

December 9, 2024

Project B2410032

Mr. Jon Maruska  
City of Duluth  
411 West 1<sup>st</sup> Street, Room 107  
Duluth, MN 55802

Re: Subsurface Investigation  
Duluth Water Main Extension – Lincoln Park 1  
Elinor Street, Martha Street, North 9th Ave West, South 18th Ave East, Winnipeg Avenue,  
North 19th Ave West, North 38th Ave West, North 22nd Ave West  
Duluth, Minnesota

Dear Mr. Maruska:

Braun Intertec Corporation is pleased to provide this letter report for the Lincoln Park 1 portion of the Water Main Extension project in Duluth, Minnesota.

## Scope of Services

The City of Duluth is planning to install new water main utilities at various locations throughout Duluth. The design concern is the potential for bedrock being encountered above the planned invert depth of the water main. Our investigation was intended to determine the apparent bedrock depth at the planned exploration locations.

We performed our scope of services for the project in accordance with Purchase Order 2024-00000617 from the City of Duluth. The following list describes the geotechnical tasks completed in accordance with our authorized scope of services.

- Staking and clearing the exploration locations of underground utilities. LHB, Inc. selected, and we staked the new exploration locations. We acquired the surface elevations and locations with GPS technology using the State of Minnesota's permanent GPS base station network.
- Performing forty (40) direct push probes, denoted as B85 to B120 and B85-2 to B90-2 to nominal depths of 15 feet or refusal, whichever occurred first.

- Noting any groundwater that was observed during each probe.
- Providing a letter summarizing the depth of each probe.

## Results

Direct push probes were conducted at 40 locations as shown on the location sketches attached to this letter. The results are summarized below and on the attached sheets.

**Elinor Street:** Probes B85 through B88 were conducted on Elinor Street between 59th Avenue West and North 58th Avenue West. Refusal was not encountered at any of these locations. All of the probes were extended to a depth of 15 feet. Groundwater was not observed in these probes.

**Martha Street:** Probes B85-2 through B90-2 were conducted on Martha Street between North 8th Ave East and North 9th Avenue East. Refusal was encountered in four of these six probes at depths ranging from 11 to 14 feet below the surface. Probe locations B85-2 and B86-2 did not encounter refusal. Groundwater was not observed in the probes.

**North 9th Ave West:** Probes B91 through B94 were conducted on North 9th Avenue West between West 3rd Street and West 4th Street. Refusal was encountered in Probes B92 and B94 at depths of 5 feet and 4 1/2 feet, respectively. Probes B91 and B93 were extended to a depth of 15 feet. Groundwater was not observed in the probes.

**South 18th Ave East:** Probes B95 through B98 were conducted on South 18th Ave East between Jefferson Street and London Road. Refusal was encountered in all of these probes at depths ranging from 5 1/2 to 10 feet below the surface. Groundwater was not observed in these probes.

**Winnipeg Avenue:** Probes B99 through B102 were conducted on Winnipeg Avenue between Wellington Street and West 6th Street. Refusal was not encountered at any of these locations. All of the probes were extended to a depth of 15 feet. Groundwater was not observed in these probes.

**North 19th Ave West:** Probes B103 through B105 were conducted on North 19th Ave West between West 1st Street and West 2nd Street. Refusal was not encountered at any of these locations. All of the probes were extended to a depth of 15 feet. Groundwater was not observed in these probes.

**North 38th Ave West:** Probes B106 through B109 were conducted on North 38th Avenue West between West 5th Street and West 6th Street. Refusal was not encountered at any of these locations. All of the probes were extended to a depth of 15 feet. Groundwater was not observed in these probes.

**North 22nd Ave West:** Probes B110 through B120 were conducted on North 22nd Avenue West between West 2nd Street and West 6th Street. Refusal was encountered in nine of these eleven probes at depths ranging from 2 1/2 to 13 feet below the surface with probe locations B117 and B120 not encountering refusal. Groundwater was not observed in these probes.

Refusal depths of the direct push probes are noted at the locations where it occurred above the planned termination depth of 15 feet. Refusal is defined as the point which the direct push probe could not be advanced further without excessive effort. Refusal can be caused by hardpan, cobbles, boulders, or bedrock.

