and Corridor 11 routes through the hospital campus to provide transit service to staff and visitors.
Active Transportation	Not currently well served by active transportation facilities, nor are there plans that will significantly improve them in the future. However, as the site is centrally located within the town, visitors and staff would be more willing to take active modes of transportation, and thus, the Hospital should support facilities that accommodate pedestrians and cyclists. It is unclear whether accessible standards can be met for pedestrians on this site (the ability to regrade to an acceptable standard is unknown).
Site Access	This site does not have frontage on a collector or higher order road system that would be typical for this type of land use. As such, Depot Drive will need to be upgraded to municipal standards to accommodate the future hospital.
Hydro Corridor	The north access relies on a connection to a private road (Depot Drive) and potential modifications across the existing Hydro corridor. It is unclear whether this access can be relied upon or adequately achieved through re-grading and approvals (Hydro).
Site Plan Considerations	It is recommended to continue to explore various internal site circulation options as the site plan undergoes refinement.

Due Diligence Transportation Findings (2/2)

Table 5: Due Diligence Transportation Findings Con't

Criteria`	300 Pine Street
Parking	The proposed site plan includes 550 vehicle parking spaces is anticipated to accommodate the future parking demands of the site. Based on the land use, it is recommended to provide 4-5% of the total parking supply as accessible spaces. These spaces should be conveniently located in close proximity to the main entrance and emergency department. Parking control should be explored as the site plan continues to undergo refinement. There's a significant change in elevation across the site. It is unclear whether acceptable standards can be achieved for supplying surface parking facilities.
Pick-Up / Drop-Off	The functional requirements of the PUDO loops must consider parked vehicles while allowing sufficient space for other vehicles to maneuver around it. The needs for any additional design vehicle (i.e., fire route, specialized transit, ambulance) should be considered as part of subsequent concept plans. There's a significant change in elevation across the site. It is unclear whether acceptable standards can be achieved for supplying appropriate pick-up / drop-off facilities.
Loading	The functional program defines the specific loading needs of the future hospital. Other considerations includes linen trailer storage (typically an additional soiled dock) and refueling (Medigas and diesel). This site must accommodate meals on wheels, contractor parking, and landscape and snow removal vehicles per the functional program.
MTO Approvals	The site is located within an MTO permit control area and subject to a property setback. MTO is an approving authority for this site and will review and focus on the traffic impact of the development and its potential for impacting the Highway operations. This may extend to operational of physical improvements to local area intersections. Specifically, the Taylor Road / Depot Drive intersection may require physical improvements, including but not limited to, dual westbound left turn lanes and extension of the westbound left storage lanes. [redacted]

Conclusions

[redacted]

BA Group

MOVEMENT IN URBAN ENVIRONMENTS

Appendix 2-D

South Muskoka Memorial Hospital Redevelopment
Heliport Feasibility Study

Muskoka Algonquin Healthcare

CONFIDENTIAL

AviaNG.ca

Revision 0
September 16, 2024
23-0165-02

September 16, 2024

BY EMAIL ONLY

Stantec Architecture
100-401 Wellington St. W
Toronto, ON M5V 1E7

RE: South Muskoka Memorial Hospital Redevelopment
Heliport Feasibility Study and Preliminary Design Requirements
Muskoka Algonquin Healthcare
O/Ref: 23-0165-02

Dear Ms. Petricca,

Avia NG Inc. is pleased to submit the *South Muskoka Memorial Hospital Heliport Feasibility Study and Preliminary Design Requirements Report* in supplement to the Stage 1.3B Functional Program for the South Muskoka Memorial Hospital Redevelopment Master Plan.

Should you have any questions in the meantime, please do not hesitate to contact the undersigned.

Sincerely,
AVIA NG INC.



Joshua Horst, MAvnMgt, AvMP
Senior Aviation Planner, Practice Lead

cc: Janine Maurice, Avia NG

REVISION & PUBLICATION REGISTER			
Revision No.	**Date**	**Recorded By**	**Remarks**
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INTRODUCTION

Muskoka Algonquin Healthcare (MAHC) has taken steps toward securing a property for the redevelopment of the South Muskoka Memorial Hospital with a new acute care hospital building in replace of the existing Bracebridge site. Avia NG Inc. was retained by Stantec Architecture as part of Stage 1.3 Functional Programming for the South Muskoka Memorial Hospital Redevelopment Master Plan [the Project] to provide an assessment of the proposed greenfield site and determine the feasibility of accommodating a new heliport on the property alongside the new acute care building while meeting the requirements of medevac helicopter operations.

This report has been structured with two (2) parts. Part A provides details from the evaluation of the site and the assessment of heliport feasibility, and is meant to be reviewed in context with the overall campus site plan, as cited within the Stage 1.3B Functional Program report prepared by Stantec Architecture. Part B provides additional details pertaining to the preliminary design requirements of the future heliport.

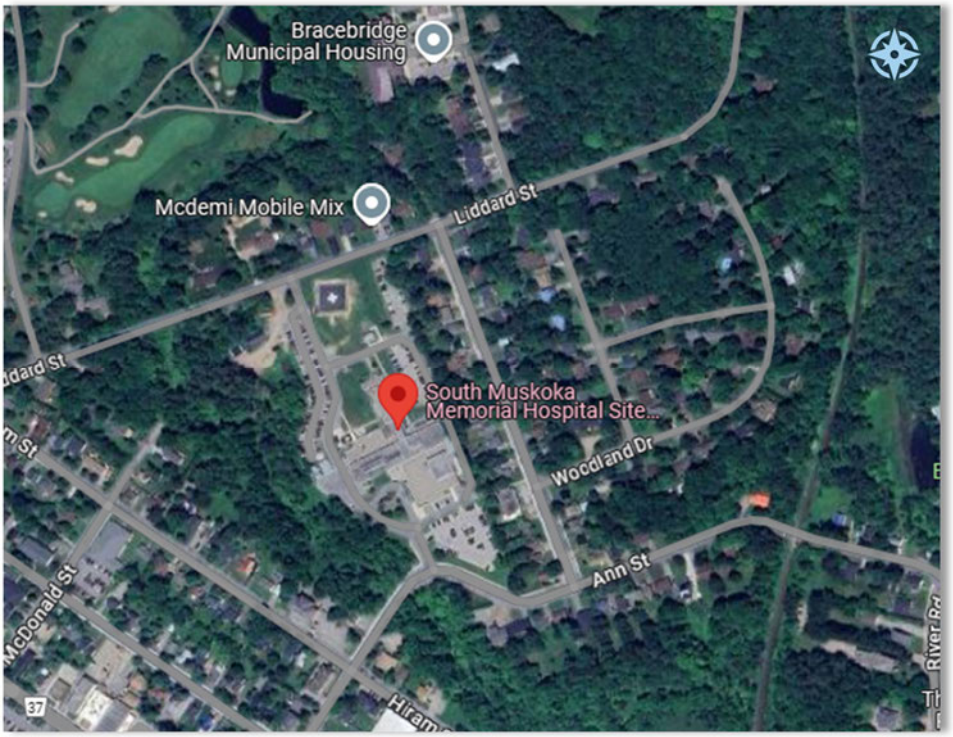


Figure 0-1 Current Hospital Site

BACKGROUND

MAHC is planning for a new hospital on a site located within the Town of Bracebridge, Ontario. Bracebridge is presently served by the existing hospital at 75 Ann Street with its accompanying surface-level helipad. The existing hospital with its heliport is shown in **Figure 0-1**.

The proposed new site will also have a heliport as part of the infrastructure of the hospital to facilitate emergency access and patient transfer for residents of the surrounding area.

HELIPORT OPERATIONAL NEEDS AND FUNCTIONAL REQUIREMENTS

The primary function of a hospital heliport is to cater to patient transfers either from the Hospital or a land ambulance to an air ambulance that would then take the patient to a regional trauma centre with specialized care services. The secondary function will be for transfers to the Hospital or land ambulance from an air ambulance. This transfer in and out function is the defining characteristics of a hospital heliport; however, a third function is to facilitate urgent dispatch of specialized medical personnel as can be required from time to time such as with the need for stabilization of medical trauma case or the assessment of a patient before a decision to transfer is made. The heliport may also serve other functions, such as use by police, dignitaries or military personnel.

In order for the heliport to serve its function and comply with the Canadian Aviation Regulations (CARs), it will require one Final Approach and Take-off Area (FATO) with a collocated Touchdown and Lift-off Area (TLOF) from which a helicopter can arrive to and depart from. It is the TLOF and FATO that are readily identifiable as the Heliport, providing the landing area for helicopters. No additional heliport parking positions are assumed to be required.

The heliport will need to be accessible by vehicles for maintenance as well as for transfer of patients between land ambulance and air ambulance. Similarly, the heliport should be accessible from the roads used by vehicles, and include a walkway to facilitate inspection by staff and patient transfer to/from Hospital and land ambulances that may not have the need or ability to drive to the edge of the helipad.

The facility will be used both during the day and at night, and during all seasons. Inclement weather conditions will prevent use of the heliport, but efforts should be made through careful site planning and facility design to minimize down time of the facility and recovery time from snow events.

STUDY OBJECTIVES

The objective for the study was to conduct an assessment of heliport feasibility and site selection to determine if the site chosen for the new hospital and the lands available [subject lands] would allow for a new surface-level heliport to be established alongside the new acute care hospital building in a location that would allow for suitable use. Additionally, the study has aimed to identify concisely the base design requirements as would need to be considered further in development of design documentation if the project were to move forward.

PART A – FEASIBILITY STUDY AND SITE SELECTION

1. FUTURE SITE CONDITIONS

1.1 GENERAL SITE

After assessing various sites, a greenfield site located at 300 Pine Street [the Site] was chosen for the future hospital and heliport. The Site, depicted in **Figure 1-1** and Appendix A Exhibit 1-1, is an irregularly shaped lot of approximately 18 ha. in size and is located between Highway 11 and Cedar Lane just east of Gray Road. The Site is found approximately 2.3 kilometres east-southeast of the existing South Muskoka Memorial Hospital.



Figure 1-1 Proposed Site Location - 300 Pine Street

The Site is mostly covered in woodland, along with the geological depression or ravine in the northwestern quadrant. Additional information regarding site characteristics is found later in this section.

