

Natasha Heindel

From: Farrer, Hayley M CIV USARMY CEPOA (USA) <Hayley.M.Farrer@usace.army.mil>
Sent: Monday, June 24, 2024 5:15 PM
To: Natasha Heindel
Subject: [Non-DoD Source] RFC Celestial Heights Master Plan
Attachments: JD Request Form print.pdf; JD Request Form.pdf

[EXTERNAL EMAIL - CAUTION: Do not open unexpected attachments or links.]

Hi Natasha,

Department of the Army (DA) authorization is required if anyone proposing to place dredged and/or fill material into waters of the U.S., including wetlands and/or perform work in navigable waters of the U.S.

A copy of the DA permit application can be found online at www.poa.usace.army.mil/Missions/Regulatory.
Sample drawings can also be found on our website at www.poa.usace.army.mil/Portals/34/docs/regulatory/guidetodrawings2012.pdf.

Section 404 of the Clean Water Act requires that a DA permit be obtained for the placement or discharge of dredged and/or fill material into waters of the U.S., including jurisdictional wetlands (33 U.S.C. 1344). The Corps defines wetlands as those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

If wetlands are completely avoided, then there would likely be no permit required under Section 404 of the Clean Water Act. A request for a No Permit Required letter would require Regulatory to evaluate construction plans further and would require the landowner to submit a Jurisdictional Determination (attached form). They may also submit a permit application and ask Regulatory to prepare a Jurisdictional Determination to help further plan avoidance or minimization in conjuncture with a permit application.

The landowner(s) is welcome to submit a preapplication meeting request, a jurisdictional determination request, or a permit application directly to our general mailbox (regpagemaster@usace.army.mil) or by our Regulatory Request System, and they will be assigned a project manager to assist them. Please feel free to contact our main line if you or the landowner(s) have any questions or concerns at 907-753-2712.

Sincerely,
Hayley Farrer
Regulatory Specialist
South Section, Alaska District
US Army Corps of Engineers
Office: (907)753-2778
Cell: (907)687-1059



Streamline the permitting process with the Regulatory Request System (RRS) — your new online platform for permit applications.

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JUN 24 2024
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25 June 2024

Katie Vachris, DBA
Project Manager
Trust Land Office
2600 Cordova Street, Suite 201
Anchorage, Alaska 99503

RECEIVED
JUN 26 2024
PLATTING

R&M No. 2846.01

RE: Boyd Road Subdivision - Geotechnical Investigation Report, Revision 3¹

Dear Ms. Vachris,

The Alaska Department of Natural Resources Trust Land Office (TLO) contracted² R&M Consultants, Inc. (R&M) to provide professional services in support of preliminary design for development of a residential subdivision adjacent to Boyd Road near Palmer, Alaska (**Drawing 1**, attached). This letter report summarizes the results of our geotechnical investigation for the project, which included: six test borings and three test pits advanced within the project site; laboratory soils testing on collected samples; and preparation of this geotechnical report including general conclusions regarding site suitability for the proposed development and recommendations for design and construction of roads and utilities.

BACKGROUND AND PROPOSED DEVELOPMENT

TLO is planning to subdivide Parcel B2, Section 12, T18N, R1E, Seward Meridian, Alaska, which is located west of Palmer Fishhook Road and directly south of Boyd Road (**Drawing 2**) near Palmer, Alaska. R&M performed a geotechnical investigation at the project site to evaluate site suitability for the proposed development and provide geotechnical recommendations for preliminary design. Proposed site improvements include construction of asphalt paved roads with two 10-foot-wide asphalt lanes and gravel shoulders, with swales and cross culverts for drainage control. The proposed road system will provide access to the individual subdivision lots. Communication, electrical and natural gas utilities will be extended along the road right-of-way (ROW). On-site water and wastewater systems will be required for each lot.

FIELD INVESTIGATION

The geotechnical subsurface investigation program consisted of advancing, sampling, and logging a total of nine test holes (i.e., test borings and test pits). Six test borings (RM23-01, RM23-05 thru RM23-09) were completed on 24 to 26 May 2023 to depths of 27 feet below the existing ground surface (bgs), and three test pits³ (RM23-02, RM23-03, RM23-04) were completed on 13 July 2023 to depths of 12 to 13 feet bgs. Field activities were guided by an R&M engineering geologist who maintained logs of the test holes and samples. Test holes were logged and sampled in general accordance with practices outlined in the Alaska Department of Transportation and Public Facilities (DOT&PF) Geotechnical Procedures Manual⁴.

¹ Revised to address report to Ms. Vachris, add recommendations for trenching, and add statement on usable building and septic areas.

² Professional Services Term Agreement No. MA 10 200000112, NTP No. 17.

³ Steep terrain at the project site precluded drilling rig access to these locations. Test pits were advanced as an alternative to test borings.

⁴ DOT&PF, 2007. Alaska Geotechnical Procedures Manual. Dated May 2007.

Test holes were located and recorded using a recreational grade GPS unit⁵. **Drawing 3** presents approximate test hole locations relative to recent site imagery and the conceptual subdivision layout. A summary of the general notes and an explanation (key) for the test hole logs are presented as **Drawings 4 and 5**, respectively. Logs of the test holes are presented as **Drawings 6 through 14**. GPS coordinates for the test holes are presented on the attached logs and summarized below on **Table 1**.

Test boring and sampling operations were performed by Winger Drilling, Inc. of Wasilla, using a track-mounted CME-55 drill rig (**Figure 1**). Test borings were advanced using continuous flight, 8-inch nominal outside diameter (OD), 3.25-inch inside diameter (ID), hollow-stem augers. A modification of the Standard Penetration Test (SPT; ASTM D1586) was employed to collect disturbed soil samples below the ground surface at regular intervals using 2.5-inch ID (3.0-inch OD) split-spoon samplers advanced by a 340-pound automatic drop-hammer with a fall of 30 inches. Hammer blows (uncorrected) required to drive the samplers each six inches of an 18 to 24-inch interval were recorded as shown on the test boring logs.

Figure 1. CME-55 Drilling Rig on Tracked Carrier



Note: Drill rig positioned at Test Boring RM23-05, 26 May 2023.

Test pits were performed by Clear Excavating, LLC of Wasilla, using a CAT 308E2 CR Mini Excavator (**Figure 2**) with a maximum reach of approximately 12 to 13 feet bgs and a heavy tooth bucket 2 feet in width. While excavating test pits, grab samples representative of the encountered soil units were collected from the test pits walls or excavator bucket.

Test holes were backfilled with soil cuttings generated during advancement. 1-inch diameter slotted PVC casings were installed at each test boring location for the purpose of enabling monitoring of groundwater levels, or confirming lack thereof, after drilling. Groundwater measurements in the PVC casings were performed on 13 July 2023.

⁵ Recreational grade GPS units are limited to a maximum accuracy of about 15 feet.

Figure 2. CAT 308E2 CR Mini Excavator



Note: Excavator positioned at Test Pit RM23-04, 13 July 2023.

After visual and ductile field classification, samples were sealed in double plastic bags and returned to R&M's laboratory in Anchorage for further examination and testing.

LABORATORY TESTING

A laboratory testing program was developed to provide data on important subsurface characteristics and material properties for engineering analysis. Testing consisted of measuring general soil index properties for soil classification and was performed at the R&M Materials Laboratory in Anchorage in accordance with the following ASTM⁶ procedures: Particle Size Analysis – sieve and hydrometer (D 422⁷); Moisture Content (D 2216); Classification of Soils (D 2487 and D 2488); Organic Content by Ash (D 2974); and Atterberg Limits (D 4318). It should be noted that the size of gravel particles obtained using 2.5-inch ID split spoon samplers is limited to the size of the opening of the sampler. Therefore, the samples collected using split spoon samplers were thus not necessarily representative of the coarse gravel fraction.

The ASTM Unified Soil Classification System (USCS) and Frost Design Soil Classification system used for this project are summarized on **Drawings 15 and 16**, respectively. The system used to classify soils containing organic matter is summarized on **Drawing 17**. Laboratory test results are presented on the Test Boring Logs and on the Summary of Laboratory Data, **Drawings 18 through 20**. Gradation curves are presented on **Drawings 21 through 29**.

SITE CONDITIONS

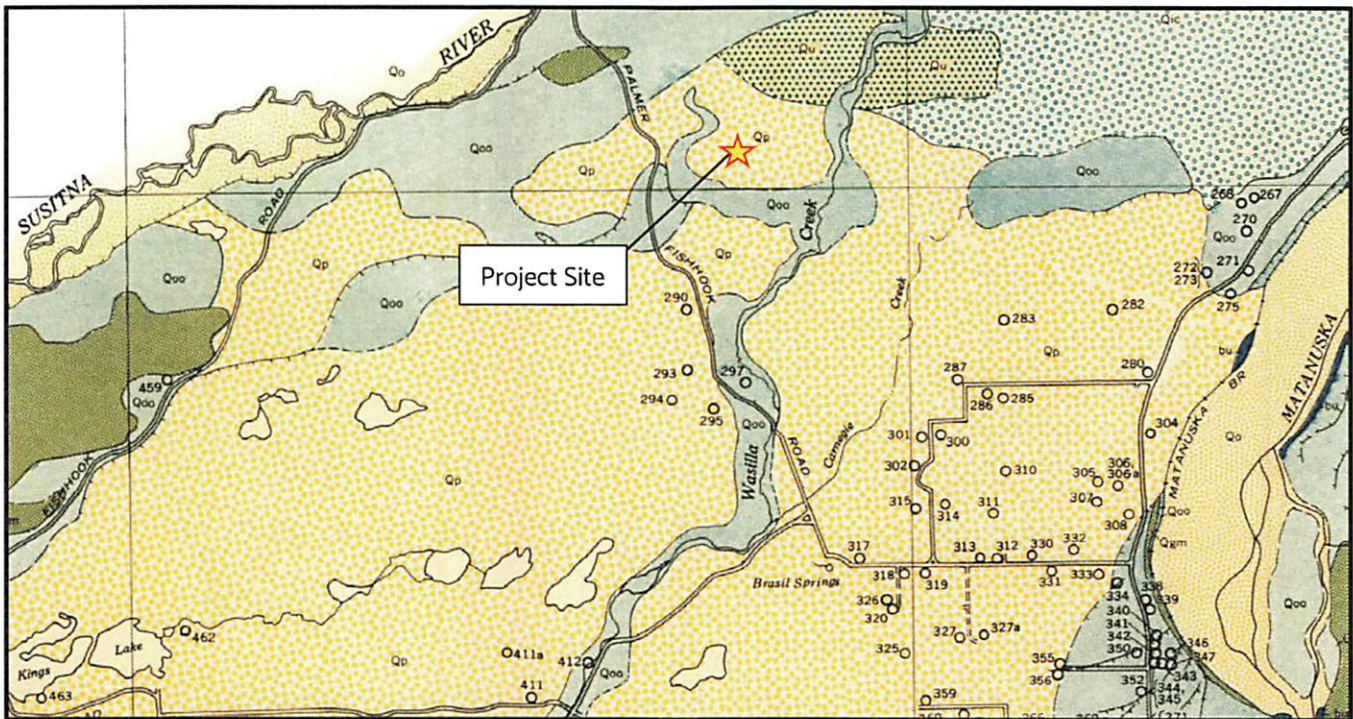
The following summarizes information pertaining to the surface and subsurface conditions encountered or interpreted within the project area based on the findings of the investigation. Vicinity/Location, Area, and Investigation Location maps for the project site are attached as **Drawings 1 through 3**, respectively.

⁶ American Society of Testing and Materials (ASTM), 2023. Annual Book of ASTM Standards, Volumes O4.08 and O4.09, Soil and Rock.

⁷ ASTM Standard D422 was not reapproved following the 2016 calendar year but remains commonly employed in Alaska.

Regional Geology. The project site is located within the Cook Inlet-Susitna Lowland physiographic province of Alaska⁸. This area is characterized as a glaciated lowland containing areas of ground moraine and stagnant ice topography, drumlin fields, eskers, and outwash plains. The topography is primarily the product of five major glacial advances that crossed the area in the middle to late Pleistocene age⁹, as well as the effect of colluvial and alluvial deposits consequent with or subsequent to the advances. Surficial soils across the project site vicinity have been mapped as outwash stream deposits; chiefly sand, gravel, and some silt¹⁰ (**Figure 3**). The in-situ soil profile encountered at the project site appeared generally consistent with this geological mapping.

Figure 3: Surficial Geological Mapping of Project Area



Notes: Map extracted from Trainer, 1960. Map key below:

- bu (dark blue shading): Mesozoic and Tertiary bedrock (undifferentiated); conglomerate, sandstone, shale, greenstone, and intrusive igneous rocks.
- Qgm (olive green shading): Quaternary ground moraine deposits; till, in part gravelly, and locally with gravel cover.
- Qic (coarse blue dot shading): Quaternary ice-channel deposits; eskers and associated pitted deposits, crevasse fillings, gradational.
- Qo (fine yellow dot shading): Quaternary outwash deposits; sand, gravel, and some silt along Matanuska River and major tributaries.
- Qoo (light blue-green shading): Older Quaternary outwash deposits; chiefly sand, gravel, and some silt.
- Qp (Coarse yellow dot shading): Quaternary pitted deposits; chiefly terraced outwash stream deposits; includes undifferentiated eskers and crevasse fillings in an elongate area that extends from Swamp Lake through Pittman to Big Lake.
- Qu (light blue-green shading): Undifferentiated Quaternary deposits; chiefly deposits of outwash streams, but include nonglacial lake and stream deposits.