Based on our knowledge of the area, we suspect that the refusals were caused by bedrock. However, in this area, both bedrock and boulders are common. Coring or test pits would be required to positively identify the cause(s) of the refusal.

### **Groundwater**

It should be noted that groundwater may take several hours or days to seep in to and stabilize in an open hole, and our probes were backfilled immediately. Seasonal and annual fluctuations should also be anticipated.

### **General**

In performing its services, Braun Intertec used that degree of care and skill ordinarily exercised under similar circumstances by reputable members of its profession currently practicing in the same locality. No warranty, express or implied, is made.

To have questions answered or schedule a time to meet and discuss our approach to this project further, please contact Kyle Warmuth ([kwarmuth@braunintertec.com](mailto:kwarmuth@braunintertec.com)) at 218.624.4967.

Sincerely,

BRAUN INTERTEC CORPORATION



Kyle P. Warmuth, PE  
Project Engineer

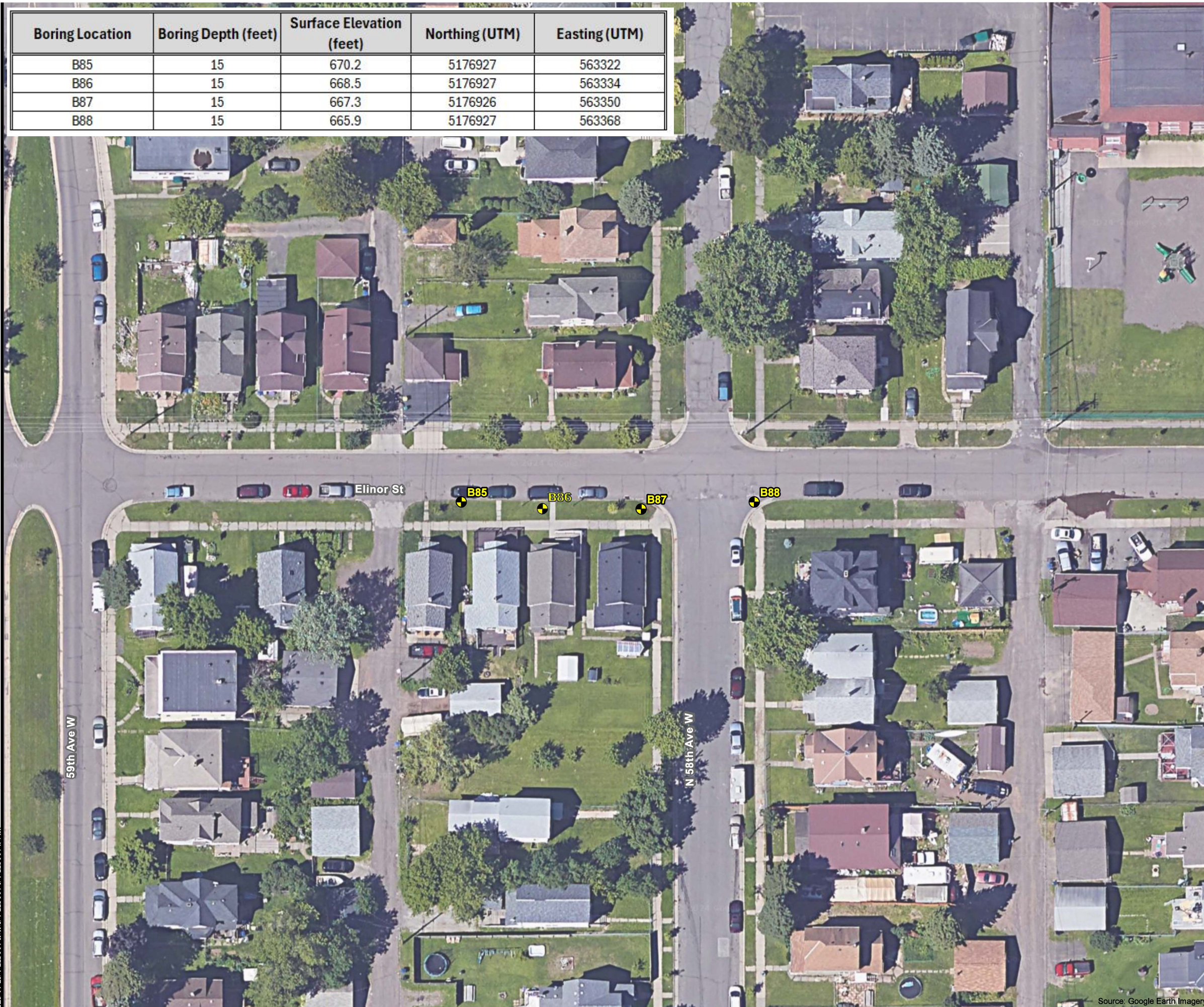


Steven A. Thayer, PE  
Senior Manager, Senior Engineer

Attachments:

Direct Push Location Sketches with Refusal Depths (7 pages)

Boring Location	Boring Depth (feet)	Surface Elevation (feet)	Northing (UTM)	Easting (UTM)
B85	15	670.2	5176927	563322
B86	15	668.5	5176927	563334
B87	15	667.3	5176926	563350
B88	15	665.9	5176927	563368



☉ Denotes Boring Location

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Drawing Information

Project No:  
B2410032

Drawing No:  
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Date Drawn: 11/14/2024  
Checked By: KW  
Last Modified: 11/14/2024

Project Information

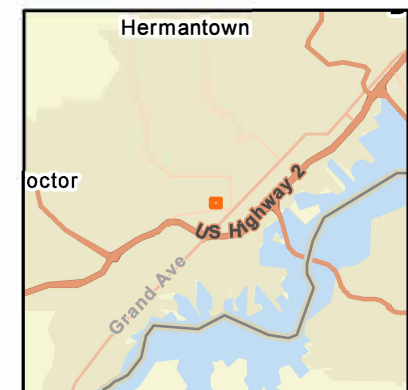
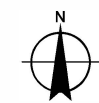
Duluth Water Main  
Extension - Lincoln 1

Lincoln Park

Duluth, Minnesota

Boring Location  
Sketch

Sheet:  
2 of 8



Source: Google Earth Imagery

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Boring Location	Boring Depth (feet)	Surface Elevation (feet)	Northing (UTM)	Easting (UTM)
B85-2	15	1149.1	5183983	568456
B86-2	15	1143.6	5183983	568474
B87-2	14*	1140.3	5183983	568485
B88-2	15	1136.2	5183983	568498
B89-2	11*	1132.2	5183983	568511
B90-2	11*	1129.6	5183985	568526

\*= Refusal



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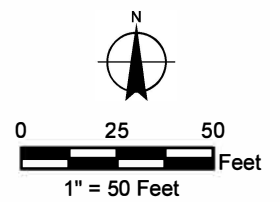
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Boring Location  
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Source: Google Earth Imagery

Boring Location	Boring Depth (feet)	Surface Elevation (feet)	Northing (UTM)	Easting (UTM)
B91	15	918.7	5181170	567700
B92	5*	915.9	5181162	567708
B93	15	912.4	5181149	567724
B94	4 1/2*	910.5	5181137	567741