1.2 SURROUNDING LANDS AND OBSTRUCTION ENVIRONMENT

Figure 1-2 shows the surrounding land uses of the chosen site for the future hospital and heliport. The irregular-shaped lot has the Highway 11 Utility and Transportation Corridor running from the northeast to the southwest along the length of its base. To the north is a high voltage hydro transmission line corridor, with a residential area, athletic facilities, woodland, and a retail park. Along the site's western border is a light industrial area.

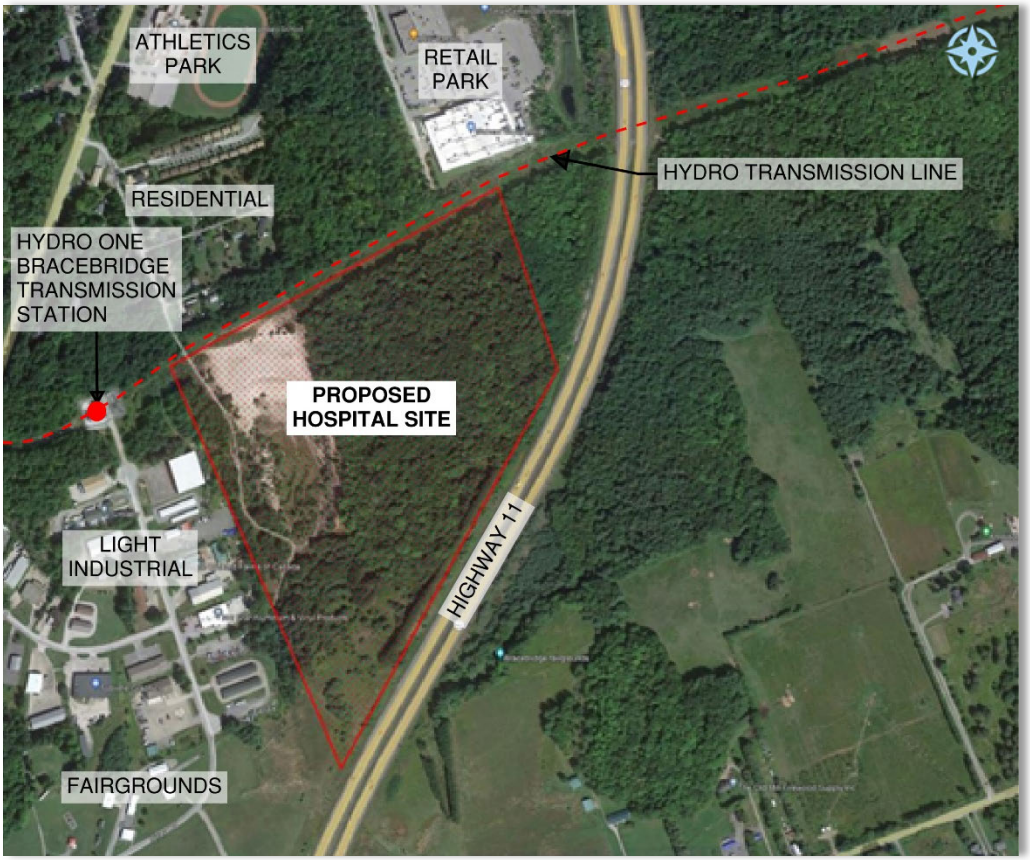


Figure 1-2 Surrounding Area of Chosen Location

1.3 REGIONAL CONTEXT

South Muskoka Memorial Hospital in Bracebridge is one of two hospitals that are part of MAHC, the other being Huntsville District Memorial Hospital in Huntsville, about 45 km north of South Muskoka Memorial Hospital. MAHC provides acute care services to the District Municipality of Muskoka, including Huntsville, Bracebridge, Gravenhurst, and several other smaller communities within the District. MAHC is part of the North Simcoe Muskoka Local Health Integrated Network, providing healthcare services to Huntsville, Bracebridge and Gravenhurst; the townships of Lake of Bays, Muskoka Lakes, Georgian Bay; East Parry Sound; Beaver Creek Federal Penitentiary; Moose Deer Point and the Wahta First Nation.

1.4 PLANNING CONTEXT

According to the Town of Bracebridge Zoning By-law, the western half of the Site is zoned for Business Park Industrial, while the eastern half is zoned for Special Purpose Commercial. The eastern half of the Site is subject to a Special Exception Area related to Zoning By-law parking requirements. Adjacent zoning designations include more Business Park Industrial to the west, Rural to the south and east, Special Purpose Commercial to the north and northeast, and Open Space and Residential to the north and northwest. **Figure 1-3** provides an excerpt of the zoning by-law and corresponding zones for the site and surrounding lands.



Figure 1-3 Future Hospital and Heliport Site Zoning

According to other planning documents available from the Town of Bracebridge, the Site does not have any other significant designations and lies outside of the Town's floodplains.

2. PROPOSED SITE PLAN AND HELIPORT LOCATION

2.1 PROPOSED HELIPORT LOCATION

The initial suggested location of the heliport was to be nearer the centre of the Site, west of the hospital building and overlooking the ravine. While this location would potentially require a retaining wall due to the proximity to the ravine edge, the location was chosen with consideration to the open unobstructed area of the ravine, ideal for helicopter overflight. The original location is shown in **Figure 2-1** below.

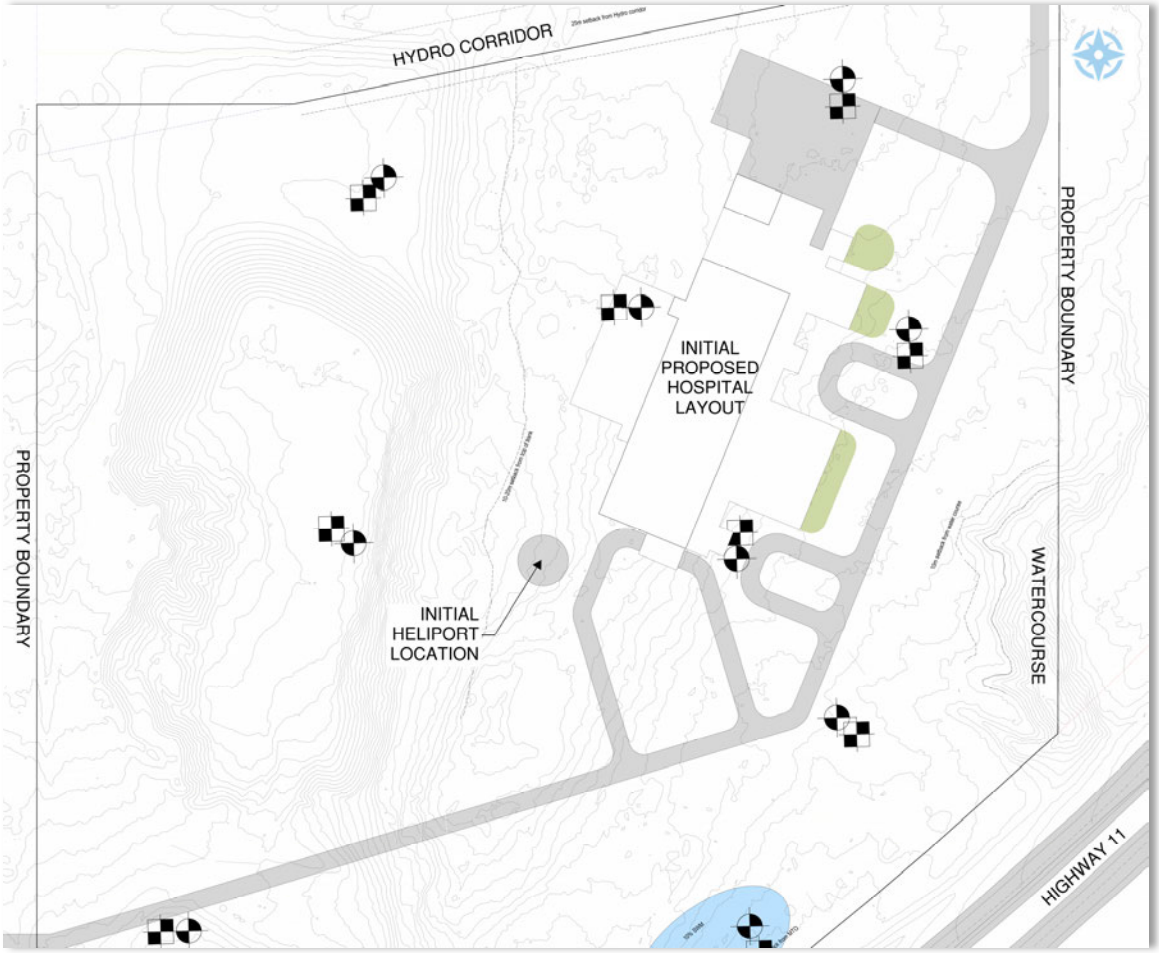


Figure 2-1 Initial Hospital and Heliport Location

However, in later stages of this project, the footprint required for the Hospital building was changed with consideration to vehicle parking and access. Due to the revised layout and a desire to locate the heliport closer to the Emergency Room (ER) entrance, a revised location for the heliport was proposed.

The second iteration of heliport siting resulted in the proposed location shown in **Figure 2-2** and Appendix A Exhibit 2-2. This location would see the heliport sited to the east /southeast of the site.