⁸ Wahrhaftig, Clyde. 1965. Physiographic Divisions of Alaska. U.S. Geological Survey Professional Paper 482.

⁹ Coulter, H.W., et al. 1965. Map Showing Extent of Glaciations in Alaska. U.S. Geological Survey Miscellaneous Geologic Investigations Map I-415. 1 sheet. Scale 1:2,500,000.

¹⁰ Trainer, F.W., 1960. Map of the Matanuska Valley Agricultural Area, Alaska, Showing Surficial Geology and Location of Wells. Geological Survey Water-Supply Paper 1494, Plate 1, Scale 1:50,000.

Surface. The project site was undeveloped at the time of the investigation and was generally surfaced with a 3- to 7-inch-thick organic mat at the test hole locations, with grass and brush surface cover. The project site in the vicinity of the test hole locations generally exhibited uplands vegetation with spruce, birch, willow and alder growth. Topography across the project site is dominated by eskers, with an undulating and hilly ground surface with moderate to steep slopes. An exception is the southeastern corner of the site, away from the test hole locations, which exhibits a lowland area with boggy surface conditions. Drainage at the project site generally appeared to be good and primarily conveyed by infiltration with some surface flow to small streams, except for the lowland at the southeastern corner of the site.

Soil Profile. The subsurface soil profile encountered below the organic mat at the test hole locations was consistent, with two generalized soil units interpreted: (I) silty surficial deposits; overlying (II) glacial outwash deposits. The depth interval of these generalized units interpreted at each test hole is summarized on **Table 1**. Descriptions for each unit highlighting soil classification, density, and laboratory testing results are provided below. A graph depicting SPT blowcounts versus depth for each SPT sample performed is provided on **Figure 4**, with SPT values corrected for overburden pressure, sampling characteristics, and oversize sampler.

Unit I – Silty Surficial Soils, typically consisting of sandy silt to silty sand containing organics (USCS = oSM, oML), were encountered below the organic mat at each test hole location. The silty surficial deposits ranged in thickness from approximately 0.6 to 5.1 feet and were generally moist to wet, soft or loose, and non-plastic. This soil unit typically contained visible organic matter consisting of organic silt, roots, and other organic debris. Gravel content and cobbles were encountered intermixed near the bottom of this unit at some test hole locations.

For those samples tested from Unit I: average moisture content was 39 percent (range [r]=21.2 to 61.7, number of tests [n]=15), average percent passing the No. 200 sieve (P200) was 59 percent (r=39 to 76, n=6), and average organic content was 8.4 percent (r=6.5 to 12, n=5). Results of dry preparation Atterberg limits testing in this soil unit (n=2) were nonplastic (NP). These soils are highly frost susceptible (F4).

Unit II – Glacial Outwash, consisting primarily of poorly to well graded gravel and sand with variable silt contents (USCS= GW, GP, GW-GM, GP-GM, SP, SP-SM), was encountered underlying the silty surficial soil deposits (Unit I) at each test hole location. This soil unit is consistent with the 'Qoo' and 'Qp' units mapped at the project site (**Figure 3**). Unit II soils were generally interpreted to be medium dense to very dense in consistency, dry to moist, and nonplastic. The glacial outwash unit contained occasional to frequent cobbles and possible boulders. Frost class of the glacial outwash deposits unit was interpreted/tested ranging from non-frost susceptible (NFS) to slightly frost susceptible (S2).

For those samples tested from Unit II: average moisture content was 3.3 percent (r=1.0 to 7.4, n=46); average P200 content was 5.7 percent (r=1.0 to 8.1, n=20), and average percent passing the 0.02 mm sieve (P.02) was 3.4 percent (r=1.5 to 5.3, n=9).

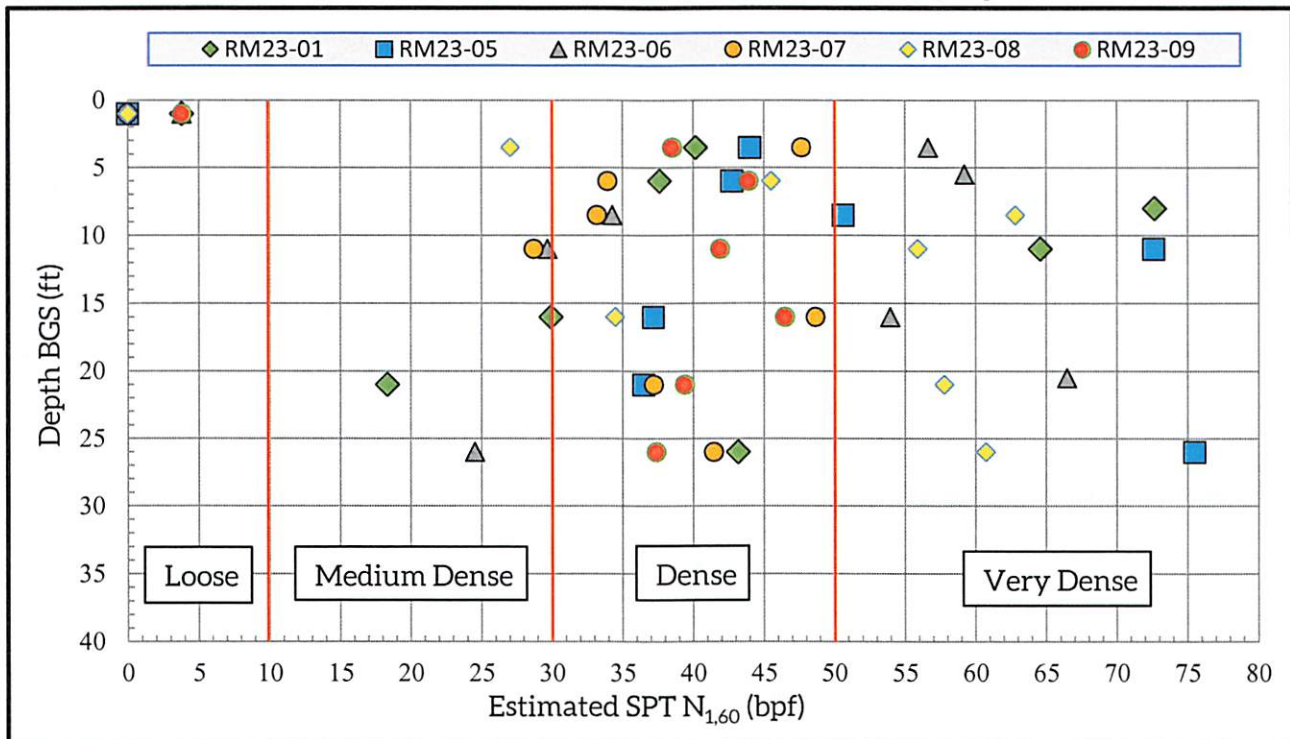
Table 1: Generalized Soil Unit Profile at Test Boring Locations

Test Hole Number	GPS Coordinates (WGS84)		Interpreted Depth of Generalized Soil Unit (In feet below existing ground surface)			Groundwater Depth
	Latitude (N)	Longitude (W)	Organic Mat (Thickness)	UNIT I Silty Surficial Soils	UNIT II Glacial Outwash	
RM23-01	61.67140	149.20721	0.4	0.4 to 3.1	3.1 to 27.0 ^{TD}	NE
RM23-02	61.66980	149.20750	0.5	0.5 to 3.0	3.0 to 12.0 ^{TD}	NE
RM23-03	61.66861	149.20611	0.6	0.6 to 3.0	3.0 to 13.0 ^{TD}	NE
RM23-04	61.67028	149.20306	0.5	0.5 to 1.1	1.1 to 12.0 ^{TD}	NE
RM23-05	61.67052	149.20554	0.3	0.3 to 2.9	2.9 to 27.0 ^{TD}	NE
RM23-06	61.67058	149.20265	0.4	0.4 to 3.3	3.3 to 27.0 ^{TD}	NE
RM23-07	61.67055	149.19659	0.4	0.4 to 3.0	3.0 to 27.0 ^{TD}	NE
RM23-08	61.67130	149.19876	0.4	0.4 to 5.5	5.5 to 27.0 ^{TD}	NE
RM23-09	61.67075	149.19948	0.5	0.5 to 3.2	3.2 to 27.0 ^{TD}	NE

TD = total depth of test hole.

NE = groundwater not encountered while drilling/excavating and during subsequent measurements performed on 13 July 2023.

Figure 4: Corrected SPT Blowcounts vs. Depth for Test Borings



Note: the presence of coarse gravels and cobbles likely inflated SPT values in some test intervals.

Groundwater was not suspected or interpreted at the test hole locations during drilling/excavating and groundwater was not encountered during subsequent water level measurements performed on 13 July 2023 in the slotted PVC casings installed to total depth at each test boring. We generally do not anticipate shallow groundwater conditions affecting this site in the vicinity of the test boring locations. However, some wetness was observed within the silty surficial soils (Unit I) indicating potential for perched water to develop in this soil unit. Additionally, several small intermittent streams appear to run through the site within troughs in the uplands portion of the site, and lowland muskeg terrain with ponding exists in the southeastern corner of the site; shallow groundwater conditions are anticipated in the vicinity of these features.

Permafrost was not suspected or interpreted at the test hole locations during this investigation, and we generally do not anticipate permafrost affecting this site. The project area is regionally mapped as containing isolated masses of permafrost (less than 10 percent area coverage) with heightened potential for perennially frozen soil in areas with high ground insulation such as bogs or swamps¹¹.

Bedrock was not suspected or interpreted at the test hole locations during this investigation. We do not anticipate shallow bedrock conditions affecting this site.

GENERAL CONCLUSIONS AND GEOTECHNICAL RECOMMENDATIONS

The following summarizes general conclusions regarding suitability of the project site for the proposed development and geotechnical recommendations for design and construction of roads and utilities. Earthwork material designations herein reference those specified in the **DOT&PF 2020 Standards Specifications for Highway Construction**.

Seismic Design Parameters shown on Table 2 address the geotechnical aspects of structural design on these sites relative to ASCE/SEI 7-22.

Table 2: Seismic Design Parameters

Site Parameters	Value
Site Class	D
PGA _M	0.72
S _s	2.25
S ₁	0.91
S _{MS}	1.98
S _{M1}	2.48
S _{DS}	1.32
S _{D1}	1.65

¹¹ Jorgenson et al., 2008. "Permafrost Characteristics of Alaska", Institute of Northern Engineering, University of Alaska.

Usable Area. The investigation results indicate favorable conditions for the installation of water wells, onsite wastewater disposal (i.e., septic) systems, and site development. The proposed lots each contain greater than 10,000 square feet of usable building area and greater than 10,000 square feet of contiguous septic area in accordance with Matanuska-Susitna Borough Code 43.20.281(A). Design and installation of onsite water and wastewater systems should be performed in accordance with the governing Alaska Department of Environmental Conservation requirements for these systems. To improve drainage within the footprint of septic system infiltration galleries, materials consistent with the Silty Surficial Soil unit (Unit I defined above) variably surfacing the site should be removed such that the base of the infiltration gallery bedding is placed on soils consistent with the Glacial Outwash unit (Unit II defined above).

Site Stability: The project site is generally underlain by dense coarse-grained soils free of shallow groundwater; soil liquefaction is unlikely. Additionally, loss of bearing capacity and land spreading are unlikely to occur in the relatively dense soils underlying the site. The project site exhibits variable topography with some moderate to steep slopes. Slope instability is unlikely where appropriate grading and construction practices are applied in development of this site.

Site Grading. We understand that the project site would be graded for development of paved roads and accompanying utility extensions. Considering the results of this investigation, the project site is favorable for grading. Prior to site grading, the surficial silty soils (Unit I) should be stripped from areas to be developed. Anticipate the overexcavation required to remove the Unit I soils will typically be on the order of 3 to 5 feet in depth bgs. The base of excavations should consist of materials consistent with glacial outwash (Unit II) as described herein and be compacted to at least 95 percent of maximum laboratory unit weight (ASTM D 1557). **DOT&PF Selected Material Type A or B** should be used as excavation backfill or where necessary bring the surface to grade within the **influence area**¹² below pavements and utilities. Grading materials should be placed in maximum 10-inch (loose) lifts and compacted to at least 95 percent of maximum laboratory unit weight (ASTM D 1557). Any cut slopes, graded embankment slopes, or slopes on the periphery of graded areas should be laid back to a maximum steepness of 2 horizontal and 1 vertical.

Excavation Reuse. Based on the results of this investigation the silty surficial soils (Unit I) are not suitable for reuse as structural fill or classified fill for embankment construction in the influence area below pavements, utilities, or foundations. The glacial outwash (Unit II) materials underlying this site may be suitable for reuse as **DOT&PF Selected Materials**. Materials excavated onsite may be reused during site grading and construction if they: meet the defined specifications and criteria; are monitored and stockpiled separately; and are kept free of organics, other debris, and excess moisture. The existing organic mat materials surfacing the site may be suitable for reuse in turfing graded surfaces adjacent to the roads. Consider turfing and seeding completed slope surfaces for erosion protection.