\*= Refusal



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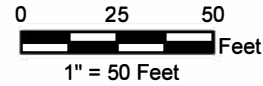
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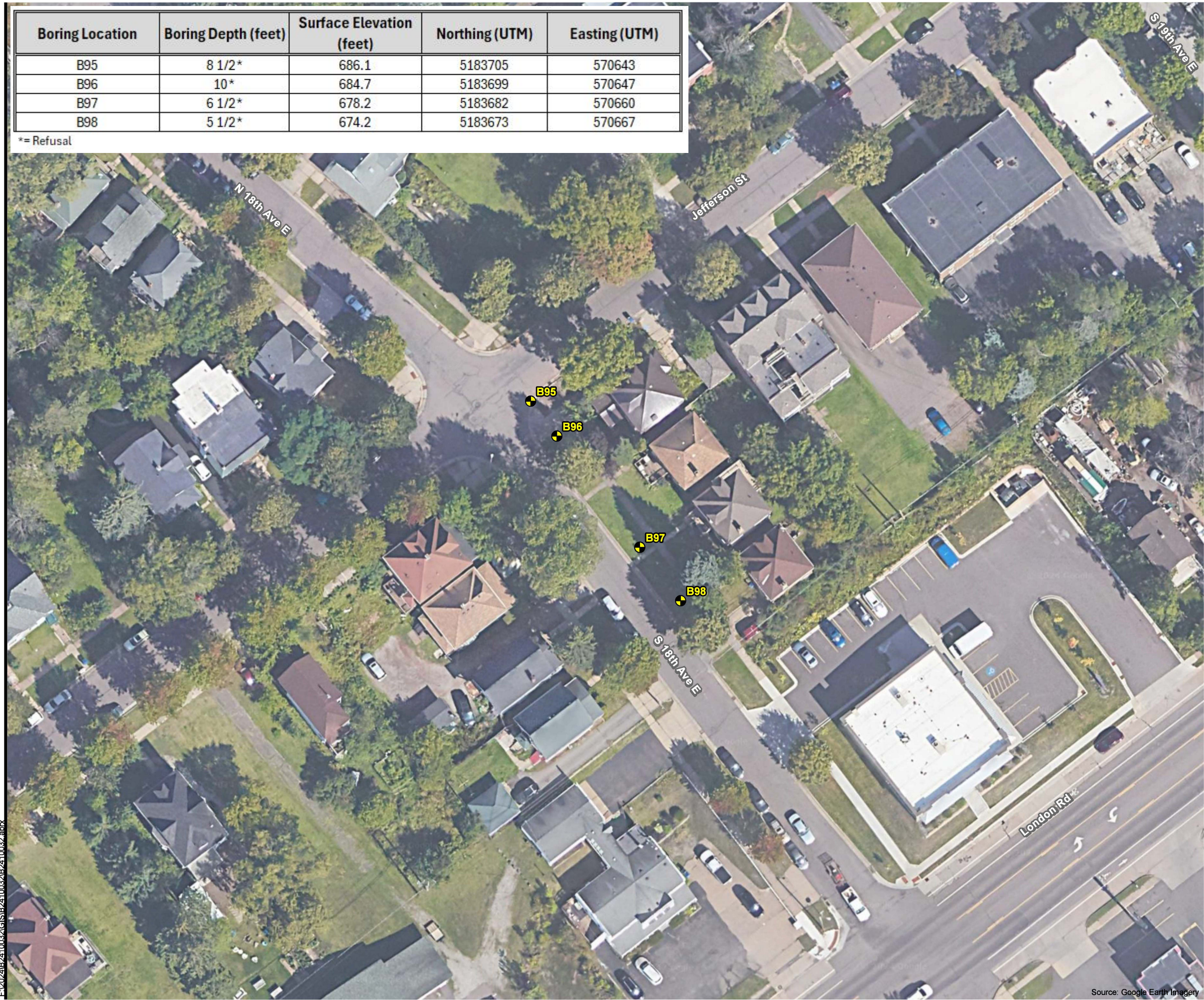


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Source: Google Earth Imagery

Boring Location	Boring Depth (feet)	Surface Elevation (feet)	Northing (UTM)	Easting (UTM)
B95	8 1/2*	686.1	5183705	570643
B96	10*	684.7	5183699	570647
B97	6 1/2*	678.2	5183682	570660
B98	5 1/2*	674.2	5183673	570667