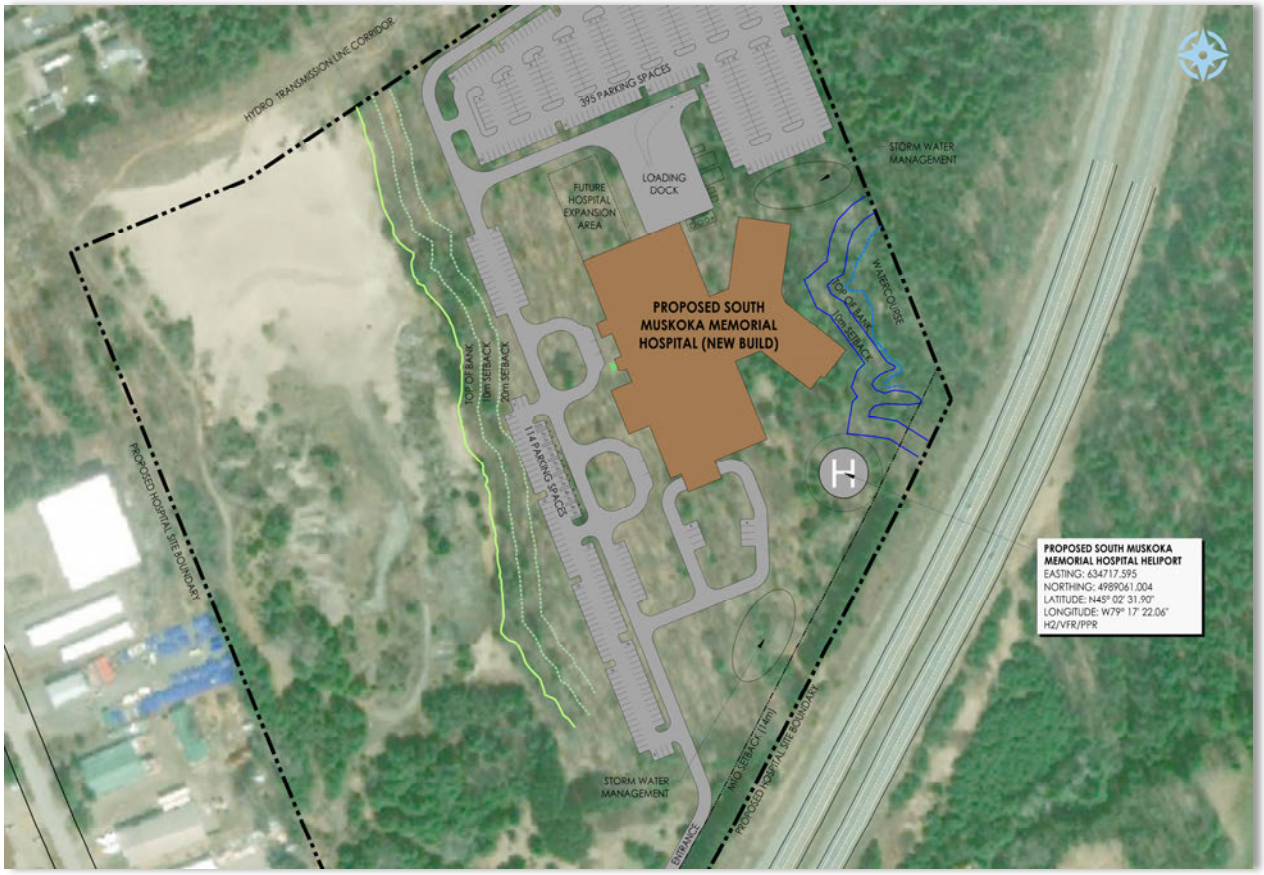


Figure 2-2 Proposed Hospital and Heliport Location

2.2 OPPORTUNITIES AND CONSTRAINTS

The proposed Site location offers an opportunity to provide a heliport that remains located within the community and on hospital property. The Site itself offers a large plot of undeveloped land, with a portion of the lands slightly elevated above lands towards the west, reducing the natural constraints that would otherwise be imposed on establishing usable flight paths. The location, being near the Town's limits, provides multiple areas that could be considered for emergency landing areas, enabling an H2 heliport classification to be pursued. The proximity to Highway 11 provides the added benefit of near direct highway access, reducing time for ground ambulance transfers.

However, the Site is not without several constraints that will have bearing on the design of the heliport and availability of flight paths.

Development on the Site is constrained by the location of the ravine, resulting in relatively few configurations for the proposed acute care building to be situated. This combined with the location of the high voltage power transmission lines running east-west along the northside of the Site, limits significantly the location that a surface-level heliport could be established on the property with any degree of usability. No matter the location of the heliport, extensive tree clearing will be required with use of this Site.

The heliport will need to be located near the southeast end of the Site to allow for flight paths to be establish. The proximity to the highway and proposed hospital parking lots will have further bearing on flight path alignment and use.

2.2.1 PROXIMITY TO ROADWAYS, ENTRANCES AND PARKING LOTS

The proposed location will be linked to the roadway network through access to Gray Road and also potentially to the north connecting with Depot Drive. The heliport is anticipated to be accessed from the Emergency Room Access Road. The proximity of the heliport to the Emergency Room entrance and parking lots will require mitigation of rotor downwash hazards with security personnel and placement of signage in the vicinity of the heliport to inform the public of the dangers of helicopter operations.

2.2.2 PROXIMITY TO ON-SITE AND OFF-SITE OBSTACLES

The main hospital building will be located to the north and northwest of the heliport, and potentially as close as 25-30 metres from the Final Approach and Take-off Area (FATO) edge. The location of the building will be considered the primary obstacle to air navigation and require obstacle marking and lighting.

Other obstacles of interest in the vicinity include the hydro transmission line corridor to the north, the Highway 11 corridor and trees on- and off-site. Additionally, the high mast flood light standards in neighboring retail parking areas may constitute an obstacle for certain flight paths and will need to be further evaluated as part of heliport design development.

Refer to **Figure 2-3** for a photo inventory of these obstacles.



Hydro Transmission Line Corridor (North)



Highway 11



Flood Light Standards in Retail Parking Lot

Figure 2-3 Obstacles of Interest

2.2.3 OBSTACLE REMOVAL

Examining further the obstacle environment surrounding the site, the area towards the south, southeast and east may be conducive to establishing of heliport flight paths, provided sufficient tree clearing is completed on-site and along Highway 11. Similarly, a flight path curving towards the north from a southerly located heliport may be feasible provided sufficient tree clearing is completed and hydro transmission lines are marked and lighted. With the exception of trees located along the Highway 11 corridor, no off-site obstacle removal is anticipated to be required in order to establish two of more usable flight paths. However, additional obstacle marking and lighting of the high voltage hydro transmission lines and high mast flood lighting should be anticipated.

Due to the significant grade change and distance from the east side of the Site to the west, no off-site tree removal is anticipated so long as the finished grade of the heliport remains suitably elevated relative to the existing grade of the west side lands.

2.3 WIND COVERAGE AND HELIPORT USABILITY

Aircraft, including helicopters, are best suited for take-off and landing into the wind, and therefore an important consideration in determining the alignment of flight paths are the prevailing winds. Selecting flight paths with headings that align well with the prevailing winds help to maximize the usability of a heliport and reduce the likelihood that a pilot encounters crosswinds that exceed what is acceptable for the flight. Furthermore, by providing two or more flight paths with an alignment that provides reciprocals to each other, heliport usability can be further improved, helping to ensure that the pilot is able to both land and depart under a greater variety of wind conditions.

An evaluation of the historical wind data and its distribution for the local area has been completed as part of this assessment. It was observed that no suitable weather stations are located within the Town of Bracebridge. **Figure 2-4** illustrates prevailing wind distribution from the last ten years using historical wind data from Muskoka Airport (CYQA), located approximately 7 kilometres from the site by NAV CANADA. This weather station is considered to be the most accurate for weather data in the area.

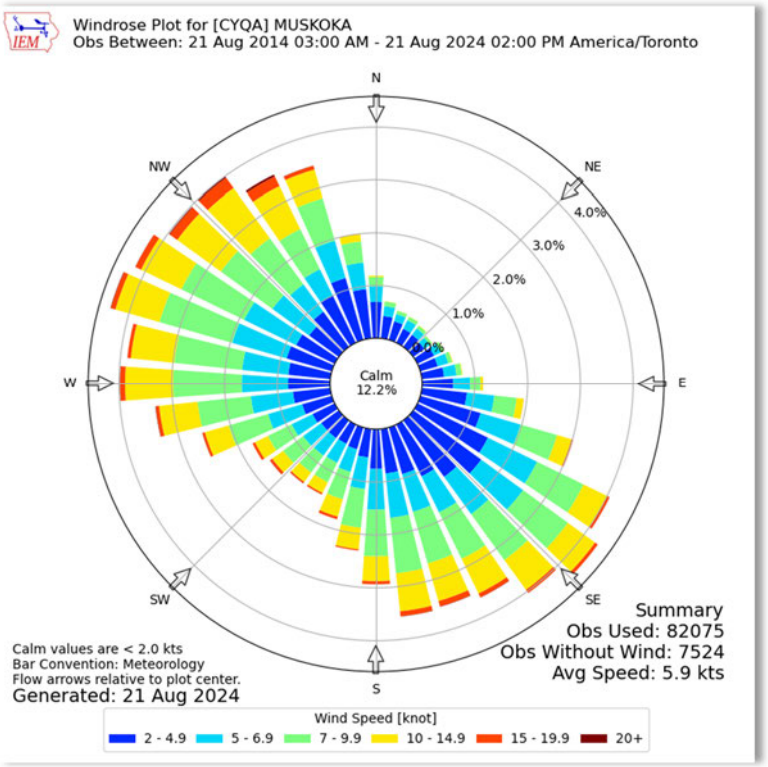


Figure 2-4 - 10-year Wind Rose for Muskoka Airport 2014-2024

The diagram shows that winds originate predominantly from the northwest and southeast. As take-offs and landings are best performed into the wind, the preferred departure and arrival paths would therefore be aligned generally in a west, northwest and east, southeast direction. However, given that the hospital

building is proposed north and northwest of the heliport, west and east or southeast flight paths will be needed to provide suitable heliport usability.

2.4 AERONAUTICAL IMPACT ASSESSMENT

The site for the new South Muskoka Memorial Hospital is, in aviation terms, found to be in relatively close proximity to a number of other aerodromes, including several water aerodromes and land aerodromes. **Figure 2-5** identifies location of these aerodromes within approximately 10 kilometers of the Town of Bracebridge**.** The most significant from an aeronautical impact perspective, is the Muskoka Airport, located 6.5 kilometers south southwest of the proposed site. At this distance, specific aeronautical constraints need to be reviewed to determine if applicable to the development of the site and operation of heliport.

2.4.1 MUSKOKA AIRPORT ZONING REGULATIONS

Airport Zoning Regulations (AZRs) can be found in place for the Muskoka Airport. These federally enacted regulations place restrictions on land use and new development around specific airports for the purpose of preserving safe use of airspace by arriving and departing aircraft. Some AZRs can extend restrictions to distances in excess of 15 kilometres from the Airport and will limit the height of future developments. In the case of Muskoka Airport, the AZRs extend to a distance of approximately 4 kilometres and stop short of the proposed site.