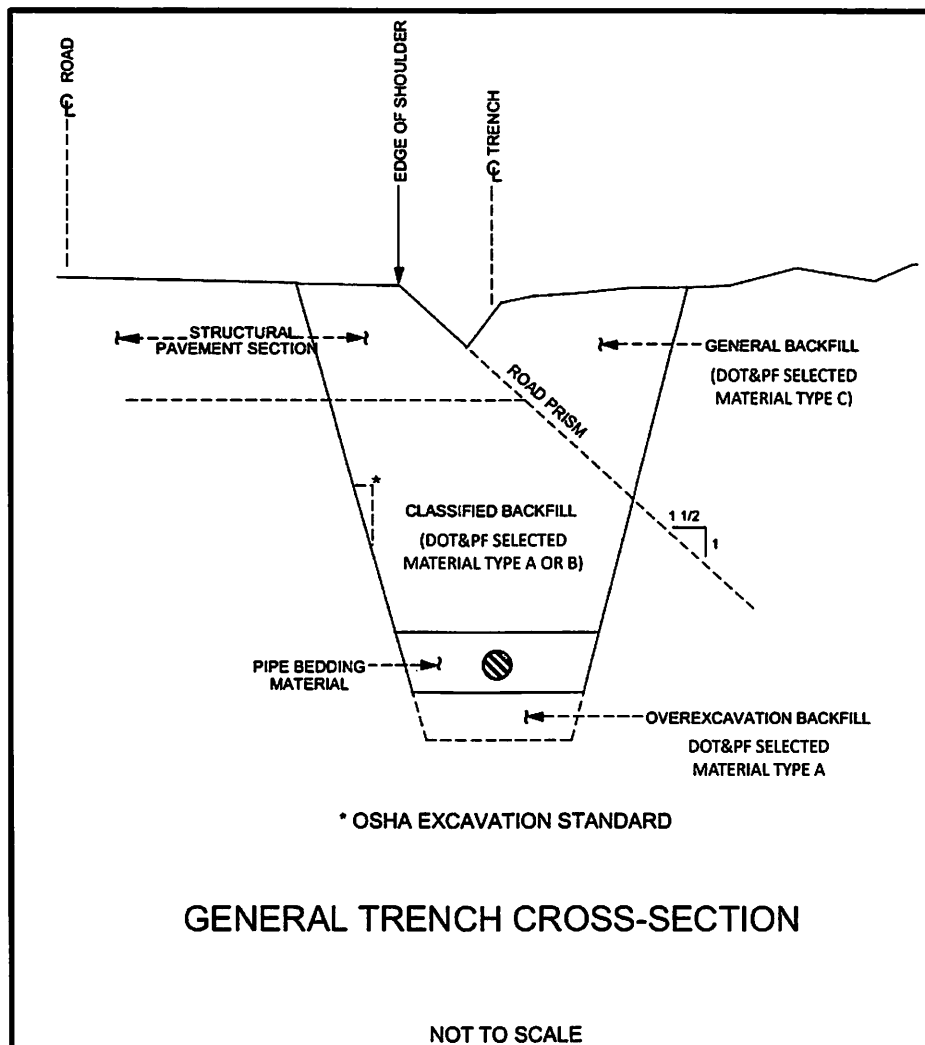
¹² Influence area is defined as that area within a 1h:1v (horizontal:vertical) prism extending outwards and down from the pavement, foundation and/or utility bedding.

Trenches. The following geotechnical recommendations pertain to trench design and construction considerations. Construction practices and material classifications for backfill and bedding of pipe culverts, storm drains, manholes, inlets, conduits, and other structures should follow those provided in the **DOT&PF 2020 Standard Specifications for Highway Construction**.

Trench slopes should conform to prevailing safety requirements in the Occupational Safety and Health Administration Excavation Standard (29 CFR Part 1926), herein referred to as the OSHA Standard. Further interventions (flattening or shoring) to the OSHA Standard maximum slopes may be required if the trench walls are exposed for long periods (>24 hours), trenches are allowed to fill with water, trench walls are exposed to heavy rain, excavated or backfill material is stockpiled at the surface within about “one-trench-depth” of the top of the trench, or if heavy or frequent traffic and equipment is operating near the top of the trench.

A typical trench section is presented on **Figure 5**, which also illustrates the following described backfill categories.

Figure 5: Generalized Trench Typical Section



Where not otherwise specified, bedding material should conform to **DOT&PF Selected Material Type A passing the 3-inch sieve**. Bedding should extend to 12 inches above, below, and on either side (horizontally) of the pipe or conduit and ancillary structures. The bedding should be placed in maximum 6-inch loose lifts and compacted to a minimum of 95 percent maximum density, determined in accordance with ASTM D 1557. Excavation areas that are inaccessible to proof-rolling should be inspected by hand probing or shallow test pits. Any evident loose or disturbed soils should be recompacted, or removed and replaced with **Selected Material Type A passing the 3-inch sieve**.

All backfill in overexcavations below the design trench depth should conform to the requirements for classified backfill inside the 'road prism' presented on **Figure 5**. The overexcavation backfill should be placed in maximum 10-inch loose lifts and compacted to a minimum of 95 percent maximum density, determined in accordance with ASTM D 1557. Backfill type and compaction requirements above the bedding are different depending if the trench is inside or outside the road prism.

Outside the 'road prism' backfill above the bedding can be with **DOT&PF Selected Material Type C**. This backfill should be placed in maximum 12-inch lifts and compacted to a minimum of 90 percent maximum density. Inside the 'road prism', all 'classified' and 'structural' backfill (see **Figure 5**) should be placed in maximum 10-inch lifts (loose thickness) and compacted to at least 95 percent maximum density (ASTM D-1557). Trench backfill below the road section and above and below the pipe bedding should conform to the specifications for **DOT&PF Selected Material Type A or B**.

Asphalt Pavement Design. Site conditions are generally favorable for construction of the proposed asphalt paved roads and utility systems. We anticipate that pavement structural sections can perform well if bearing on the glacial outwash (Unit II) materials encountered at relatively shallow depths across this site. Unit II soils were generally dense in consistency and non-plastic, dry to moist, with relatively low silt contents and low frost-susceptibility.

We recommend the following minimum pavement structural section:

- 2 inches of hot mix asphalt pavement, over
- 2 inches of **DOT&PF Base Course Grading D-1**, over
- 12 inches of **DOT&PF Selected Material Type A passing the 3-inch sieve**, over
- additional thickness of **DOT&PF Selected Material Type A or B** as needed to meet grade, over
- prepared surface of in situ soil consistent with glacial outwash (Unit II) materials.

Foundations. Favorable soils (Unit II) for support of conventional foundations were encountered underlying the surficial silty soils (Unit I) at the project site. Unit II soils were generally dense in consistency and non-plastic, dry to moist, with relatively low silt contents and low frost-susceptibility.

CLOSURE

The discussion presented in this report is preliminary in nature and based on our understandings of the proposed project, our investigation, and the other pertinent information listed herein. Because subsurface characteristics can change significantly within a given area, and with the passing of time, the possibility exists that important conditions not disclosed by this investigation may be discovered on the site during construction. Should this situation occur, the influence of the new information on the design aspects should be evaluated without delay.

R&M Consultants, Inc. performed this work in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions. No warranty, express or implied, beyond exercise of reasonable care and professional diligence, is made. This report is intended for use only in accordance with the purposes of study described within.

We appreciate the opportunity to perform this geotechnical investigation. Should you require further information concerning the investigation or this report, please contact us at your convenience. Sincerely,

R&M CONSULTANTS, INC.

Reviewed By:



Brian M. Mullen, PE
Senior Geotechnical Engineer

A handwritten signature in blue ink that reads "Aaron Banks".

Aaron T. Banks, CPG
Senior Geologist

ATTACHMENTS

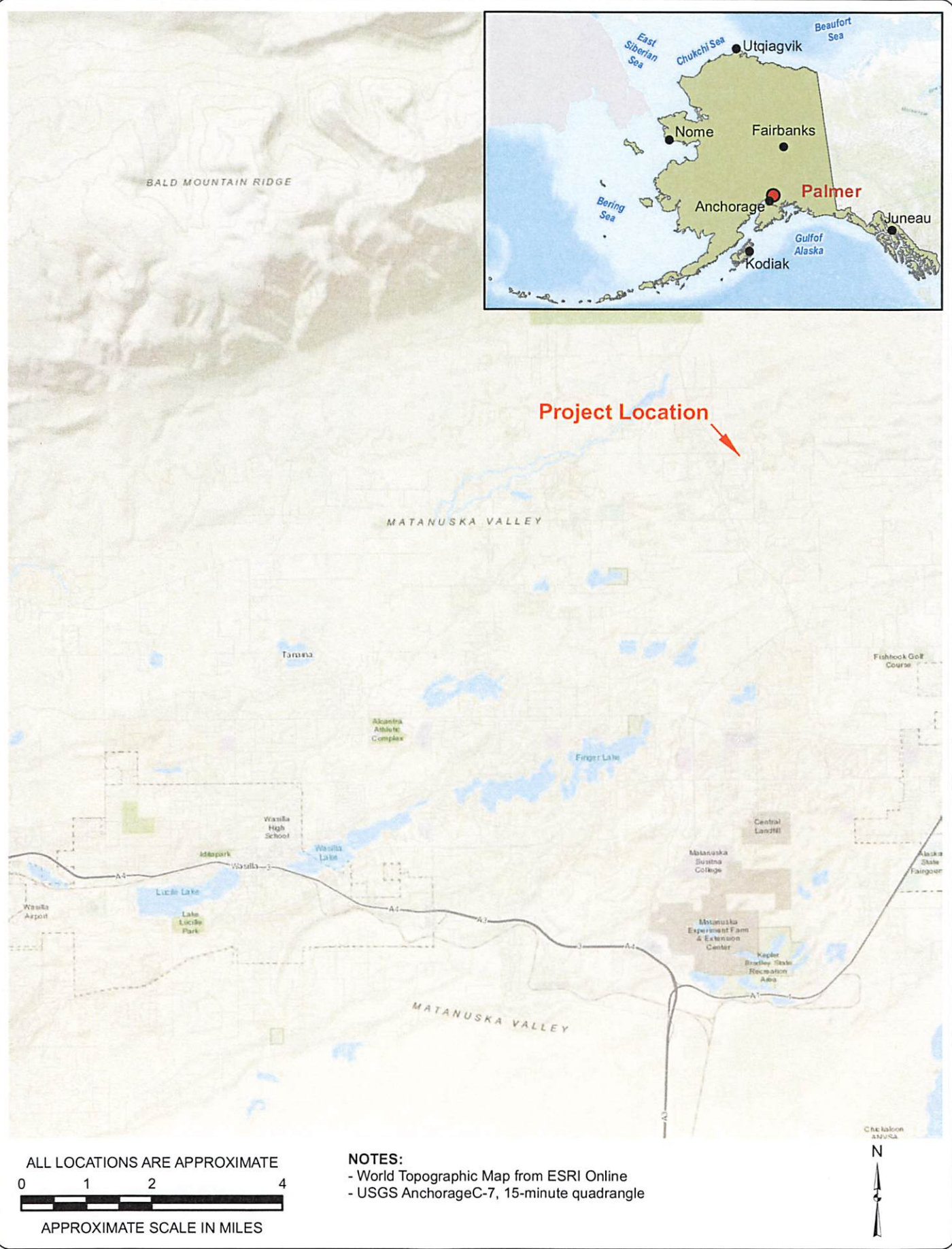
- Location/Vicinity and Area Maps (**Drawings 1 and 2**)
- Investigation Location Map (**Drawing 3**)
- General Notes (**Drawing 4**)
- Explanation of Selected Symbols (**Drawing 5**)
- Test Hole Logs (**Drawings 6 through 14**)
- Classification of Soil for Engineering Purposes (**Drawing 15**)
- USACE Frost Design Soil Classification (**Drawing 16**)
- Classification of Soils Containing Organic Matter (**Drawing 17**)
- Summary of Laboratory Soils Data (**Drawing 18-20**)
- Gradation Curves (**Drawings 21-29**)

HANDOUT #2 **11 OF 40**
CELESTIAL HEIGHTS MSP
CASE # 2024-068
MEETING DATE: JULY 3, 2024

CASE # 2024-068
MEETING DATE: JULY 3, 2024

HANDOUT #2
12 OF 40
CELESTIAL HEIGHTS MSP

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PREPARED BY:
R&M CONSULTANTS, INC.