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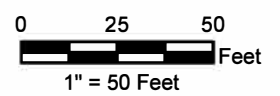
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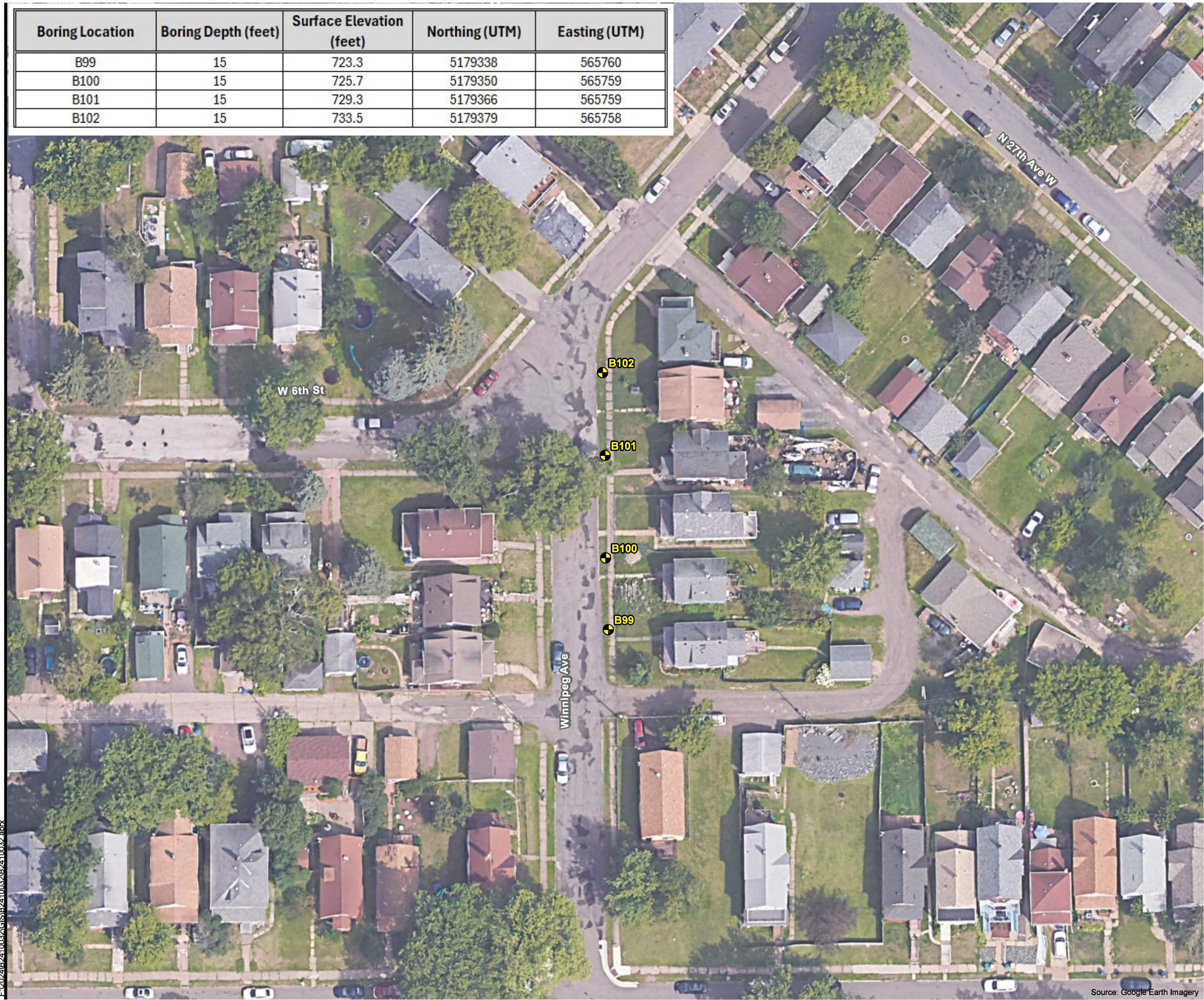
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8 of 8



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Source: Google Earth Imagery

Boring Location	Boring Depth (feet)	Surface Elevation (feet)	Northing (UTM)	Easting (UTM)
B99	15	723.3	5179338	565760
B100	15	725.7	5179350	565759
B101	15	729.3	5179366	565759
B102	15	733.5	5179379	565758