While the Site may not be subject to the AZRs, consideration should still be given to ensuring that the proposed development does not conflict with the Airport. A NAV CANADA Land Use Submission should be made as part of initial design development to determine if the proposed elevation of the building may impact existing Instrument Approach Procedures (IFPs) used by aircraft arriving to Runway 18 at Muskoka Airport. In addition, early application should be made to Transport Canada as part of the identification of obstacles for aeronautical assessment.

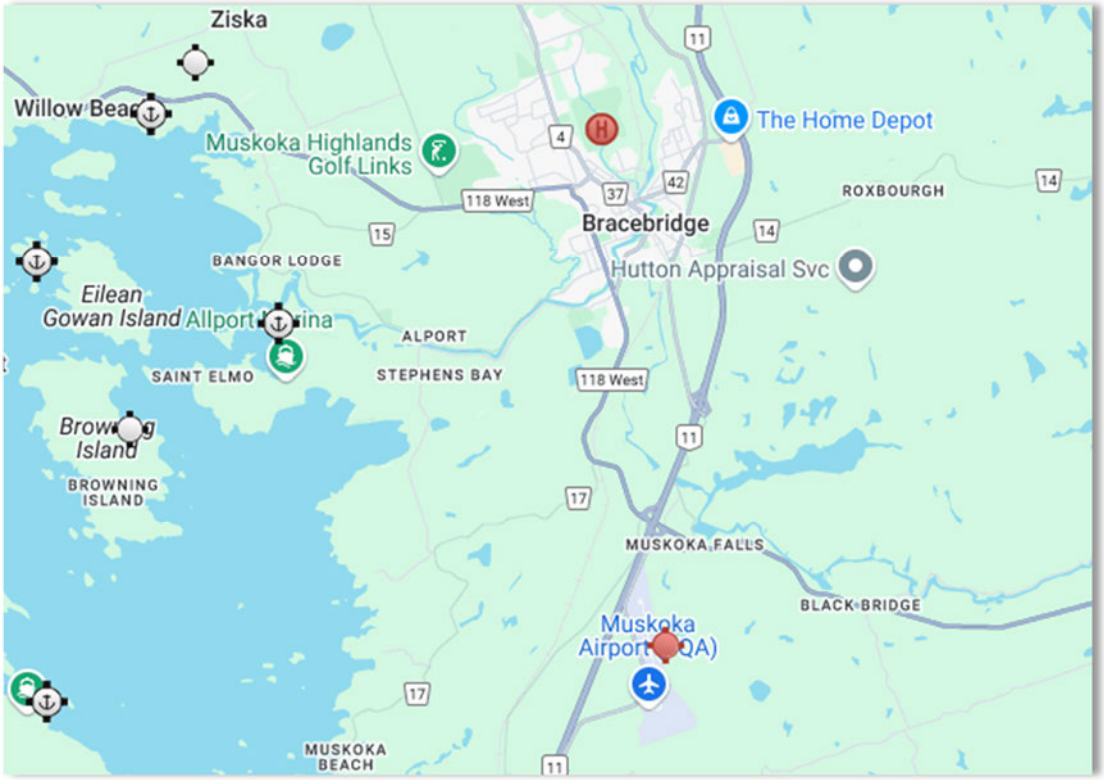


Figure 2-5 Map Showing Proximity of the Site to Nearby Aerodromes

2.4.2 LOCAL AIRSPACE

Due to the site being within five (5) nautical miles (9.26 km) of the Muskoka Airport, it is located within Muskoka's Mandatory Frequency Class 'E' airspace, as seen in **Figure 2-6**. Air traffic, including medevac flights, operating within this airspace are subject to measures administered by NAV CANADA and CARs 602.98. These measures, specific to Class 'E' airspace with a mandatory frequency assigned, applies to air traffic below 3900 feet Above Sea Level (ASL). Consequently, all helicopter movements associated with the future heliport will need to comply with the requirements of operating within Class 'E' airspace both to and from the heliport. Pilots utilizing the heliport would be required to communicate with other Air Traffic and NAV CANADA (Timmins Radio) to advise before utilizing the airspace.

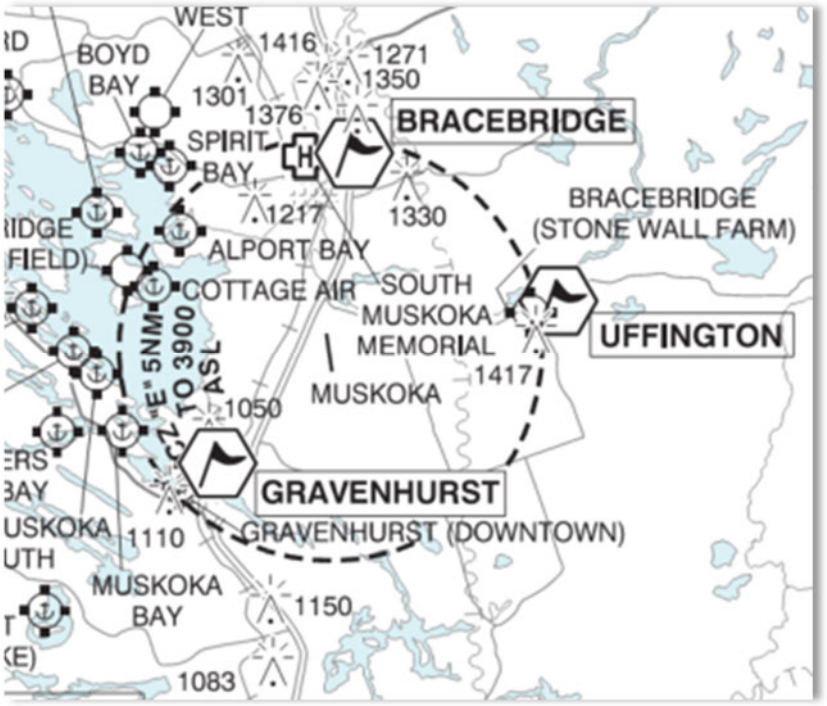


Figure 2-6 Map Showing Extent of Class E Airspace (Source: NAV CANADA)

PART B – Preliminary Design Requirements

3. INTRODUCTION AND BACKGROUND

The preparation of a preliminary design for the heliport is not included as part of this current assignment. However, included here-in are details and design considerations applicable to the preparation of a preliminary design for the future heliport. In some cases, what is typical or recommended has been included for reference but should not be misinterpreted as design direction.

3.1 COMPLIANCE WITH CANADIAN AVIATION REGULATIONS

The identification of these heliport preliminary design requirement has been prepared with due considerations to the applicable Canadian Aviation Regulations (CARs) as prescribed under *Section 305, CARs Standard 325 – Heliports,* and *CARs Standard 621 – Obstruction Marking and Lighting.* The preliminary design should also reference where applicable the standards of the National Fire Protection Association (NFPA) and Canadian Standards Associated (CSA).

4. HELIPORT PHYSICAL CHARACTERISTICS

4.1 GENERAL

The future South Muskoka Memorial Hospital (Bracebridge) heliport is intended to be a surface-level heliport meeting Transport Canada certification requirements, with physical characteristics in accordance with the Canadian Aviation Regulations (CARs) Part III Standard 325 – *Heliports* for use by air ambulance service providers.

4.2 AIRCRAFT USE AND DESIGN AIRCRAFT MIX

The future heliport will be a surface-level heliport designed with the physical dimensions to accommodate a broad mix of helicopters typically used in medevac air ambulance operations. The primary helicopter in Ontario engaged in medevac air ambulance service is the Augusta Westland AW139 as operated by Ornge. In addition to the AW139; other helicopters that may be routinely used in medevac service within Canada can be represented by the inclusion of the Sikorsky S-76 and Bell 412EPI as other design aircraft. **Tables 4-1, 4-2, 4-3** provide a summary of the most relevant technical data for these helicopters which could be referenced in the preparation of a heliport design compatible with their use.

There are additional helicopters, such as the Airbus H145 as utilized by the Ontario Provincial Police or Bell 429 as used by the Canadian Coast Guard, that can also be considered with the heliport's design, but in general these aircraft are of a smaller variety that would be accommodated by a facility designed for use by the primary three helicopters listed earlier in this section: the AW139, Sikorsky S-76 and Bell 412EPI.

Table 4-1 Agusta Westland AW139 Physical Characteristics

Agusta Westland AW139		
Characteristics	**Dimensions**	**Image**
Maximum Take-Off Weight (MTOW)	6,800 kg	
Fuselage Length	13.49 m	
Overall Length	16.66 m	
Overall Height	4.98 m	
Main Rotor Diameter	13.8 m	
Wheel Base / Skid Length	N/A	
Wheel Track / Skid Width	N/A	
Engine(s)	2x PT6C-67C Turboshafts with FADEC	
Fuel Capacity	1,588 L main + 588 L auxiliary	
Source(s): Leonardo Aircraft Company, EASA and Transoft Solutions.		

Table 4-2 Sikorsky S-76 Physical Characteristics

Sikorsky S76C		
Characteristics	**Dimensions**	**Image**
Maximum Take-Off Weight (MTOW), including IGW Kit	5,307 kg	
Fuselage Length	13.21 m	
Overall Length	16.00 m	
Overall Height	3.58 m	
Main Rotor Diameter	13.41 m	
Wheel Base / Skid Length	5.00 m	
Wheel Track / Skid Width	2.58 m	
Engine(s)	2x Turbomeca Arriel 2S1	
Fuel Capacity	1,030 L	
Source(s): Sikorsky Aircraft.		

Table 4-3 Bell 412 EPI Physical Characteristics

Bell 412EPI		
Characteristics	**Dimensions**	**Image**
Maximum Take-Off Weight (MTOW)	5,398 kg	
MTOW with IGW Kit	5,534 kg	
Fuselage Length	12.91 m	
Overall Length	17.31 m	
Overall Height	4.54 m	
Main Rotor Diameter	14.02 m	
Wheel Base / Skid Length	3.27 m	
Wheel Track / Skid Width	2.89 m	
Engine(s)	PT6T-3D or PT6T-3DF Twin Pack	
Fuel Capacity	1,251 L	
Source(s): Bell Aircraft Corporation.		