ADNR TLO BOYD ROAD SUBDIVISION
PALMER, AK

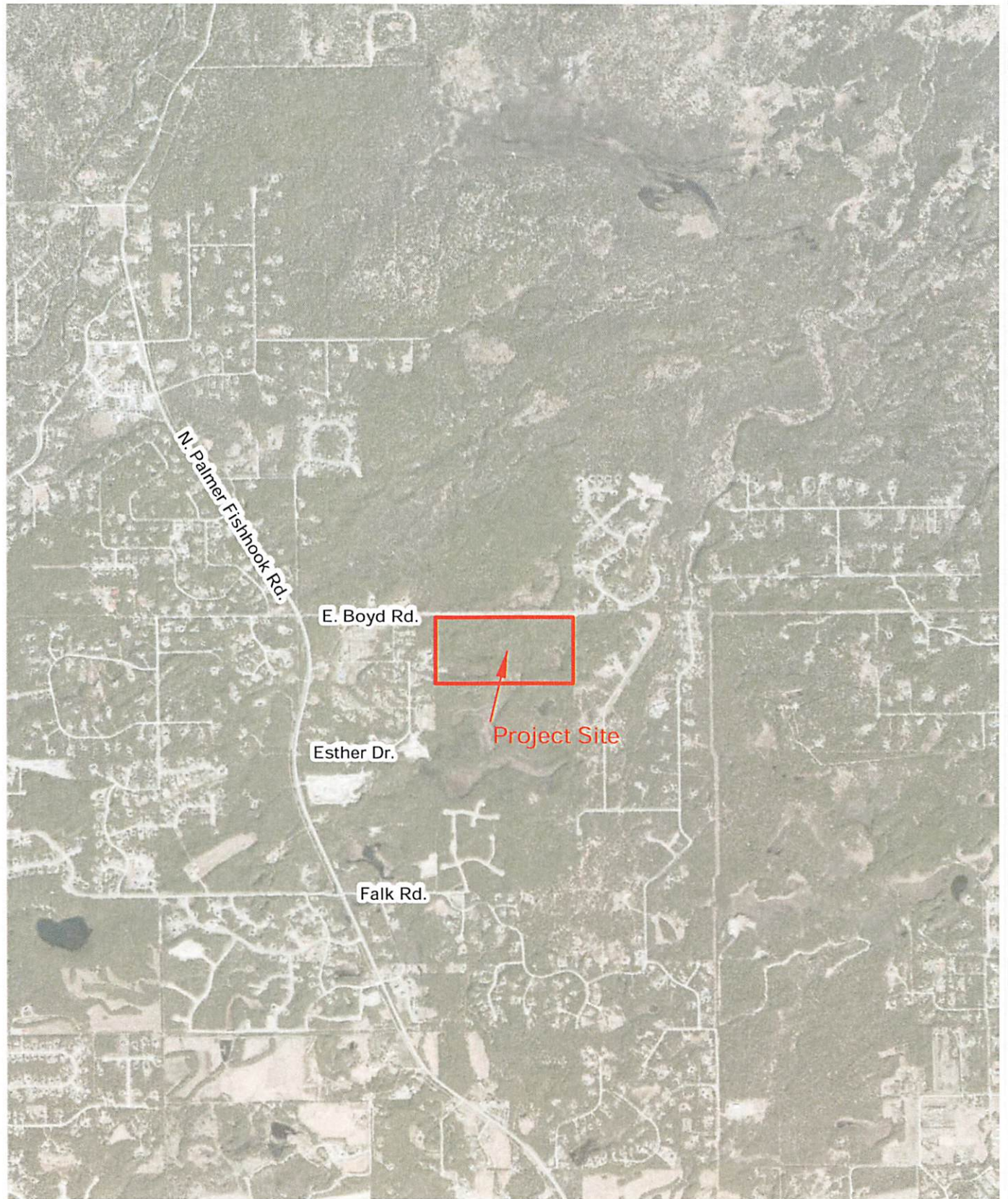
LOCATION AND VICINITY MAP

PROJ.NO:	2846.01
DATE:	JULY 2023
REF:	GEOTECH RPT
DRAWING NO:	1

CASE # 2024-068
MEETING DATE: JULY 3, 2024

HANDOUT #2
13 OF 40
CELESTIAL HEIGHTS MSP

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ALL LOCATIONS ARE APPROXIMATE
0 0.25 0.5 1
APPROXIMATE SCALE IN MILES

NOTES:
- Aerial Photography from World Imagery on ESRI Online

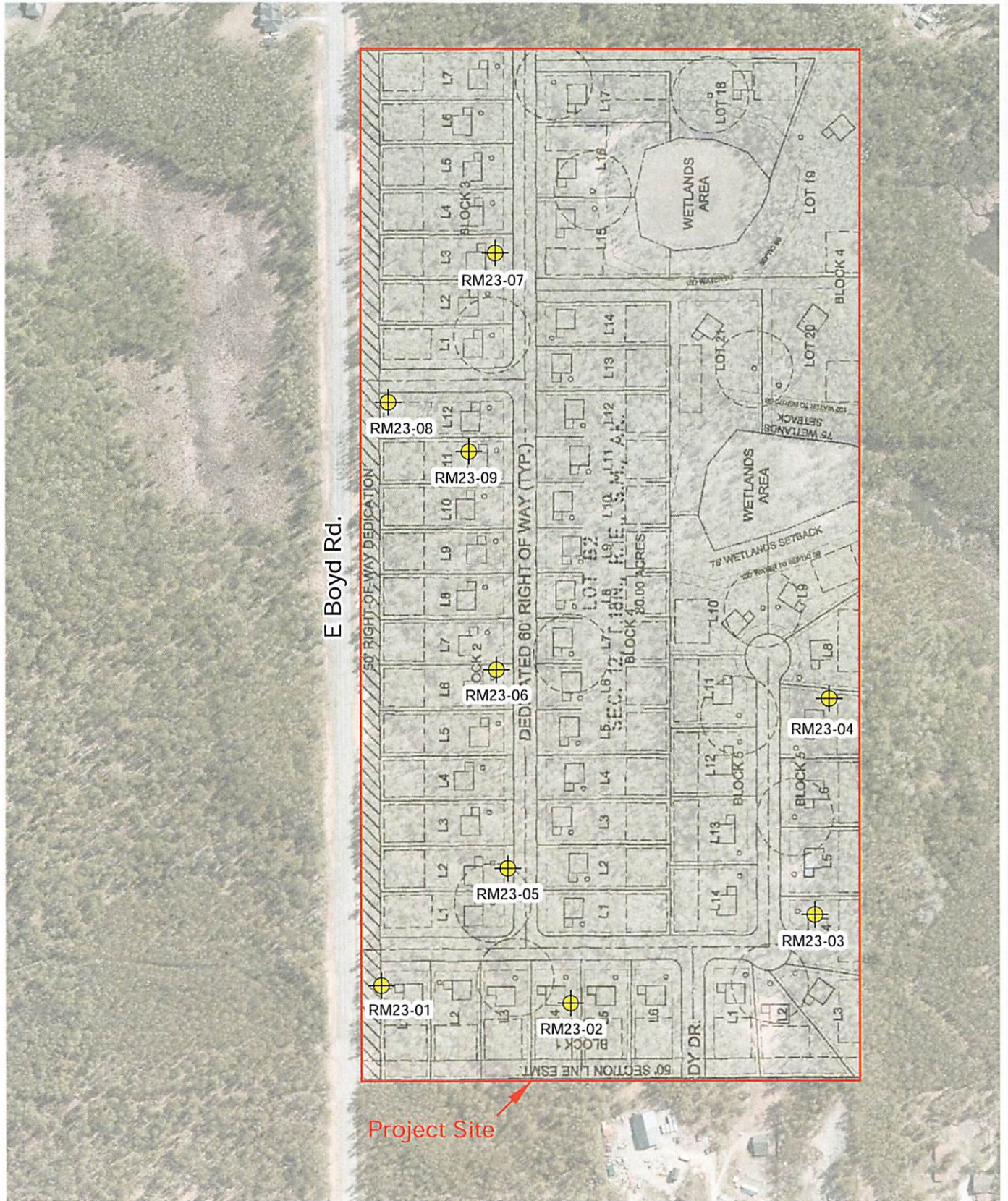


PREPARED BY:
R&M CONSULTANTS, INC.

ADNR TLO BOYD ROAD SUBDIVISION
PALMER, AK
AREA MAP

PROJ.NO: 2846.01
DATE: JULY 2023
REF: GEOTECH RPT
DRAWING NO: 2

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ALL LOCATIONS ARE APPROXIMATE
0 175 350 700
APPROXIMATE SCALE IN FEET

NOTES
- Aerial Photography from World Imagery on ESRI Online
- Concept Design Plan (June 2022)



PREPARED BY:
R&M CONSULTANTS, INC.

ADNR TLO BOYD ROAD SUBDIVISION
PALMER, AK
INVESTIGATION LOCATION MAP

PROJ.NO: 2846.01
DATE: JULY 2023
REF: GEOTECH RPT
DRAWING NO: 3

SOILS

CONSISTENCY AND SYMBOLS

CLASSIFICATION: Identification and classification of the soil is accomplished in accordance with the ASTM version of the Unified Soil Classification System. When laboratory testing data on material passing the 75-mm sieve is available Standard D 2487 (Classification of Soils for Engineering Purposes) is used and when laboratory data is not available D 2488 (Visual-Manual Procedure) is used. This classification system identifies three major soil divisions: coarse-grained soils, fine-grained soils, and highly organic soils. These three divisions are further subdivided into a total of 15 basic soil groups. Based on the results of visual observations and prescribed laboratory tests, a soil is catalogued according to the basic soil groups, assigned a group symbol(s) and name, and thereby classified. Flow charts contained in the two standards can be used to assign the appropriate group symbol(s) and name.

SOIL DENSITY/CONSISTENCY - CRITERIA: Soil density/consistency as defined below and determined by normal field and laboratory methods applies only to non-frozen material. For these materials, the influence of such factors as soil structure, i.e. fissure systems shrinkage cracks, slickensides, etc., must be taken into consideration in making any correlation with the consistency values listed below. In permafrost zones, the consistency and strength of frozen soil may vary significantly and inexplicably with ice content, thermal regime and soil type.

<u>COARSE GRAINED</u> (DOT&PF 2007)		<u>FINE GRAINED</u> (ASTM D 2488)	
<u>Relative Density</u>	<u>N * (blows/FT.)</u>	<u>Consistency</u>	<u>Thumbnail Test</u>
Very loose	0 - 4	Very soft	Thumb > 1 in.
Loose	5 - 10	Soft	Thumb = 1 in.
Medium dense	11 - 30	Firm	Thumb = 1/4 in.
Dense	31 - 50	Hard	Thumbnail indents
Very dense	>50	Very hard	Thumbnail will not indent

* Standard Penetration "N": Blows per 12 inches of a 140-pound manual hammer (lifted with rope & cathead) falling 30 inches on a 2-inch O.D. split-spoon sampler except where noted. Blow counts presented on test boring logs are direct field values (i.e. they have not been corrected to account for hammer efficiency, borehole diameter, sampling method, or rod length)

KEY TO TEST RESULTS

DD - Dry Density	PP - Pocket Penetrometer
LL - Liquid Limit	P200 - % Passing No. 200 Screen
MC - Moisture Content	P.02 - % Passing 0.02 mm
Org - Organic Content	P.005 - % Passing 0.005 mm
PI - Plastic Index	P.002 - % Passing 0.002 mm
PL - Plastic Limit	Gs - Specific Gravity
	Cs - Chemical Sample Identification

HANDOUT #2 **15 OF 40**
CELESTIAL HEIGHTS MSP
CASE # 2024-068
MEETING DATE: JULY 3, 2024

PREPARED BY:
R&M CONSULTANTS, INC.

GENERAL NOTES

PROJ.NO:	GENERAL
DATE:	N/A
REF:	N/A
DWG.NO:	4

STANDARD SYMBOLS

SYMBOL	NAME	PARTICLE SIZE	SYMBOL	NAME
	CLAY	< 0.002mm, Plastic		ORGANICS
	SILT	0.002mm, - #200		ICE
	SAND (Sa)	#200, - #4		ICE W/SOIL INCLUSIONS
	GRAVEL (Gr)	#4, - 3"		ICE LENSE IN SOIL
	COBBLES & BOULDERS	3" - 12" & > 12"		ICE CRYSTALS IN CLAY