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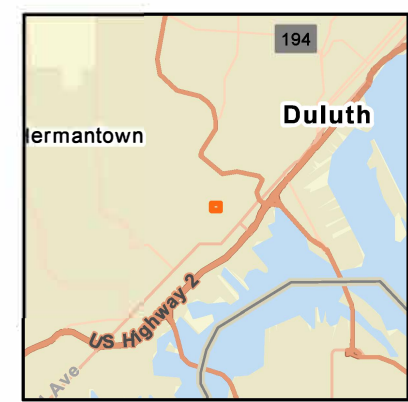
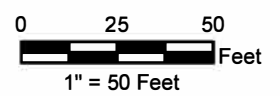
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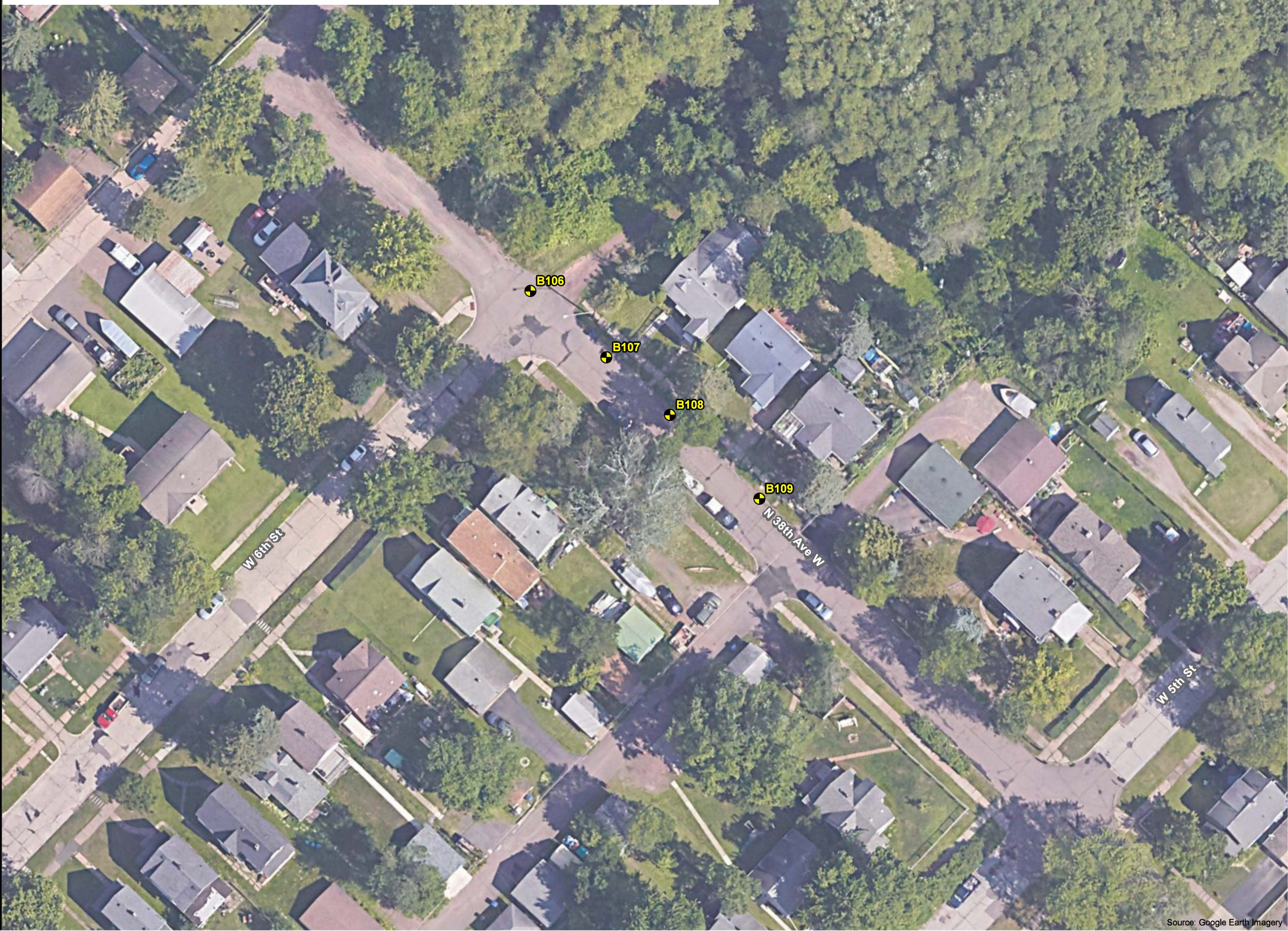
Duluth, Minnesota

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Boring Location	Boring Depth (feet)	Surface Elevation (feet)	Northing (UTM)	Easting (UTM)
B106	15	659.5	5178356	564783
B107	15	660.3	5178346	564795
B108	15	660.0	5178338	564804
B109	15	658.4	5178325	564818