4.3 TLOF, FATO AND SAFETY AREA REQUIREMENTS

According to CARs Standard 325, the geometric design of a heliport is directly related to the physical characteristics of the design helicopter and shall also consider the requirements as outlined in the Helicopter's approved Rotor Flight Manual (RFM).

Table 4-4 summarizes the requirement for the proposed hospital's surface-level heliport based on use by the proposed design aircraft, the Bell 412 EPI, in accordance with CARs Standard 325.

Table 4-4 Proposed Heliport Physical Characteristics

Surface	Minimum Dimensions	Minimum Criteria
Touchdown and Lift-Off Area (TLOF)	21.03 m dia. concrete/asphalt pad (Equal to width of FATO recommended)	Greater of 1.0x Overall Length or CAT A requirements
Final Approach and Take-Off Area (FATO)	26.25 m dia. concrete/asphalt pad	1.5x Overall Length
Safety Area (SA)	35.00 m dia. asphalt or treated surface	Extending FATO by 0.166 x Overall Length or 3.0 m, whichever is greater
Extent of Load Bearing Surface	21.03 m dia. (Equal to width of FATO recommended)	Based on minimum dimensions of TLOF
Extent of Graded Area	26.25m dia. (Equal to width of SA recommended)	Based on minimum dimensions of FATO
Safety Area Transitional Boundary	3.0 m from SA	Minimum 3.0 m
Note: All dimensions based on a circular landing surface.		

4.3.1 MATERIALS OF CONSTRUCTION

A load-bearing concrete surface measuring 21.03 metres in diameter would be proposed in the centre of the heliport. The concrete centre would be constructed of Portland cement concrete with design as required by local subsurface conditions as determined by a geotechnical report based on the static loading requirement of the design helicopter. The concrete surface should also be prepared to ensure proper paint adherence.

Beyond the limits of the concrete pad, a heavy-duty asphalt pavement should be constructed to support the dynamic load of the design helicopter; this surface would be 26.25 metres in diameter. The FATO should be constructed of hot mix asphaltic cement surface with design as required by local subsurface conditions as determined by geotechnical report based on the loading requirements of a standard ambulance, municipal firefighting or maintenance vehicle.

The heliport safety area would have a proposed overall diameter of 35 metres to accommodate the design helicopter. The safety area ideally should be constructed of topsoil and seeding or other cover that would prevent loose objects or debris that could be uplifted and cause damage as FOD (foreign object debris) during helicopter operations.

4.3.2 GRADE AND ELEVATION

Given that it is generally considered desirable to locate a surface-level hospital heliport as close to the emergency entrance of the hospital as possible without sacrificing safety and heliport usability, it is often found to be advantageous to raise slightly the elevation of the helipad (FATO) in relation to the surrounding grade and nearby lanes or roadways and parking lots. By increasing the height of the helipad above nearby obstacles, the heliport can often be located closer to the Hospital emergency entrance than would otherwise have been possible given the typical obstacle environment.

It is anticipated for the new heliport, that the FATO and associated Safety Area will need to be raised slightly above surrounding grade to facilitate obstacle clearance, snow removal and maintenance activities. An elevation of approximately 1.5 to 2m above the Emergency Room exit lane may be appropriate subject to further evaluation of proposed grade changes. Restrictions on vehicular and pedestrian movements adjacent to the heliport may also be required to ensure that appropriate obstacle clearances are maintained and consideration to rotor downwash hazards mitigated.

5. HELIPORT CLASSIFICATION AND FLIGHT PATHS

5.1 HELIPORT CLASSIFICATION

The size and shape and slope of heliport flight paths and associated obstacle limitation surfaces are determined by the heliport classification. Since the proposed surface level heliport will not have instrument approaches and will be used during the day and at night, the heliport will have a day/night non-instrument classification. Transport Canada further subdivides non-instrument heliports into three (3) categories: H1, H2, and H3. These categories are defined by Transport Canada as follows:

1. *A non-instrument heliport is classified as H1 if the heliport is located with an obstacle environment where:*
    a. *There is no emergency landing area within 625 metres from the FATO; and*
    b. *The helicopters using the heliport can be operated at a weight, and in such a manner that, in case of an engine failure at any time during the approach or take-off, the helicopter can either*
        i. *Land and safely stop on the FATO or TLOF area, or*
        ii. *Safely continue the flight to an appropriate landing area.*
2. *A non-instrument heliport is classified as H2 if the heliport is located within an obstacle environment where:*
    a. *The height of the obstacles are infringing the first section slope of the approach and take-off surface set out in Table 4-1(CARs 325); and*
    b. *There are reachable emergency landing or rejected take-off areas within 625 metres of the FATO in relation to the altitude of the helicopter and its performance with one engine inoperative.*
3. *A non-instrument heliport is classified as H3 if the heliport is located within an obstacle environment where:*
    a. *The height of the obstacles do not penetrate any of the obstacle limitation surfaces (OLS) requirement set out in Table 4-1 (CARs 325);*
    b. *There are reachable emergency landing areas or rejected take-off areas within 625 metres of the FATO in relation to the altitude of the helicopter and its performance during autorotation.*

The new heliport will need to be planned and established to support an initial classification of H2 whilst respecting the more stringent obstacle clearance requirements of an H1 classification, at least on certain select flight paths. Preserving the ability to classify the heliport as H2 will allow aircraft operators the ability to accommodate a greater range of operating conditions with fewer restrictions to aircraft weight. Establishing flight paths that can also remain usable under an H1 classification will help to ensure that the heliport remains viable in the future should there be a loss in suitable emergency landing areas or the encroachment of built-up areas around the Hospital.

5.1.1 EMERGENCY LANDING AREAS

In accordance with CARs 325, where a heliport is classified as H2, it is required to establish at least one (1) Emergency Landing Area (ELA) for each flight path area. According to the Advisory Circular 305-001, Transport Canada defines an ELA as "an area where an unavoidable landing or ditching may take place with a reasonable expectancy of no injuries to persons or damage to property on the surface".

Although Transport Canada does not define the required size of an emergency landing area, it is generally accepted as an area approximately the size of the safety area. In order to be found suitable, ELAs must be located within 625 metres from the FATO located on or within the defined flight path areas, and reachable by the helicopters based on their performance characteristics. Notably, ELAs are not required to ensure protection against damage to the helicopter or injury of the occupants, but only of those on the ground. Therefore, lands with uncontrolled access used by the public, such as parking lots, are not suitable.

Identification of suitable areas will need to take place as part of the design process.

5.2 FLIGHT PATHS

During the review of heliport feasibility, several flight paths were assessed for the proposed heliport location taking into account the obstacle environment. The potential flight paths are illustrated in **Figure 5-1** and Appendix A Exhibit 5-1 and 5-3**.**

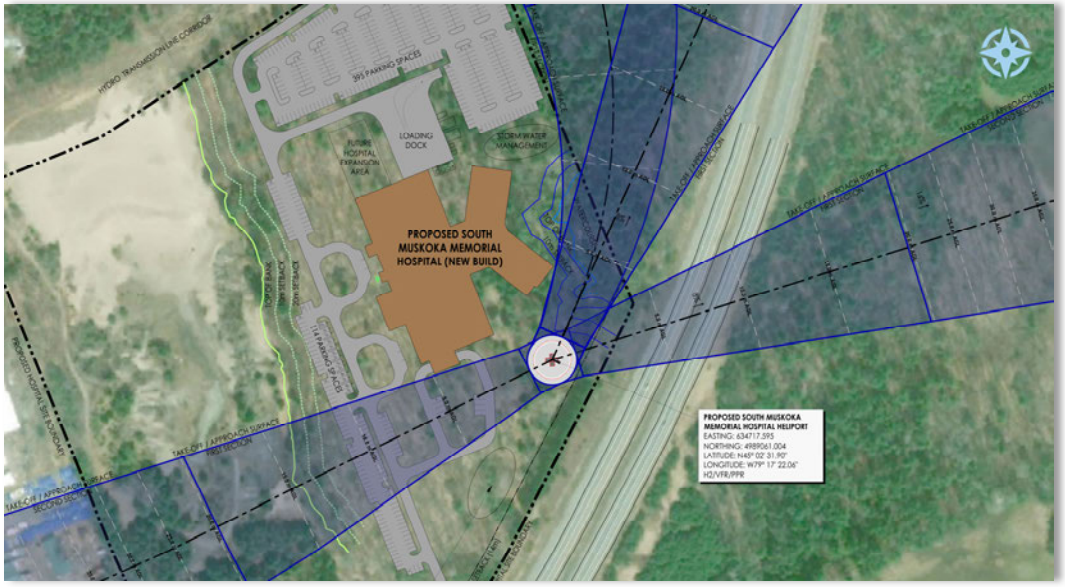


Figure 5-1 Potential Flight Paths

5.3 OBSTACLE LIMITATION SURFACES

The Obstacle Limitation Surfaces (OLS) are a series of trapezoidal inclined planes associated with defined flight path areas that protect established flight paths from obstacles that would be otherwise introduced an unacceptable hazard to aviation safety. These surfaces extend outwards and upwards rising from the heliport along the direction of the declared flight path centreline and are required to be maintained free of obstacles. The characteristics of these surfaces are based on applicable standards and vary depending on the heliport classification.

The OLS characteristics of the flight paths were established based on heliport classification of H2, day/night use, non-instrument and in accordance with the Canadian Aviation Regulations (CARs) Standard 325. The proposed OLS characteristics are listed in **Table 5-1.**

Table 5-1 Proposed (H2) Obstacle Limitation Surfaces Characteristics

Surface and Dimensions	Criteria
Approach / Take-Off Surface	
Inner Edge Length	35.0 m
Divergence	15% (Day/Night)
Length – First Section	245 m
Length – Second Section	830 m
Total Length	1,075 m
Slope – First Section	Between 8% and 12%, and not to exceed 16%
Slope – Second Section	16%
Transitional Surface*	
Height	45 m
Slope	50% [1:2]
*Needed if less than 135 degrees between flight paths.	