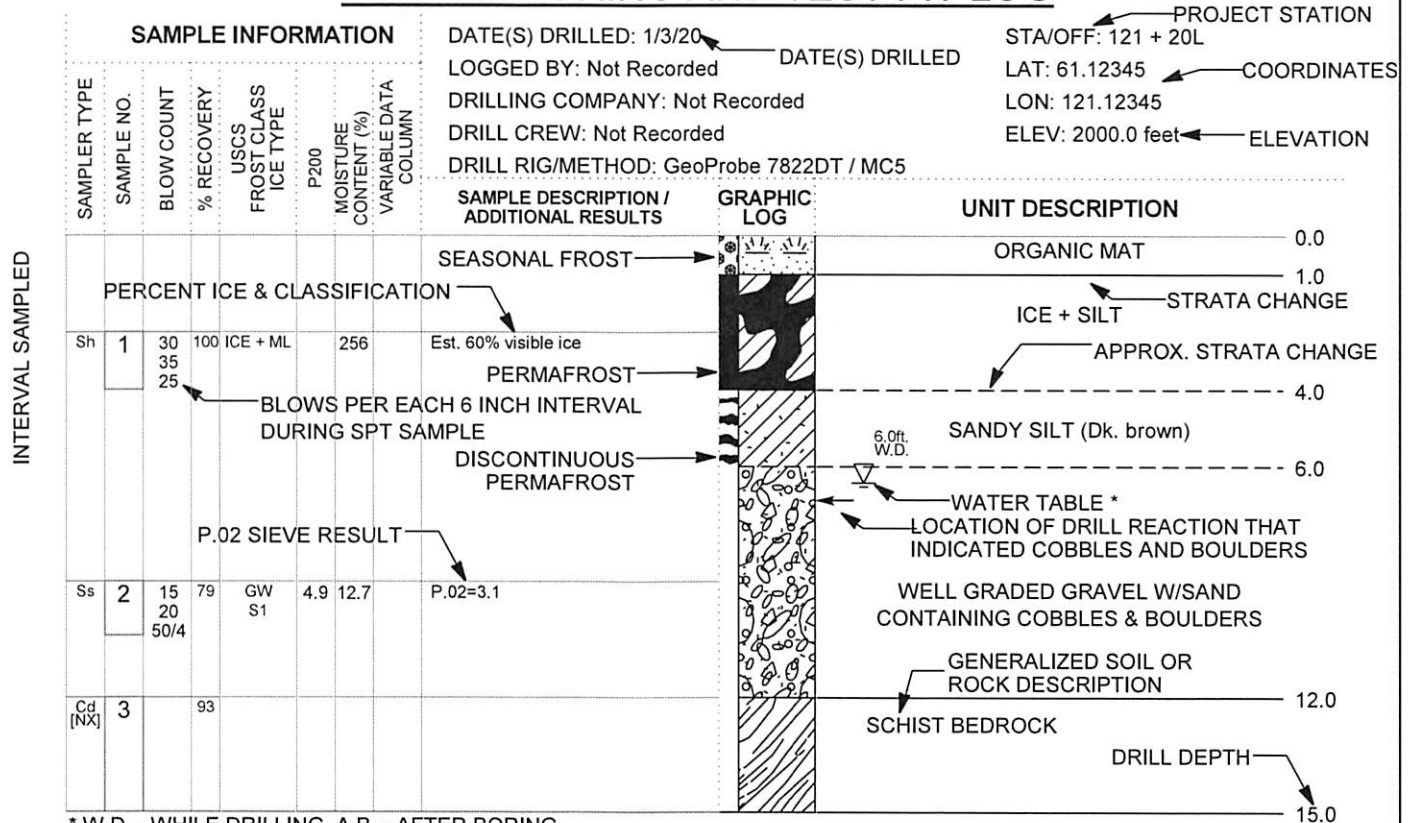
(The symbols shown above are frequently used in combinations, e. g. SILTY GRAVEL W/SAND)

SAMPLER TYPE SYMBOLS

A	Auger Sample	MC 1.5 In. I.D. Macro-core	Tm	Modified Shelby Tube
C	Cuttings Sample	MC7 3.0 In. I.D. Macro-core	Ts	3.0 In. Shelby Tube
Cd	Double Tube Core Barrel	Sh 2.5 In. Split Spoon w/340 lb. Manual Hammer	BX	Rock Core - 1-5/8 in. core diameter
Cs	Single Tube or Auger Core	Sha 2.5 In. Split Spoon w/340 lb. Auto Hammer	NX	Rock Core - 2-1/8 in. core diameter
Ct	Triple Tube Core Barrel	Sl 2.5 In. Split Spoon w/140 lb. Hammer	NQ	Rock Core - 1-7/8 in. core diameter
G	Grab Sample	Ss 1.4 In. Split Spoon w/140 lb. Manual Hammer	HQ	Rock Core - 2-1/2 in. core diameter
		Ssa 1.4 In. Split Spoon w/140 lb. Auto Hammer		

NOTE: Sampler types are noted above the boring log or adjacent to it at the respective depth. Individual logs may not utilize all listed items.

TYPICAL BORING AND TEST PIT LOG



* W.D. - WHILE DRILLING, A.B. - AFTER BORING

** - REFER TO SAMPLER SYMBOL (Ss, Sh, ETC.) FOR SAMPLER I.D. & HAMMER WEIGHT/TYPE

NOTE: Water levels shown on the boring logs are the levels measured in the boring at the times indicated.

PREPARED BY:
R&M CONSULTANTS, INC.








EXPLANATION OF SELECTED SYMBOLS

PROJ.NO:	GENERAL
DATE:	N/A
REF:	N/A
DWG.NO:	5

RM23-01

CASE # 2024-068
MEETING DATE: JULY 3, 2024

HANDOUT #2
17 OF 40
CELESTIAL HEIGHTS MSP

DEPTH (FT)	SAMPLE INFORMATION							Date(s) Drilled: 5/26/23		Lat: 61.6714		
	SAMPLER TYPE	SAMPLE NO.	BLOW COUNT	PERCENT RECOVERY	USCS FROST CLASS ICE TYPE	MOISTURE CONTENT (PERCENT)	P200 (%)	N-VALUE	Logged By: A. Pasikowski		Lon: -149.20721	
								Drilling Company: Wininger Drilling				
								Drill Crew: Joe, Frank & Cole Wininger				
								Rig/Method: CME-55 Track-Mounted / HSA				
								SAMPLE DESCRIPTION / ADDITIONAL RESULTS	GRAPHIC LOG	UNIT DESCRIPTION		
0	Sha	1	0	65		38.5		2	Brown-tan. Containing plant fibers and wholly decomposed disseminated organics., Est. <10% visible organics by volume		0.0	0.4
2		1									ORGANIC MAT (Brown-black, Moist to wet)	
4	Sha	2	10	70	SM* F4*	44.3	41	22	Brown-tan. Containing disseminated organics and some plant matter, Org=12.4%, Fines=41		3.1	
6		3	5		GP-GM* S1	2.8	6.6				Brown-tan-gray, Gr=62, Sa=31, Fines=7, P.02=4.5, P.005=2.8, P.002=1.8	
8	Sha	4	5	70		3.1		24	Driving gravel/cobble. Poor Recovery		27.0	
10		5	36	100							Brown-tan-gray, Gr=79, Sa=18, Fines=3	
12	Sha	6	8	45	GP PFS*	1.0	3.4	37	Brown-tan-gray		27.0	
14		7	19								Tan-gray	
16	Sha	7	23	85		2.5		20	Brown-dk. brown		27.0	
18		8	10			3.3					POORLY GRADED GRAVEL W/SILT AND SAND TO GRAVEL W/SAND CONTAINING COBBLES & BOULDERS (Brown-tan-gray, Gravel subrounded to subangular, hard, Fine to coarse sand, Nonplastic, Dry)	
20	Sha	9	3	80		3.8		14	Brown-tan-gray		27.0	
22		6	8								Tan-gray	
24	Sha	10	7	55		1.9		37	Tan-gray		27.0	
26		14	23								Tan-gray	

* Estimated classification

- 1) Latitude and Longitude coordinates reference the WGS 84 datum and were recorded using a recreational-grade GPS unit.
- 2) Gr = gravel (%), Sa = Sand (%), Fines = Passing the No. 200 sieve (%), P.xx = % passing size mm.
- 3) No groundwater was encountered during measurements performed on 7/13/23.
- 4) 1-inch slotted PVC casing installed to 27 feet for monitoring of groundwater levels.

PREPARED BY:
R&M CONSULTANTS, INC.

ADNR TLO BOYD ROAD SUBDIVISION
PALMER, AK

LOG OF TEST BORING

PROJ.NO:	2846.01
DATE:	AUG 2023
REF:	GEOTECH RPT
DWG.NO:	6

RM23-02

DEPTH (FT)	SAMPLE INFORMATION							Date(s) Drilled: 7/13/23		Lat: 61.6701	
	SAMPLER TYPE	SAMPLE NO.	BLOW COUNT	PERCENT RECOVERY	USCS FROST CLASS ICE TYPE	MOISTURE CONTENT (PERCENT)	P200 (%)	N-VALUE	Logged By: A. Pasikowski	Lon: -149.2075	
								Drilling Company: Clear Excavating			
								Drill Crew: Ryan Laulainen			
								Rig/Method: CAT 308E2 CR Mini Excavator			
								SAMPLE DESCRIPTION / ADDITIONAL RESULTS	GRAPHIC LOG	UNIT DESCRIPTION	
0		1		100		32.4				ORGANIC MAT (Brown, Moist to wet)	0.0
2		2		100	ML* F4*	24.0	68			SANDY SILT CONTAINING ORGANICS (Brown w/orange (rust colored) staining, Fine to medium sand, Nonplastic, Moist to wet)	0.5
4		3		100	SP NFS	2.5	1.6			POORLY GRADED SAND (Gray, Fine to coarse sand, Nonplastic, Dry to moist)	3.0
6		4		100	GW NFS	2.3	1			WELL GRADED GRAVEL W/SAND CONTAINING COBBLES & BOULDERS (Gray-brown, Gravel subrounded to subangular, hard, Fine to coarse sand, Dry to moist)	5.0
10		5		100		1.7				Brown-gray	12.0

* Estimated classification

- 1) Latitude and Longitude coordinates reference the WGS 84 datum and were recorded using a recreational-grade GPS unit.
- 2) Gr = gravel (%), Sa = Sand (%), Fines = Passing the No. 200 sieve (%), P.xx = % passing size mm.
- 3) No groundwater was encountered during test pit excavation.




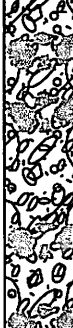
HANDOUT #2 **18 OF 40**
CELESTIAL HEIGHTS MSP
CASE # 2024-068
MEETING DATE: JULY 3, 2024

PREPARED BY:
R&M CONSULTANTS, INC.

ADNR TLO BOYD ROAD SUBDIVISION
 PALMER, AK
 LOG OF TEST PIT

PROJ.NO:	2846.01
DATE:	AUG 2023
REF:	GEOTECH RPT
DWG.NO:	7

RM23-03

DEPTH (FT)	SAMPLE INFORMATION						Date(s) Drilled: 7/13/23		Lat: 61.66841	
	SAMPLER TYPE	SAMPLE NO.	BLOW COUNT	PERCENT RECOVERY	USCS FROST CLASS ICE TYPE	MOISTURE CONTENT (PERCENT)	P200 (%)	N-VALUE	Logged By: A. Pasikowski	
								Drilling Company: Clear Excavating		
								Drill Crew: Ryan Laulainen		
								Rig/Method: CAT 308E2 CR Mini Excavator		
								SAMPLE DESCRIPTION / ADDITIONAL RESULTS	GRAPHIC LOG	UNIT DESCRIPTION
0										0.0
	1				ML* F4*	61.7	76	Brown-black. Containing plant fibers and wholly decomposed organics., Est. <10% visible organics by volume, Fines=76		0.6
2										
	2				GW-GM* S1	3.2	5.5	Brown-tan, Gr=61, Sa=34, Fines=6, P.02=3.9, P.005=1.7, P.002=1.1		3.0
4										
	3				GW* S1*	2.5	3.4	Gr=67, Sa=30, Fines=3		13.0
6										
8										
10										
12										

* Estimated classification
 1) Latitude and Longitude coordinates reference the WGS 84 datum and were recorded using a recreational-grade GPS unit.
 2) Gr = gravel (%), Sa = Sand (%), Fines = Passing the No. 200 sieve (%), P.xx = % passing size mm.
 3) No groundwater was encountered during test pit excavation.

HANDOUT #2 19 OF 40
CELESTIAL HEIGHTS MSP
CASE # 2024-068
MEETING DATE: JULY 3, 2024

PREPARED BY: R&M CONSULTANTS, INC.	ADNR TLO BOYD ROAD SUBDIVISION PALMER, AK <hr/> LOG OF TEST PIT	PROJ.NO: 2846.01 DATE: AUG 2023 REF: GEOTECH RPT DWG.NO: 8
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RM23-04

DEPTH (FT)	SAMPLE INFORMATION							Date(s) Drilled: 7/13/23	Lat: 61.66829
	SAMPLER TYPE	SAMPLE NO.	BLOW COUNT	PERCENT RECOVERY	USCS FROST CLASS ICE TYPE	MOISTURE CONTENT (PERCENT)	P200 (%)	N-VALUE	Logged By: A. Pasikowski
0									
2	1 2				27.9			Brown-reddish brown. Containing plant fibers and wholly decomposed organics., Est. <5% visible organics by volume Brown-reddish brown, Gr=71, Sa=23, Fines=7, P.02=3.5, P.005=1.4, P.002=0.9	0.0
4					3.1	6.5			0.5
6									1.1
8	3				GP-GM* S1*	2.5	5.2	Brown-gray, Gr=57, Sa=38, Fines=5	
10									
12									12.0

* Estimated classification

- 1) Latitude and Longitude coordinates reference the WGS 84 datum and were recorded using a recreational-grade GPS unit.
- 2) Gr = gravel (%), Sa = Sand (%), Fines = Passing the No. 200 sieve (%), P.xx = % passing size mm.
- 3) No groundwater was encountered during test pit excavation.

HANDOUT #2 **20 OF 40**
CELESTIAL HEIGHTS MSP
CASE # 2024-068
MEETING DATE: JULY 3, 2024

PREPARED BY:
R&M CONSULTANTS, INC.