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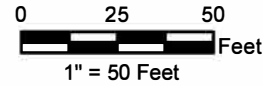
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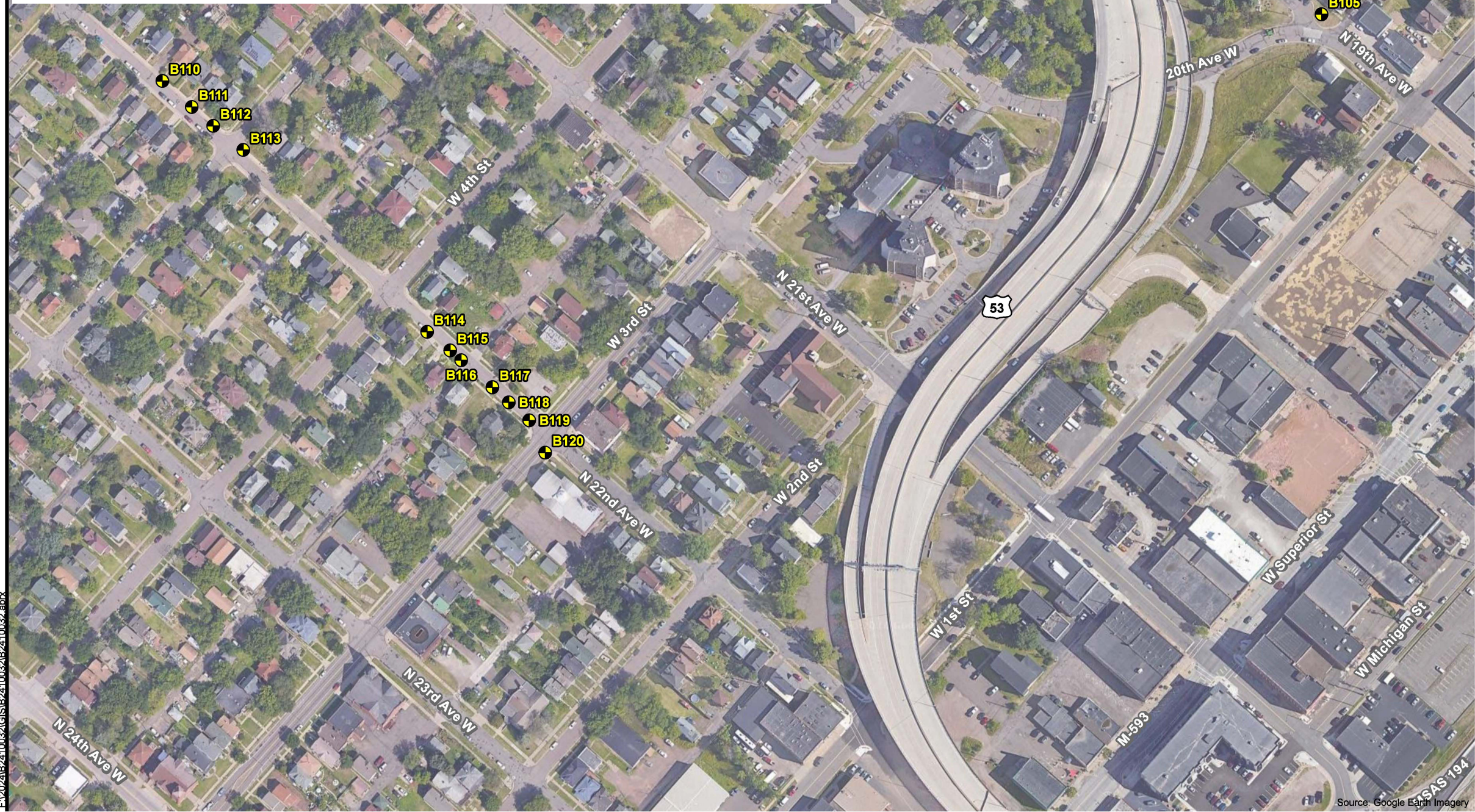


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Source: Google Earth Imagery

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B103	15	658.8	5180008	566885
B104	15	652.8	5179988	566904
B105	15	645.9	5179974	566918
B110	13*	766.5	5179935	566316
B111	11*	759.0	5179922	566331
B112	4*	753.8	5179912	566343
B113	5*	749.1	5179900	566358
B114	2 1/2*	686.7	5179806	566454
B115	5*	679.5	5179796	566466
B116	7 1/2*	675.9	5179791	566472
B117	15	667.5	5179777	566489
B118	13*	662.7	5179769	566497
B119	7*	657.0	5179760	566508
B120	15	653.2	5179743	566516

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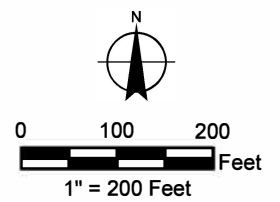
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