5.3.1 OBSTACLE MARKING AND LIGHTING AREA

All heliports certified in accordance with CARs 305 and Standard 325, and intended for use at night, are required to mark and/or light obstacles that intrude upon the Obstacle Marking and Lighting Area (OMLA). The OMLA, illustrated in **Figure 5-2**, is a combination of an inclined conical surface and trapezoidal plane that rise outwards from the periphery of the FATO. The characteristics of this area are linked to the size of the FATO but in general rise outwards at a 1:25 slope to a distance of 150 metres and then continue in the direction of approach/departure to a distance of 1,000 metres at a slope of 1:9.5 and extending 30 metres each side of the flight path area. If obstacles protrude the OMLA, the obstacles must be equipped with obstruction marking and / or lighting in accordance with CARs Standard 621 unless otherwise shielded by another obstacle suitably marked and lit.

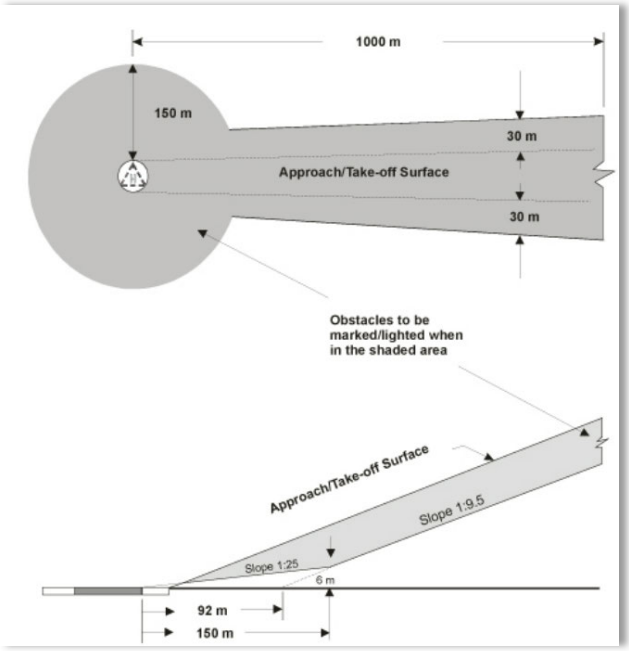


Figure 5-2 Obstacle Marking / Lighting Area (Source: Transport Canada)

A detailed Obstacle Marking and Lighting Assessment will need to be carried out as part of any future design development.

6. VISUAL AIDS

6.1 GENERAL

The heliport will include all heliport visual aids, including wind direction indicators, lighting and paint markings per CARs Standard 325.

6.2 WIND DIRECTION INDICATOR

Transport Canada requires all heliports to be equipped with a wind direction indicator (WDI). If the heliport is to be used at night, as in the case at the proposed future heliport, the wind cone shall be illuminated and equipped with an obstruction light. The wind direction indicator wind cone structure and is a conspicuous colour such as solid red or red and white bands that displays the wind direction and approximate wind velocity in the vicinity of the heliport.

The physical characteristics of the wind cone, including size, shape, and fabric colour shall be in accordance with Transport Canada standards. It is recommended that the minimum windsock size permissible be used, as is common for surface level heliports. The windsock location shall be such that it is easily viewed from any direction of approach and from the surface of the helipad. If the view may be obstructed or in certain conditions the swirling winds may not provide a good indication of the current wind condition on the helipad a second WDI may be required, subject to Transport Canada assessment.

6.3 HELIPORT BEACON

Based on the heliport location, surrounding obstacle environment, and proximity to other lights, a heliport beacon is not anticipated to be required for the future heliport. However, if the pilots indicate it is difficult to visually identify the heliport site, especially during poor weather conditions, such as mist, rain, or blowing snow, a beacon could be considered.

Where provided the heliport beacon shall show a sequence of four white flashes indicating the letter "H" of the International Morse Code, each flash shall have a duration of 0.5 to 2.0 milliseconds, the four flashes shall be equally spaced over a time period of 0.8 +/- 10%, and be repeated over an off period between 1.2 and 2.2 seconds rendering a rate of 20 to 30 cycles per minute. The light from the beacon shall show in all directions when viewed from above, with vertical light distribution of the bean extending upwards from an elevation of not more than 5 degrees. The beacon shall also be provided with a means of intensity adjustment at the time of installation from 2,000 to 20,000 candela to accommodate for ambient background lighting conditions.

6.4 APPROACH/ TAKE-OFF DIRECTION LIGHTING SYSTEM

The Canadian Aviation Regulations (CARs) Standard 325.33(2)(a) states that an approach/take-off direction lighting system shall be provided for FATOs with a single approach/ departure path or where there is an operational need to select a preferred flight path for noise abatement procedures. Given the location and anticipated number of flight paths, a approach/take-off direction lighting system may be required on one or more flight paths.

6.5 HOSPITAL HELIPORT IDENTIFICATION MARKINGS

In accordance with CARs Standard 325.31(2)(b), a hospital heliport identification marking must be provided in the centre of the FATO/TLOF to identify that the heliport serves a hospital. The marking will consist of a white solid cross and a red capital H that is aligned with magnetic north, as illustrated in **Figure 6-1**. Since the pad surface may be concrete, a 15 cm red border should be added to the cross for increased conspicuity.

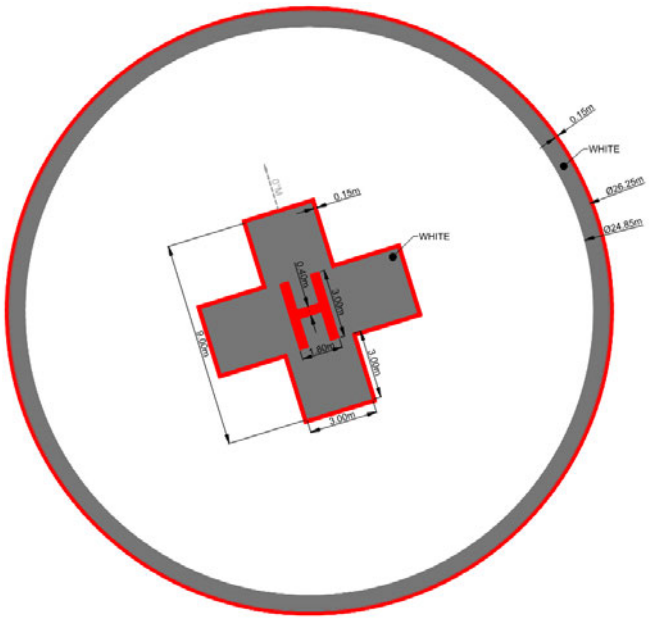


Figure 6-1 Hospital Heliport Identification and FATO Area Edge Markings

6.6 FATO Area Edge Markings

A Final Approach and Take-Off (FATO) area edge marking must be provided to identify the extent of the FATO. The marking shall be in accordance with CARs Standard 325.31(2)(d) and it shall be a 0.7-metre wide solid white line (minimum per standard 0.6 metres). The outer edge of the FATO area edge marking must be coincident with the FATO diameter of 26.25 metres. The inner edge of the FATO area edge marking will be offset by 0.7 metres, resulting in a 24.85 metre diameter. The FATO area edge marking may need to be supplemented with a 15cm red border. The marking will be as illustrated in **Figure 6-1**.

6.7 TLOF and FATO Perimeter Edge Lights

Transport Canada requires in accordance with CARs Standard 325 that all heliports classified for use at night be equipped with suitable lighting to clearly delineate the limits of the TLOF and/or FATO where the TLOF is deemed to be coincident and of the same size and shape of the FATO. FATO perimeter edge lighting is proposed for the heliport. The FATO lights may be inset or elevated, so long as they do not exceed an elevation of 25 cm above the FATO surface. The lights are to be omni-directional, medium intensity green and compatible with night vision goggles. A means of controlling the light intensity will also need to be established through integrated control or by other means. It is typically proposed that elevated LED lights units in compliance with CARs be used to delineate the FATO area. If inset light units are selected instead of elevated light units, the inset light units should be installed so as to be centered on the FATO edge and equally spaced around the FATO. In any case, the light units shall be equally spaced around the FATO and not exceed 7.5 metres spacing. The permissible offset distance for a FATO perimeter edge light shall be in accordance with CARs 325.33(8) as measure from the FATO edge. Based on what is typical of a heliport designed for use by the AW139, a minimum of twelve (12) FATO perimeter edge lights will be required for the heliport equally distributed around the FATO with an offset distance of 0.75 metres from the FATO edge.

6.8 FATO Perimeter Floodlighting

The purpose of the heliport perimeter floodlighting is to ensure adequate lighting is provided for Hospital Staff and Emergency Health Services crews. Low profile perimeter flood lighting is recommended to be installed surrounding the periphery of the paved landing area. Heliport perimeter floodlighting, if provided, shall be designed to not distract or cause glare to pilots in the air or on the ground. Perimeter floodlighting is proposed utilizing adjustable LED flood lights mounted near the perimetry of the safety area. The average horizontal illuminance of each floodlight shall be at least 10 lux with a uniformity ratio (average to minimum) of not more than 8:1. It is anticipated that at least six (6) flood lights could be required to illuminate the area. The perimeter floodlighting may also serve as a backup lighting system to FATO edge lights.

6.9 Obstruction Lighting

Any on- and off-site obstacles that are identified as requiring obstacle marking and lighting to support night use of the Heliport must be lighted in accordance with CARs Standard 621. Typical obstruction lighting within the Obstacle Marking and Lighting Area will be red, steady-burning, LED, CL-810 fixtures, and compatible with Night Vision Imaging Systems. On-site obstruction lighting shall be connected to a dedicated electrical circuit which will provide full-time power supply (daytime and nighttime).

6.10 Heliport Lighting Control

Lighting can be activated either by a ground-located switch and/ or through the use of Aircraft Radio Control of Aerodrome Lighting (ARCAL) if installed. ARCAL allows the pilot to activate the heliport lighting and to control the intensity (depending on the type) by clicking the transmission button on their radio. Installing

ARCAL would require applying for a radio frequency through Innovation, Science, and Economic Development Canada.

6.11 LANDSCAPING

Landscaping elements, including but not limited to shrubs, bushes, trees and decorative elements, surrounding the heliport should be kept to a minimum to ensure they do not protrude into the flight path obstacle limitation surfaces. Slopes extending from the safety area should be limited to a maximum downward slope of 1:4 and tie in as appropriate to existing terrain avoiding creation of a ditch or swale that could hold water.