ADNR TLO BOYD ROAD SUBDIVISION
 PALMER, AK
 LOG OF TEST PIT

PROJ.NO:	2846.01
DATE:	AUG 2023
REF:	GEOTECH RPT
DWG.NO:	9

RM23-05

CASE # 2024-068
MEETING DATE: JULY 3, 2024

HANDOUT #2
21 OF 40
CELESTIAL HEIGHTS MSP

DEPTH (FT)	SAMPLE INFORMATION							Date(s) Drilled: 5/26/23 Lat: 61.67052 Logged By: A. Pasikowski Lon: -149.20554 Drilling Company: Winger Drilling Drill Crew: Joe, Frank & Cole Winger Rig/Method: CME-55 Track-Mounted / HSA			
	SAMPLER TYPE	SAMPLE NO.	BLOW COUNT	PERCENT RECOVERY	USCS FROST CLASS ICE TYPE	MOISTURE CONTENT (PERCENT)	P200 (%)	N-VALUE	SAMPLE DESCRIPTION / ADDITIONAL RESULTS	GRAPHIC LOG	UNIT DESCRIPTION
0	Sha	1	0	65	ML F4*	42.0	65	0	Brown-black. Containing plant fibers and wholly decomposed disseminated organics, Org=8.3%, LL=NV, PL=NV, PI=NP, Fines=65	0.0	ORGANIC MAT (Brown-black, Moist to wet)
2			0							0.3	SILT W/SAND CONTAINING ORGANICS (Brown w/orange (rust colored) staining, Fine to medium sand, Nonplastic, Moist to wet)
4	Sha	2	6	65	GW-GM* S1	30.8		24	Brown w/orange staining, Est. 5% visible organics by volume Brown-gray, Gr=62, Sa=33, Fines=5, P.02=3.5, P.005=1.8, P.002=1.5	2.9	
6	Sha	4	8	55		4.1		26	Brown-gray		
8	Sha	5	12	65		2.3		34	Brown-gray		
10	Sha	6	9	85	GP-GM* S1*	3.1	7.1	40	Brown-gray, Gr=47, Sa=46, Fines=7		
14											
16	Sha	7	5	65		3.4		24	Brown-tan-gray		
18											
20	Sha	8	11	85		4.4		27	Brown-gray		
22											
24											
26	Sha	9	30	90		4.3		63	Brown-tan-gray		
27											

WELL TO POORLY GRADED GRAVEL W/SILT AND SAND (Brown-tan-gray, Gravel to 2.5" dia, subrounded to subangular, hard, Fine to coarse sand, Nonplastic, Dry to moist)

* Estimated classification

- 1) Latitude and Longitude coordinates reference the WGS 84 datum and were recorded using a recreational-grade GPS unit.
- 2) Gr = gravel (%), Sa = Sand (%), Fines = Passing the No. 200 sieve (%), P.xx = % passing size mm.
- 3) No groundwater was encountered during measurements performed on 7/13/23.
- 4) 1-inch slotted PVC casing installed to 27 feet for monitoring of groundwater levels.

PREPARED BY:
R&M CONSULTANTS, INC.

ADNR TLO BOYD ROAD SUBDIVISION
PALMER, AK
LOG OF TEST BORING

PROJ.NO:	2846.01
DATE:	AUG 2023
REF:	GEOTECH RPT
DWG.NO:	10

RM23-06

DEPTH (FT)	SAMPLE INFORMATION							Date(s) Drilled: 5/25/23	Lat: 61.67058	
	SAMPLER TYPE	SAMPLE NO.	BLOW COUNT	PERCENT RECOVERY	USCS FROST CLASS ICE TYPE	MOISTURE CONTENT (PERCENT)	P200 (%)	N-VALUE	Logged By: A. Pasikowski	Lon: -149.20265
								Drilling Company: Wininger Drilling		
								Drill Crew: Joe, Frank & Cole Wininger		
								Rig/Method: CME-55 Track-Mounted / HSA		
								SAMPLE DESCRIPTION / ADDITIONAL RESULTS	GRAPHIC LOG	UNIT DESCRIPTION
0	Sha	1	1	70		33.2	2	Brown-dk. brown-black. Containing plant fibers and wholly decomposed and disseminated organics., Est. 5% - 10% visible organics by volume		0.0
2			1							0.4
2	Sha	2	11			38.7	31	Brown w/orange staining, Est. 5% visible organics by volume		SILTY SAND CONTAINING ORGANICS AND COBBLES (Brown w/orange (rust colored) staining, Fine to medium sand, Nonplastic, Moist to wet)
4			15							
4		3	16		GP-GM* S1	2.8	5.5	Tan-gray, Gr=70, Sa=25, Fines=6, P.02=3.5, P.005=1.7, P.002=1.1		
6			20							
6	Sha	4	13	100		2.7	37	Driving gravel/cobble, Tan-gray		
6			17							
6			20							
6			50/0.0							
8	Sha	5	10	60		2.9	24	Tan-gray		
8			14							
8			10							
8			10							
10	Sha	6	7	70	GW-GM* S1*	2.9	6.8	17	Tan-gray, Gr=52, Sa=41, Fines=7	
10			9							
10			8							
10			9							
12										
14										
14	Sha	7	12	50		1.1	36	Tan-gray		WELL TO POORLY GRADED GRAVEL W/SILT AND SAND TO GRAVEL W/SAND CONTAINING COBBLES & BOULDERS (Gray-tan, Gravel subrounded to subangular, hard, Fine to coarse sand, Nonplastic, Dry to moist)
14			21							
14			15							
14			13							
16										
18										
20	Sha	8	9	38			50	Driving gravel/cobble. Rock fragments in sampler.		
20			50/0.3							
22										
24										
24	Sha	9	4	75		5.5	21	Tan-gray		
24			10							
24			11							
24			11							
26										

* Estimated classification



- 1) Latitude and Longitude coordinates reference the WGS 84 datum and were recorded using a recreational-grade GPS unit.
- 2) Gr = gravel (%), Sa = Sand (%), Fines = Passing the No. 200 sieve (%), P.xx = % passing size mm.
- 3) No groundwater was encountered during measurements performed on 7/13/23.
- 4) 1-inch slotted PVC casing installed at 27 feet for monitoring for groundwater levels.

CASE # 2024-068
 MEETING DATE: JULY 3, 2024
 HANDOUT #2
 22 OF 40
 CELESTIAL HEIGHTS MSP

PREPARED BY: R&M CONSULTANTS, INC.	ADNR TLO BOYD ROAD SUBDIVISION PALMER, AK LOG OF TEST BORING	PROJ.NO: 2846.01 DATE: AUG 2023 REF: GEOTECH RPT DWG.NO: 11
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RM23-07

CASE # 2024-068
MEETING DATE: JULY 3, 2024
HANDOUT #2
23 OF 40
CELESTIAL HEIGHTS MSP

DEPTH (FT)	SAMPLE INFORMATION							Date(s) Drilled: 5/24/23		Lat: 61.67055	
	SAMPLER TYPE	SAMPLE NO.	BLOW COUNT	PERCENT RECOVERY	USCS FROST CLASS ICE TYPE	MOISTURE CONTENT (PERCENT)	P200 (%)	N-VALUE	Logged By: A. Pasikowski		Lon: -149.19659
								Drilling Company: Winger Drilling			
								Drill Crew: Joe, Frank & Cole Winger			
								Rig/Method: CME-55 Track-Mounted / HSA			
								SAMPLE DESCRIPTION / ADDITIONAL RESULTS	GRAPHIC LOG	UNIT DESCRIPTION	
0	Sha	1	0	70		47.3	0	Brown-tan-black. Containing plant fibers and wholly decomposed and disseminated organics., Est. 5% - 10% visible organics by volume		0.0	ORGANIC MAT (Brown-dk. brown, Moist to wet)
2			0							0.4	SILTY SAND CONTAINING ORGANICS (Brown-tan, Fine to medium sand, Nonplastic, Moist to wet)
4	Sha	2	8	70		39.5	26	Brown-tan, Est. <5% visible organics by volume Brown, Gr=42, Sa=54, Fines=4		3.0	POORLY GRADED SAND W/GRAVEL CONTAINING COBBLES (Brown, Gravel subrounded to subangular, Fine to coarse sand, Nonplastic, Dry to moist)
6			13		SP NFS*	3.8	3.9			4.8	POORLY GRADED SAND WSILT AND GRAVEL TO WELL GRADED GRAVEL W/ SAND (Brown-gray, Gravel to 2.5" dia, subrounded to subangular, hard, Fine to coarse sand, Nonplastic, Dry to moist)
8	Sha	4	8	95	SP-SM* S2	3.9	6.6	20			
10			10								
12			10								
14			10								
16	Sha	5	9	80		3.1	21	Brown			
18			11								
20			10								
22	Sha	6	4	95	GW PFS*	3.9	3.4	15	Brown-gray, Gr=63, Sa=34, Fines=3		
24			5								
26			10								
27.0			10								

* Estimated classification

- 1) Latitude and Longitude coordinates reference the WGS 84 datum and were recorded using a recreational-grade GPS unit.
- 2) Gr = gravel (%), Sa = Sand (%), Fines = Passing the No. 200 sieve (%), P.xx = % passing size mm.
- 3) No groundwater was encountered during measurement performed on 7/13/23.
- 4) 1-inch slotted PVC casing installed to 27 feet for monitoring of groundwater levels.

PREPARED BY: R&M CONSULTANTS, INC.	ADNR TLO BOYD ROAD SUBDIVISION PALMER, AK LOG OF TEST BORING	PROJ.NO: 2846.01 DATE: AUG 2023 REF: GEOTECH RPT DWG.NO: 12
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RM23-08

CASE # 2024-068
MEETING DATE: JULY 3, 2024

HANDOUT #2
24 OF 40
CELESTIAL HEIGHTS MSP

DEPTH (FT)	SAMPLE INFORMATION							Date(s) Drilled: 5/24/23		Lat: 61.6713		
	SAMPLER TYPE	SAMPLE NO.	BLOW COUNT	PERCENT RECOVERY	USCS FROST CLASS ICE TYPE	MOISTURE CONTENT (PERCENT)	P200 (%)	N-VALUE	Logged By: A. Pasikowski		Lon: -149.19876	
									Drilling Company: Winger Drilling		Drill Crew: Joe, Frank & Cole Winger	
								Rig/Method: CME-55 Track-Mounted / HSA				
								SAMPLE DESCRIPTION / ADDITIONAL RESULTS	GRAPHIC LOG	UNIT DESCRIPTION		
0	Sha	1	0	80		42.9	0	Brown-black. Containing plant fibers and wholly decomposed disseminated organics., Est. 5% - 10% visible organics by volume		0.0	0.4	
2			0							0.4	0.4	
4	Sha	2	1	85	GM* F3*	21.2	39	15	Dk. brown, Org=6.6%, Gr=34, Sa=27, Fines=39	2.5	2.5	
6			2							2.5	2.5	
8	Sha	3	8	90	GP-GM* S1	4.0	8.1	29	Brown-tan, Gr=66, Sa=26, Fines=8, P.02=5.3, P.005=3.0, P.002=2.0	5.0	5.0	
10			12							5.0	5.0	
12	Sha	4	9	60	GP-GM* S1*	2.9	5.3	44	Brown-lt. brown, Gr=71, Sa=24, Fines=5			
14			15									
16	Sha	5	10	80				32	Rock fragments in sampler, Brown-gray			
18			15									
20	Sha	6	6	75		3.3		23	Brown-gray	14.0	14.0	
22			9								14.0	14.0
24	Sha	7	9	95		3.5		44	Brown	16.0	16.0	
26			19								16.0	16.0
28	Sha	8	9	65		3.2		52	Brown	18.0	18.0	
30			35								18.0	18.0
32			17						POORLY GRADED GRAVEL W/SILT AND SAND TO GRAVEL W/SAND CONTAINING COBBLES & BOULDERS (Brown-lt. brown-gray, Gravel subrounded to subangular, hard, Fine to coarse sand, Nonplastic, Dry to moist)	20.0	20.0	
34			15								20.0	20.0
36										27.0	27.0	

* Estimated classification

- 1) Latitude and Longitude coordinates reference the WGS 84 datum and were recorded using a recreational-grade GPS unit.
- 2) Gr = gravel (%), Sa = Sand (%), Fines = Passing the No. 200 sieve (%), P.xx = % passing size mm.
- 3) No groundwater was encountered during measurements performed on 7/13/23.
- 4) 1-inch slotted PVC casing installed to 27 feet for monitoring of groundwater levels.

PREPARED BY:
R&M CONSULTANTS, INC.