The surface immediately abutting the paved helipad area and extending include disturbed or regraded areas shall be treated to resist the effects of rotor downwash. Sod is typically appropriate if well secured and shall be maintained appropriately with grass cut to a length that does not attract birds or other wildlife that may look for refuge.

The area surrounding the proposed stormwater management ponds found southwest and north of the proposed heliport site will also need to be assessed for risk as part of a wildlife hazard management to minimize potential conflict between aircraft and birds. Alternatively, consideration could be given to use of underground stormwater management.

6.12 EQUIPMENT AND INSTALLATIONS

6.12.1 FENCING

The heliport may need to have fencing designed to deter unauthorized access by persons to the heliport, including the installation of fencing surrounding the heliport. Access points to the heliport may need to be controlled using lockable, manual sliding (vehicle) and swing gates (pedestrian). Fencing will additionally prevent larger wildlife from entering the heliport area.

6.12.2 SIGNAGE

The heliport and surrounding area should be equipped with signage to enable use of the heliport and its certification. These signs will need to be strategically placed and convey appropriately the following:

- Caution Helicopter Operating Area;
- Caution Low Flying Aircraft;
- Caution High Wind and Noise;
- No Parking;
- Authorized Personnel Only; and
- No Smoking.

6.12.3 FIRE PROTECTION, EXTINGUISHING AGENTS AND EQUIPMENT

The heliport will need to comply with CARs 325 and where practicable NFPA 418 to ensure that the necessary fire-fighting equipment is stationed in the appropriate place on site and be clearly marked.

Other fire safety protocols should be implemented including the following:

- The surface of the heliport shall sloped such to provide drainage away from the access points;
- No smoking signs will need to be installed on the heliport fence; and
- One access point will need to be provided and designated for fire-fighting personnel.

7. HELIPORT CERTIFICATION AND ADDITIONAL CONSIDERATIONS

7.1 HELIPORT CERTIFICATION PROCESS

If it is determined that the proposed heliport is required to be certified, or if voluntary certification is requested, then steps will need to be taken towards obtaining obtain Transport Canada certification of the proposed heliport.

Once it has been determined that a heliport will be constructed and timelines are ascertained, steps will then need to be taken to initiate the heliport certification process. This process starts with an identification of the legal entity that would own the heliport and ultimately be responsible for its compliance with the regulations. An application is then prepared for submission to the Minister of Transport. This application notifies the Minster of the intent to construct and operate a heliport in compliance with CARs 305. This step does not grant certification but rather enables a file to be opened with Transport Canada's regional office to track documentation while the project progresses. The application makes formal request for heliport certification identifying the owner, operator, proposed heliport location and type of heliport. A letter of no objection from the municipality concerning construction of the heliport is also typically requested at this time.

The heliport certification process extends through construction with the preparation of a draft Heliport Operations Manual and training of staff. Following the completion of heliport construction, the Heliport Operations Manual is finalized with as-built information and any remaining staff training is completed. The Heliport Operations Manual is subsequently submitted to Transport Canada for review and processing. Transport Canada is then invited to complete a heliport certification inspection and meet with the Heliport Manager. This process may occur at any time after the heliport is constructed. However, if heliport certification is required by the regulator, the heliport cannot be used until certification is complete and the Heliport Certificate is issued by Transport Canada.

At a minimum, the heliport will be registered with Transport Canada and published by NAV CANADA in the Canadian Flight Supplement and in related aeronautical charts.

7.2 MAINTENANCE AND SNOW REMOVAL

Transport Canada requires that the heliport be free of debris, including snow. Due to the location of the heliport within Ontario, snow is a common event which shall be considered in maintenance planning. To facilitate snow removal, it is proposed that the heliport be equipped with an access ramp that will permit access by snow removal equipment.

7.3 FUEL / WATER SEPARATOR

Transport Canada no longer requires a fuel/water separator for heliports that do not offer aircraft refuelling services. Therefore, as no refuelling facilities are proposed for the future heliport, a fuel/water separator is not required. However, these systems are still common at new heliport developments due to site-specific environmental mitigation requirements.

7.4 ROTOR DOWNWASH

Rotor downwash caused by helicopters in the arrival or departure phases of flight can cause a safety hazard to people and equipment on the ground and in the immediate vicinity of a helicopter. The size and weight of the helicopter, as well as the wind direction and speed, have a significant effect on the extent of this hazard.

Transport Canada suggests that a protection area around the helicopter rotor(s), measured from the tip of the rotor blade, approximately three (3) times the overall length of the largest helicopter using the heliport, is considered suitable in most weather conditions. This area should be considered in the development of Standard Operating Procedures to limit pedestrian traffic during heliport use.

Based on the layout proposed and proximity to the ER entrance, precautions will need to be taken to ensure that rotor downwash hazards are suitably mitigated through design and standard operating procedures by security personnel.

7.5 Restriction on Vehicle and Pedestrian Movement During Heliport Use

Due to rotor downwash and obstacle limitation surfaces, restrictions will apply to vehicle and pedestrian movements on the hospital campus when the heliport is in use. Signs will need to be installed to inform the public in the proximity of the heliport of this hazard. Risk of personal injury or property damage will need to be carefully monitored and mitigation measures put in place to ensure safety of pedestrians. Such mitigation measures may include identification of safe setback distances and installation of wind break fencing.

7.6 Locations of Fuel and Compressed Gas Storage

Fuel storage and compressed gas tanks, including oxygen and propane storage tanks, are prohibited from being placed within certain flight path areas. Based on an inventory of existing conditions, taken by Avia NG during the site visit in 2023, and further supported by a review of satellite imagery from 2022, no compressed gas or fuel storage tanks were observed within 150m of the proposed heliport location.

7.7 Security Surveillance

It is suggested that cameras are used for surveillance of the heliport and surrounding areas.

7.8 Flight Path Protections

7.8.1 Risk of Intrusion by Trees or Future Development

Several trees and obstacles would need to be removed to enable use of the future heliport and increase heliport usability with an H2 classification. Trees will need to be monitored for growth that could result in penetration of required obstacle limitation surfaces or obstacle marking and lighting areas. When intrusion of an obstacle limitation surface occurs, it can result in reduction in heliport usability, closure of a flight path, or in the event of a single flight path heliport, it can result in closure of the heliport until the obstacle is removed. Similarly, if an obstacle is permitted to intrude upon the obstacle marking and lighting area and is unable to be removed or marked and lighted in accordance with CARs Standards 325 and 621, the heliport may be restricted to day-use only, subject to an aeronautical study.

7.8.2 Airport (Heliport) Zoning Regulations

To ensure future compliance and the ability to prevent trees and other obstacles from infringing upon the obstacle limitation surfaces of the Heliport, the Owner may elect to pursue with cooperation of the Provincial Authority the implementation of Airport (Heliport) Zoning Regulations via a Federal-Provincial Process that enables the Provincial Authority to put into place a by-law to protect the flight paths from conflicting land uses. Avia NG's team assigned to this project have led the industry in the development and implementation of AZRs both for airports and heliports across Canada and are uniquely qualified to advise on appropriate zoning measures. It is recommended that the Hospital consider over the long term AZRs as a means to protecting the heliport's flight paths and associated obstacle limitation surfaces from intrusion that may otherwise compromise future heliport certification and use.

8. CLOSING

This Heliport Feasibility Study and Preliminary Design Requirements Report indicates that the proposed site of the new South Muskoka Memorial Hospital provides a location conducive to establishing a new hospital heliport, alongside the new acute care hospital building and compliant with the Canadian Aviation Regulations. Analysis has been undertaken, in context with the Stage 1.3B Functional Program undertaken by Stantec Architecture, with a conceptual illustration of helipad placement on the lands provided as part of the hospital conceptual development and massing. The extent to which tree clearing and site regrading is required for the future heliport will be subject to design development, however it is anticipated to be extensive based on what is known about the current site. Due to the configuration of the site and location proposed for the new hospital building, there will be little flexibility in where to place the surface-level heliport. However, additional measures such as increased heliport mounding or designing the proposed future hospital heliport to be sited atop the hospital rooftop or a parkade would further increase flexibility by mitigating the impacts of the dominant obstacles on the subject lands.

APPENDIX A

Study Exhibits



Notes

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Scale 1:1500

25 0 10 25 50 75 100 METRES

50 0 50 100 200 350 FEET

SCALE BASED ON SHEET SIZE 22" X 34"

GRID NORTH

N W E S

AVIA • NG
AIRPORT CONSULTANTS

MUSKOKA ALGONQUIN HEALTHCARE

Client: MUSKOKA ALGONQUIN HEALTHCARE

Project:
HUNTSVILLE AND SOUTH MUSKOKA
HOSPITAL REDEVELOPMENT
HELIPORT SPECIALIST CONSULTING SERVICES

Title:
SOUTH MUSKOKA MEMORIAL HOSPITAL
PROPOSED SITE LOCATION
300 PINE STREET

Revision:	0	Date:	September 16, 2024
QA/QC:	JRM/JJH	Avia NG Project No.	23-0165
Drawn:	JCG	Exhibit:	1-1

ANSI D (22.00 x 34.00 inches)
C:\Users\jcg\Avia NG\Avia NG - Documents\23-0165 MAHC Huntsville-Bracebridge Rotex - Documents\CAD\MAHC Bracebridge Heliport Rotoc Options r0d 2024-09-16.dwg
September 17, 2024

HYDRO TRANSMISSION LINE CORRIDOR

395 PARKING SPACES

FUTURE HOSPITAL EXPANSION AREA

LOADING DOCK

STORM WATER MANAGEMENT

PROPOSED SOUTH MUSKOKA MEMORIAL HOSPITAL (NEW BUILD)

WATERCOURSE

TOP OF BANK

10m SETBACK

20m SETBACK

114 PARKING SPACES

HYDRO ONE BRACEBRIDGE TRANSMISSION STATION

PROPOSED HOSPITAL SITE BOUNDARY

STORM WATER MANAGEMENT

ENTRANCE

MTO SETBACK (114m)

PROPOSED HOSPITAL SITE BOUNDARY

PROPOSED SOUTH MUSKOKA MEMORIAL HOSPITAL HELIPORT
NORTHING: 4989061.004
EASTING: 634717.595
LATITUDE: N45° 02' 31.90"
LONGITUDE: W79° 17' 22.06"
H2/VFR/PPR