ADNR TLO BOYD ROAD SUBDIVISION
PALMER, AK
LOG OF TEST BORING

PROJ.NO:	2846.01
DATE:	AUG 2023
REF:	GEOTECH RPT
DWG.NO:	13

RM23-09

CASE # 2024-068
MEETING DATE: JULY 3, 2024

HANDOUT #2
25 OF 40
CELESTIAL HEIGHTS MSP

DEPTH (FT)	SAMPLE INFORMATION							Date(s) Drilled: 5/25/23 Logged By: A. Pasikowski Drilling Company: Wininger Drilling Drill Crew: Joe, Frank & Cole Wininger Rig/Method: CME-55 Track-Mounted / HSA			
	SAMPLER TYPE	SAMPLE NO.	BLOW COUNT	PERCENT RECOVERY	USCS FROST CLASS ICE TYPE	MOISTURE CONTENT (PERCENT)	P200 (%)	N-VALUE	SAMPLE DESCRIPTION / ADDITIONAL RESULTS	GRAPHIC LOG	UNIT DESCRIPTION
0	Sha	1	0	85	ML F4*	42.2	65	2	Brown-tan-black. Containing plant fibers and wholly decomposed and disseminated organics., Org=8.3%, LL=NV, PL=NV, PI=NP, Fines=65	0.0	ORGANIC MAT (Brown-tan-black, Moist-wet)
2	Sha	2	5	100		50.7		22	Brown-tan, Est. 5% - 10% visible organics by volume	0.5	SANDY SILT CONTAINING ORGANICS (Brown-tan-gray, Fine to medium sand, Nonplastic, Moist-wet)
4		3	11		GP* PFS	3.7	4.5		Tan-gray, Gr=54, Sa=42, Fines=5, P.02=3.1, P.005=2.3, P.002=1.4	3.2	
6	Sha	4	6	70	GP-GM* S1*	3.9	5.7	28	Tan-gray, Gr=54, Sa=40, Fines=6		
10	Sha	5	27	80		2.6		24	Tan-gray		
16	Sha	6	24	80	GW-GM* S1*	3.1	7.5	31	Tan-gray, Gr=50, Sa=43, Fines=8		WELL TO POORLY GRADED GRAVEL W/SILT AND SAND CONTAINING COBBLES & BOULDERS (Tan-gray, Gravel subrounded to subangular, hard, Fine to coarse sand, Nonplastic, Dry to moist)
22	Sha	7	13	70		3.8		30	Tan-gray		
26	Sha	8	10	80		4.3		32	Rock fragments in sampler, Tan-gray		
27.0											

* Estimated classification

- 1) Latitude and Longitude coordinates reference the WGS 84 datum and were recorded using a recreational-grade GPS unit.
- 2) Gr = gravel (%), Sa = Sand (%), Fines = Passing the No. 200 sieve (%), P.xx = % passing size mm.
- 3) No groundwater was encountered during measurements performed on 7/13/23.
- 4) 1-inch slotted PVC casing installed to 27 feet for monitoring of groundwater levels.

PREPARED BY:
R&M CONSULTANTS, INC.

ADNR TLO BOYD ROAD SUBDIVISION
PALMER, AK
LOG OF TEST BORING

PROJ.NO:	2846.01
DATE:	AUG 2023
REF:	GEOTECH RPT
DWG.NO:	14

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests ^A			Soil Classification			
			Group Symbol	Group Name ^B		
Coarse-grained Soils More than 50% retained on the No. 200 sieve	Gravels More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines ^C	$Cu \geq 4$ and $1 < Cc < 3$ ^E	GW	Well-graded gravel ^F	
			$Cu < 4$ and/or $1 > Cc > 3$ ^E	GP	Poorly-graded gravel ^F	
		Gravels with Fines More than 12% fines ^C	Fines classify as ML or MH	GM	Silty gravel ^{F,G,H}	
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines ^D	$Cu > 6$ and $1 < Cc < 3$ ^E	SW	Well-graded sand ^I	
			$Cu < 6$ and/or $1 > Cc > 3$ ^E	SP	Poorly-graded sand ^I	
		Sands with Fines More than 12% fines ^D	Fines classify as ML or MH	SM	Silty sand ^{G,H,I}	
Fine-grained Soils 50% or more passes the No. 200 sieve	Silts and Clays Liquid Limit less than 50	inorganic	$PI > 7$ and plots on or above "A" line ^J	CL	Lean clay ^{K,L,M}	
		organic	$PI < 4$ and plots below "A" line ^J	ML	Silt ^{K,L,M}	
	Silts and Clays Liquid Limit 50 or more	inorganic	Liquid limit - oven dried	< 0.75	OL	Organic Clay ^{K,L,M,N}
			Liquid limit - not dried		OH	Organic Silt ^{K,L,M,O}
		organic	PI plots on or above "A" line	CH	Fat clay ^{K,L,M}	
			PI plots below "A" line	MH	Elastic silt ^{K,L,M}	
Highly organic soils	Primarily organic matter, dark in color, and organic odor			PT	Peat	

^A Based on the material passing the 3-in. (75-mm) sieve.

^B If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

^C Gravel with 5 to 12 % fines require dual symbols:
 GW-GM well-graded gravel with silt
 GW-GC well-graded gravel with clay
 GP-GM poorly-graded gravel with silt
 GP-GC poorly-graded gravel with clay

^D Sands with 5 to 12 % fines require dual symbols:
 SW-SM well-graded sand with silt
 SW-SC well-graded sand with clay
 SP-SM poorly-graded sand with silt
 SP-SC poorly-graded sand with clay

^E $Cu = D_{60} / D_{10}$ $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

^F If soil contains $\geq 15\%$ sand, add "with sand" to group name.

^G If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

^H If fines are organic, add "with organic fines" to group name.

^I If soil contains $\geq 15\%$ gravel, add "with gravel" to group name.

^J If Atterberg limits plot in hatched area, soil is a CL-ML, silty clay.

^K If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

^L If soil contains $\geq 30\%$ plus No. 200, predominantly sand, add "sandy" to group name.

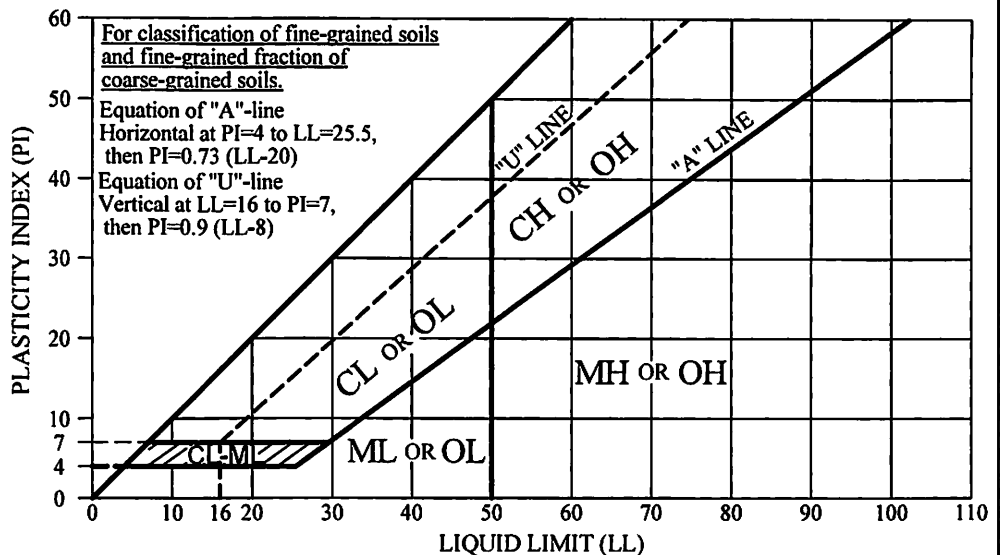
^M If soil contains $\geq 30\%$ plus No. 200, predominantly gravel, add "gravelly" to group name.

^N $PI \geq 4$ and plots on or above "A" line.

^O $PI < 4$ and plots below "A" line.

^P PI plots on or above "A" line.

^Q PI plots below "A" line.



PREPARED BY:
 R&M CONSULTANTS, INC.

**CLASSIFICATION OF SOILS FOR
 ENGINEERING PURPOSES ASTM D 2487**

PROJ.NO:	GENERAL
DATE:	N/A
REF:	N/A
DWG.NO:	15

**U.S. ARMY CORPS OF ENGINEERS
FROST DESIGN SOIL CLASSIFICATION**

FROST GROUP	KIND OF SOIL	PERCENTAGE FINER THAN 0.02 mm BY WEIGHT	TYPICAL SOIL TYPES UNDER UNIFIED SOIL CLASSIFICATION SYSTEM
NFS*	(a) Gravels Crushed Stone Crushed Rock	0 - 1.5	GW, GP
	(b) Sands	0 - 3	SW, SP
PFS+	(a) Gravels Crushed Stone Crushed Rock	1.5 - 3	GW, GP
	(b) Sands	3 - 10	SW, SP
S1	Gravelly Soils	3 - 6	GW, GP, GW-GM, GP-GM
S2	Sandy Soils	3 - 6	SW, SP, SW-SM, SP-SM
F1	Gravelly Soils	6 - 10	GM, GW-GM, GP-GM
F2	(a) Gravelly Soils	10 - 20	GM, GW-GM, GP-GM
	(b) Sands	6 - 15	SM, SW-SM, SP-SM
F3	(a) Gravelly Soils	Over 20	GM, GC
	(b) Sands, Except Very Fine Silty Sands	Over 15	SM, SC
	(c) Clays, PI>12	-----	CL, CH
F4	(a) All Silts	-----	ML, MH
	(b) Very Fine Silty Sand	Over 15	SM
	(c) Clays PI<12	-----	CL, CL-ML
	(d) Varved Clays and Other Fine-grained Banded Sediments	-----	CL, CL-ML CL and ML CL, ML, and SM; CL, CH and ML; CL, CH, ML and SM
* Non-frost-susceptible + Possibly frost-susceptible, but requires laboratory test to determine frost design soils classification.			

From: "Seasonal Frost Conditions", June, 1992, U.S. Army Corps of Engineers TM-5-822-5.

CASE # 2024-068
MEETING DATE: JULY 3, 2024

HANDOUT #2
27 OF 40
CELESTIAL HEIGHTS MSP

PREPARED BY:
R&M CONSULTANTS, INC.

FROST DESIGN SOIL CLASSIFICATION

PROJ.NO:	GENERAL
DATE:	N/A
REF:	N/A
DWG.NO:	16

CLASSIFICATION¹ OF SOILS WITH ORGANIC MATTER

PEAT (Pt): Soil comprised of predominantly organic carbon fibers (macroscopic) and/or decayed (microscopic) vegetal matter. Peat is generally dark brown to black, with a very spongy feel and strong organic odor; typically, the ash content (ASTM D 2974) is <20%, the moisture content is >500%, the fiber content is >50% (by volume), the specific gravity is <1.7, and the dry unit weight is <17 pounds per cubic-foot (pcf).

PEATY-ORGANIC SOIL (PtO): Transitional soil group comprised of significant proportions, by mass, of both mineral particles and organic carbon fibers and/or decayed vegetal matter. Peaty-Organic Soil is generally light brown to black, with a spongy feel and organic odor; typically, the ash content ranges from 20 to 40%, the moisture content is between 150 and 800%, the fiber content is <50%, the specific gravity ranges from 1.6 to 1.9, and the dry unit weight is between 11 and 19 pcf.

ORGANIC SOIL (O): Soil comprised predominately of mineral particles, with a fraction of organic matter sufficient to notably effect the geotechnical properties (i.e. plasticity, dry strength and compactability). Most of the organic matter formed in-place (sedentary deposit), and is typically comprised of microscopic particles (the fiber content is often insignificant). Organic Soil is generally brown to blackish-brown, and soft to loose; typically, the ash content ranges from 40 to 95%, the moisture content is between 100 and 500%, the specific gravity is >1.7, the liquid limit is >50% and/or the liquid limit measured on an oven-dried sample ("Dry Preparation") is <70% of the liquid limit measured on a fresh sample ("Wet Preparation"), and the dry unit weight is >13 to 15 pcf.

MINERAL SOIL WITH ORGANIC CONTENT (oUSC)²: Transitional soil group consisting predominately of mineral constituents with a small fraction of organic matter which may, under certain conditions, effect the geotechnical properties. Most of the organic matter is macroscopic and likely formed in-place; but may also include roots, or fibrous particles that likely originated elsewhere and were transported to the site by wind or very low energy lacustrine-environment (sedimentary deposit). The soil color and odor is often not effected by the organic matter; typically, the ash content ranges from 90 to 99%, the moisture content is <100%, the specific gravity is >2.4, and the liquid limit is <50%.

MINERAL SOIL (USC): Soil is comprised predominately of mineral particles, but may contain a trace of organic (or apparent organic) matter that has no significant effect on the geotechnical properties. Ash contents are typically >97 to 99%, and the loss of mass may be more from ignition of interstitial water or non-vegetal, carbon-based matter. Most of the organic matter likely originated elsewhere and was transported to the site by wind or very low energy lacustrine-environment, and is typically comprised of fine-woody particles or roots.

¹ Callout (Group Symbol) for a general stratigraphic unit consisting predominately of this type soil.

² Use an annotated group symbol; a small caps "o", preceded by the mineral constituents based on the Unified Soil Classification (USC) System (following ASTM D 2487, Classification of Soil for Engineering Purposes).

CASE # 2024-068
MEETING DATE: JULY 3, 2024

HANDOUT #2
CELESTIAL HEIGHTS MSP
28 OF 40

PREPARED BY:
R&M CONSULTANTS, INC.