Notes

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Scale 1:1000

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SCALE BASED ON SHEET SIZE 22" X 34"

GRID NORTH

N W E S

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AIRPORT CONSULTANTS

MUSKOKA ALGONQUIN HEALTHCARE

Client: MUSKOKA ALGONQUIN HEALTHCARE

Project: HUNTSVILLE AND SOUTH MUSKOKA HOSPITAL REDEVELOPMENT HELIPORT SPECIALIST CONSULTING SERVICES

Title: **SOUTH MUSKOKA MEMORIAL HOSPITAL PROPOSED HOSPITAL AND HELIPORT LOCATION**

Revision:	0	Date:	September 16, 2024
QA/QC:	JRM/JJH	Avia NG Project No.	23-0165
Drawn:	JCG	Exhibit:	2-2

ANSI D (22.00 x 34.00 inches)
Created by: JacquelineGarcia on September 17, 2024
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ANSI D (22.00 x 34.00 Inches)
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September 17, 2024

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Scale 1:1000

10 0 5 15 25 50 75 METRES

50 0 25 50 100 250 FEET

SCALE BASED ON SHEET SIZE 22" X 34"

GRID NORTH

N W E S

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AIRPORT CONSULTANTS

MUSKOKA ALGONQUIN HEALTHCARE

Client: MUSKOKA ALGONQUIN HEALTHCARE

Project: HUNTSVILLE AND SOUTH MUSKOKA HOSPITAL REDEVELOPMENT HELIPORT SPECIALIST CONSULTING SERVICES

Title: **SOUTH MUSKOKA MEMORIAL HOSPITAL POTENTIAL FLIGHT PATHS**

Revision:	0	Date:	September 16, 2024
QA/QC:	JRM/JJH	Avia NG Project No.	23-0165
Drawn:	JCG	Exhibit:	5-1

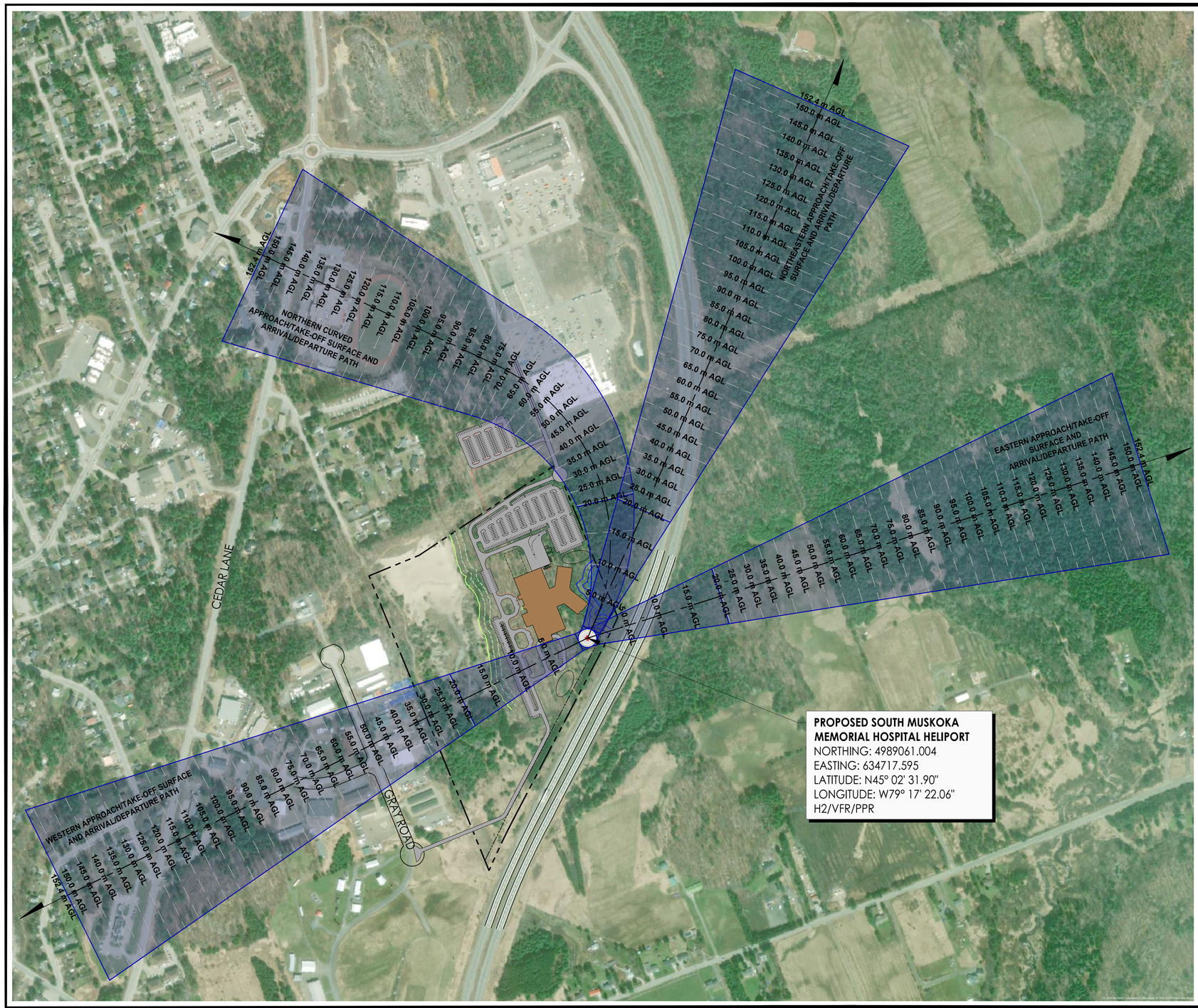
MAHC SOUTH MUSKOKA MEMORIAL HOSPITAL HELIPORT

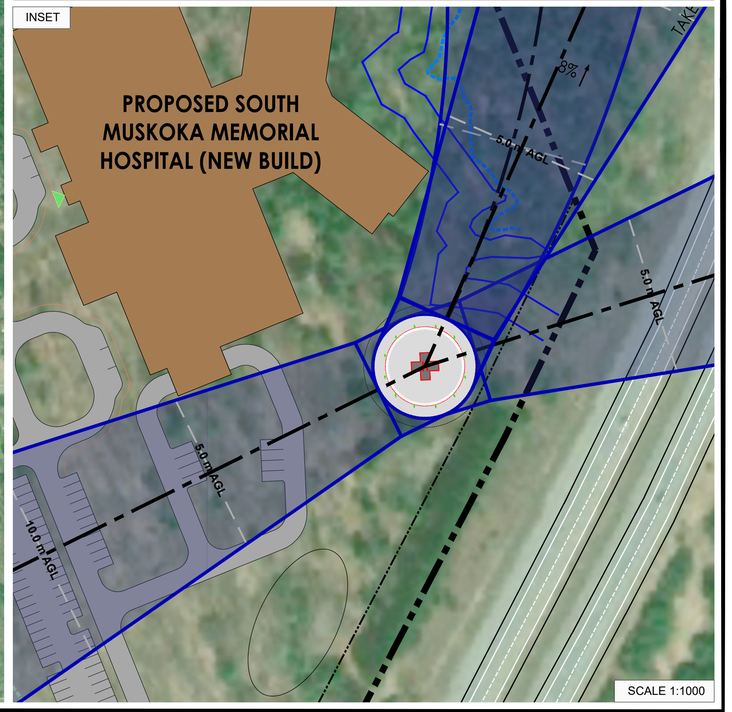
EXISTING HELIPORT CLASSIFICATION		
H2	DAY/NIGHT	VFR

HELIPORT PHYSICAL CHARACTERISTICS	
FATO WIDTH	26.25m
SAFETY AREA WIDTH	35.0m
FATO ELEVATION	TBD

FLIGHT PATH PROTECTIONS

DATA	NORTHERN ARR/DEP PATH	NORTHEASTERN ARR/DEP PATH	EASTERN ARR/DEP PATH	WESTERN ARR/DEP PATH
TYPE	CURVED ARR/DEP	ARR/DEP	ARR/DEP	ARR/DEP
GEOMETRIC CENTRE	STANDARD	STANDARD	STANDARD	STANDARD
SAFETY AREA WIDTH	35.0m			
INNER EDGE ELEVATION	TBD	TBD	TBD	TBD
FLIGHT PATH ORIGIN LOCATION (WGS84)				
NORTHING	4989061.004			
EASTING	634717.595			
LATITUDE	N45° 02' 31.90"			
LONGITUDE	W79° 17' 22.06"			
FLIGHT PATH BEARINGS (FROM)				
GRID NORTH	25.16°/295.16°	23.87°	72.51°	243.69°
OBSTACLE LIMITATION SURFACES - APPROACH/TAKE-OFF SURFACE				
DIVERGENCE	15%	15%	15%	15%
FIRST SECTION LENGTH	245m	245m	245m	245m
FIRST SECTION SLOPE	8%	8%	8%	8%
SECOND SECTION LENGTH	830.0m	830.0m	830.0m	830.0m
SECOND SECTION SLOPE	16%	16%	16%	16%
TOTAL LENGTH	1075m	1075m	1075m	1075m





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Scale 1:4000

50 0 25 50 100 200 300 METRES

200 0 100 200 500 1000 FEET

SCALE BASED ON SHEET SIZE 22" X 34"

GRID NORTH

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MUSKOKA ALGONQUIN HEALTHCARE

Client: MUSKOKA ALGONQUIN HEALTHCARE

Project: HUNTSVILLE AND SOUTH MUSKOKA HOSPITAL REDEVELOPMENT HELIPORT SPECIALIST CONSULTING SERVICES

Title: **SOUTH MUSKOKA MEMORIAL HOSPITAL PROPOSED HELIPORT AND DETAILED OLS**

Revision: 0	Date: September 16, 2024
QA/QC: JRM/JJH	Avia NG Project No. 23-0165
Drawn: JCG	Exhibit: 5-3

ANSI D (22.00 x 34.00 inches)
Date/Time: September 17, 2024 - 10:04am
User Name: Jacob Gray
Drawing: C:\Users\JacobGray\Avia NG\23-0165 MAHC Huntsville-Bracebridge Rotex - Documents\CAD\MAHC Bracebridge Heliport Rotex Options r0d 2024-09-16.dwg
September 17, 2024