ORGANIC MATTER SOIL CLASSIFICATION

PROJ.NO:	GENERAL
DATE:	N/A
REF:	N/A
DWG.NO:	17

**HANDOUT #2
CELESTIAL HEIGHTS MSP**

29 OF 40

**CASE # 2024-068
MEETING DATE: JULY 3, 2024**

SAMPLE IDENTIFICATION			PARTICLE SIZE ANALYSIS (% FINER) ¹															ATTERBERG LIMITS			MOIST. CONT. (%)	ASTM CLASS ²	FROST CLASS	ORG. CONT. (%)			
			STANDARD SIEVE SIZE												(mm)												
TEST BORING	NO.	DEPTH (FT)	3"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4	#10	#20	#40	#60	#140	#200	0.02	0.005	0.002	LL	PL	PI					
RM23-01	1	0.0- 2.0																					38.5				
RM23-01	2	2.5- 3.1													41									44.3	SM*	F4*	12.4
RM23-01	3	3.1- 4.5		100	79	59	54	49	45	38	32	24	15	11	8	6.6	4.5	2.8	1.8				2.8	GP-GM*	S1		
RM23-01	4	5.0- 7.0																					3.1				
RM23-01	6	10.0- 12.0	100	74	62	43	36	29	26	21	15	11	7	6	4	3.4							1.0	GP	PFS*		
RM23-01	7	15.0- 15.9																					2.5				
RM23-01	8	15.9- 17.0																					3.3				
RM23-01	9	20.0- 22.0																					3.8				
RM23-01	10	25.0- 27.0																					1.9				
RM23-02	1	0.0- 1.0																					32.4				
RM23-02	2	1.0- 3.0													68								24.0	ML*	F4*	6.5	
RM23-02	3	3.0- 5.0			100	97	97	96	95	94	91	75	28	6	2	1.6	1.5	0.9	0.8				2.5	SP	NFS		
RM23-02	4	5.0- 8.0		100	88	75	59	45	39	28	21	14	6	2	1	1.0							2.3	GW	NFS		
RM23-02	5	9.0- 12.0																					1.7				
RM23-03	1	0.6- 1.4													76								61.7	ML*	F4*		
RM23-03	2	3.0- 6.0		100	94	81	67	58	52	39	29	22	15	10	7	5.5	3.9	1.7	1.1				3.2	GW-GM*	S1		
RM23-03	3	10.0- 13.0		100	80	67	58	47	43	33	25	17	11	7	4	3.4							2.5	GW*	S1*		
RM23-04	1	0.5- 1.1																					27.9				
RM23-04	2	1.1- 3.1		100	74	53	44	38	35	29	24	19	15	11	7	6.5	3.5	1.4	0.9				3.1	GP-GM*	F1		
RM23-04	3	8.0- 12.0		100	83	73	67	60	56	43	32	22	14	9	6	5.2							2.5	GP-GM*	S1*		
RM23-05	1	0.0- 2.0													65					NV	NV	NP	42.0	ML	F4*	8.3	
RM23-05	2	2.5- 2.9																					30.8				
RM23-05	3	2.9- 4.5		100	92	78	71	60	51	38	29	22	14	10	6	5.1	3.5	1.8	1.5				2.8	GW-GM*	S1		
RM23-05	4	5.0- 7.0																					4.1				
RM23-05	5	7.5- 9.5																					2.3				
RM23-05	6	10.0- 12.0		100	95	92	85	73	67	53	40	27	16	11	8	7.1							3.1	GP-GM*	S1*		
RM23-05	7	15.0- 17.0																					3.4				

NOTES:

- 1) The maximum particle size of samples is limited by the I.D. of the sampler opening or the width of the auger flights.
 - 2) Soil plasticity was estimated following ASTM D 2488 when the Atterberg limits were not tested.
- *Estimated classification

PREPARED BY:
R&M CONSULTANTS, INC.

ADNR TLO BOYD ROAD SUBDIVISION
PALMER, AK

SUMMARY OF LABORATORY SOILS DATA

PROJ.NO: 2846.01
DATE: AUG 2023
REF: GEOTECH RPT
DWG.NO: 18

**HANDOUT #2
CELESTIAL HEIGHTS MSP**

30 OF 40

**CASE # 2024-068
MEETING DATE: JULY 3, 2024**

SAMPLE IDENTIFICATION			PARTICLE SIZE ANALYSIS (% FINER) ¹															ATTERBERG LIMITS			MOIST. CONT. (%)	ASTM CLASS ²	FROST CLASS	ORG. CONT. (%)			
			STANDARD SIEVE SIZE												(mm)												
TEST BORING	NO.	DEPTH (FT)	3"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4	#10	#20	#40	#60	#140	#200	0.02	0.005	0.002	LL	PL	PI					
RM23-05	8	20.0-22.0																					4.4				
RM23-05	9	25.0-27.0																						4.3			
RM23-06	1	0.0-2.0																						33.2			
RM23-06	2	2.5-3.3																						38.7			
RM23-06	3	3.3-4.5		100	93	78	65	50	43	30	20	15	11	8	6	5.5	3.5	1.7	1.1					2.8	GP-GM*	S1	
RM23-06	4	5.0-6.5																						2.7			
RM23-06	5	7.5-9.5																						2.9			
RM23-06	6	10.0-12.0		100	89	84	75	65	59	48	34	23	14	11	8	6.8								2.9	GW-GM*	S1*	
RM23-06	7	15.0-17.0																						1.1			
RM23-06	9	25.0-27.0																						5.5			
RM23-07	1	0.0-2.0																						47.3			
RM23-07	2	2.5-3.0																						39.5			
RM23-07	3	3.0-4.5		100	91	81	78	72	67	58	49	36	16	8	5	3.9								3.8	SP	NFS*	
RM23-07	4	5.0-7.0		100	96	88	84	78	74	66	56	41	22	13	8	6.6	5.3	3.4	2.2					3.9	SP-SM*	S2	
RM23-07	5	7.5-9.5																						3.1			
RM23-07	6	10.0-12.0			100	96	93	76	61	37	25	16	10	6	4	3.4								3.9	GW	PFS*	
RM23-07	7	15.0-17.0																						4.0			
RM23-07	8	20.0-22.0																						5.4			
RM23-07	9	25.0-27.0																						7.4			
RM23-08	1	0.0-2.0																						42.9			
RM23-08	2	2.5-4.5		100	84	79	76	72	70	66	61	57	52	48	42	39								21.2	GM*	F3*	6.6
RM23-08	3	5.0-7.0		100	92	75	61	52	45	34	27	22	17	13	9	8.1	5.3	3.0	2.0					4.0	GP-GM*	S1	
RM23-08	4	7.5-9.5		100	75	59	50	42	37	29	22	17	13	10	6	5.3								2.9	GP-GM*	S1*	
RM23-08	6	15.0-17.0																						3.3			
RM23-08	7	20.0-22.0																						3.5			
RM23-08	8	25.0-27.0																						3.2			
RM23-09	1	0.0-2.0														65				NV	NV	NP		42.2	ML	F4*	8.3

NOTES:
 1) The maximum particle size of samples is limited by the I.D. of the sampler opening or the width of the auger flights.
 2) Soil plasticity was estimated following ASTM D 2488 when the Atterberg limits were not tested.
 *Estimated classification

PREPARED BY:
R&M CONSULTANTS, INC.

ADNR TLO BOYD ROAD SUBDIVISION
PALMER, AK
SUMMARY OF LABORATORY SOILS DATA

PROJ.NO: 2846.01
 DATE: AUG 2023
 REF: GEOTECH RPT
 DWG.NO: 19

**HANDOUT #2
CELESTIAL HEIGHTS MSP**

31 OF 40

**CASE # 2024-068
MEETING DATE: JULY 3, 2024**

SAMPLE IDENTIFICATION			PARTICLE SIZE ANALYSIS (% FINER) ¹															ATTERBERG LIMITS			MOIST. CONT. (%)	ASTM CLASS ²	FROST CLASS	ORG. CONT. (%)				
			STANDARD SIEVE SIZE												(mm)													
TEST BORING	NO.	DEPTH (FT)	3"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4	#10	#20	#40	#60	#140	#200	0.02	0.005	0.002	LL	PL	PI						
RM23-09	2	2.5- 3.2																						50.7				
RM23-09	3	3.2- 4.5		100	91	83	74	64	58	46	35	25	14	9	5	4.5	3.1	2.3	1.4						3.7	GP*	PFS	
RM23-09	4	5.0- 7.0	100	87	79	70	68	61	57	46	35	24	14	10	7	5.7									3.9	GP-GM*	S1*	
RM23-09	5	10.0- 12.0																							2.6			
RM23-09	6	15.0- 17.0	100	93	86	82	76	66	62	50	37	27	18	13	9	7.5									3.1	GW-GM*	S1*	
RM23-09	7	20.0- 22.0																							3.8			
RM23-09	8	25.0- 27.0																							4.3			

NOTES:

- 1) The maximum particle size of samples is limited by the I.D. of the sampler opening or the width of the auger flights.
 - 2) Soil plasticity was estimated following ASTM D 2488 when the Atterberg limits were not tested.
- *Estimated classification

PREPARED BY:
R&M CONSULTANTS, INC.

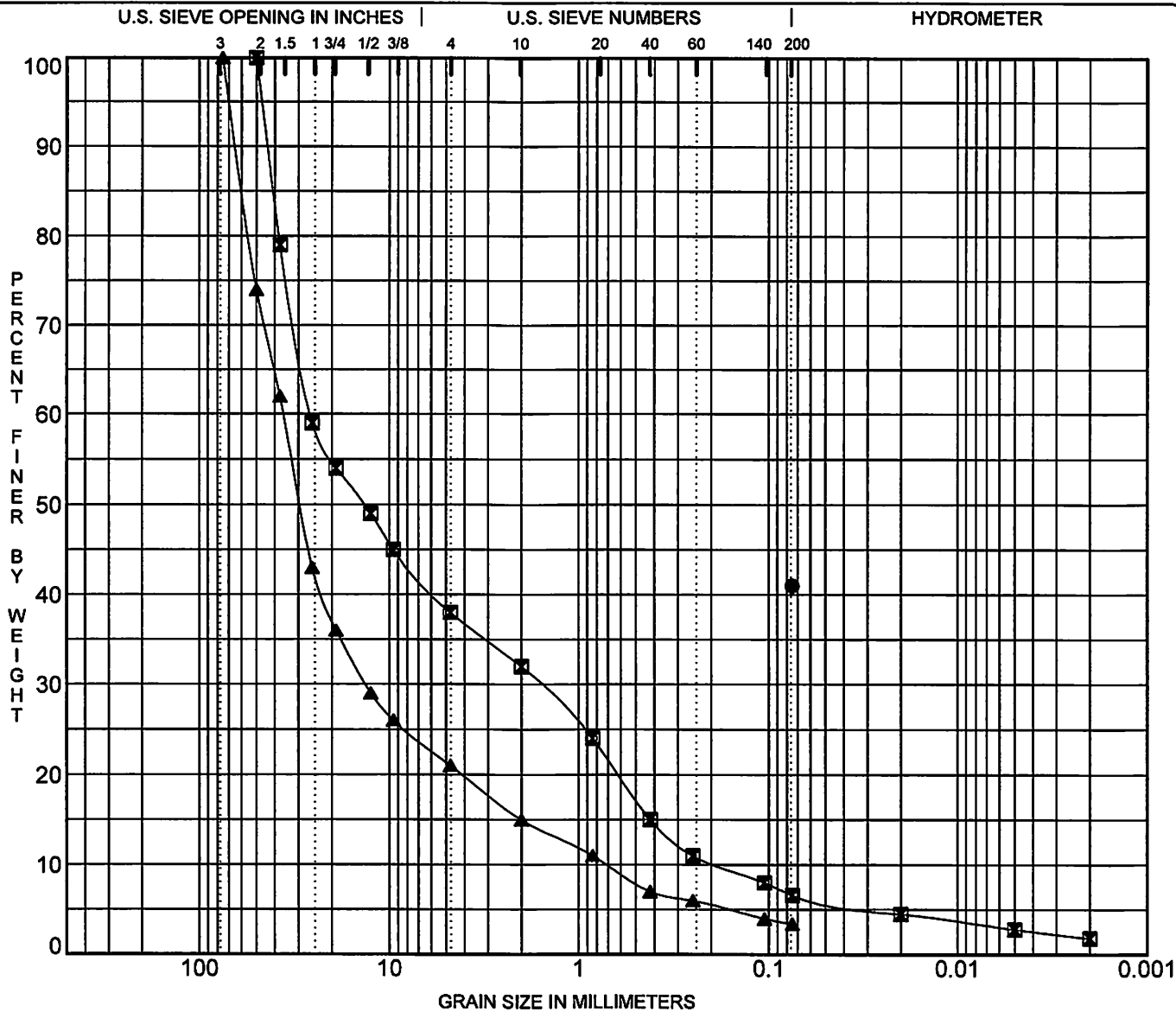
ADNR TLO BOYD ROAD SUBDIVISION
PALMER, AK

SUMMARY OF LABORATORY SOILS DATA

PROJ.NO:	2846.01
DATE:	AUG 2023
REF:	GEOTECH RPT
DWG.NO:	20

CASE # 2024-068
MEETING DATE: JULY 3, 2024

HANDOUT #2
32 OF 40
CELESTIAL HEIGHTS MSP



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Borehole	Smpl. No	Interval	ASTM Class	FROST Class	MC%	LL	PL	PI	Cc	Cu
●	RM23-01	2	2.5- 3.1	SM*	F4*	44.3					
☒	RM23-01	3	3.1- 4.5	GP-GM*	S1	2.8				0.53	140
▲	RM23-01	6	10.0- 12.0	GP	PFS*	1.0				6.9	51
	Borehole	Smpl. No	D100	D60	D30	D10	%Gravel	%Sand	%Fines	P.02	
●	RM23-01	2							41		
☒	RM23-01	3	50	25.9	1.61	0.19	62	31	7	4.5	
▲	RM23-01	6	75	35.99	13.27	0.71	79	18	3		

*Estimated Classification

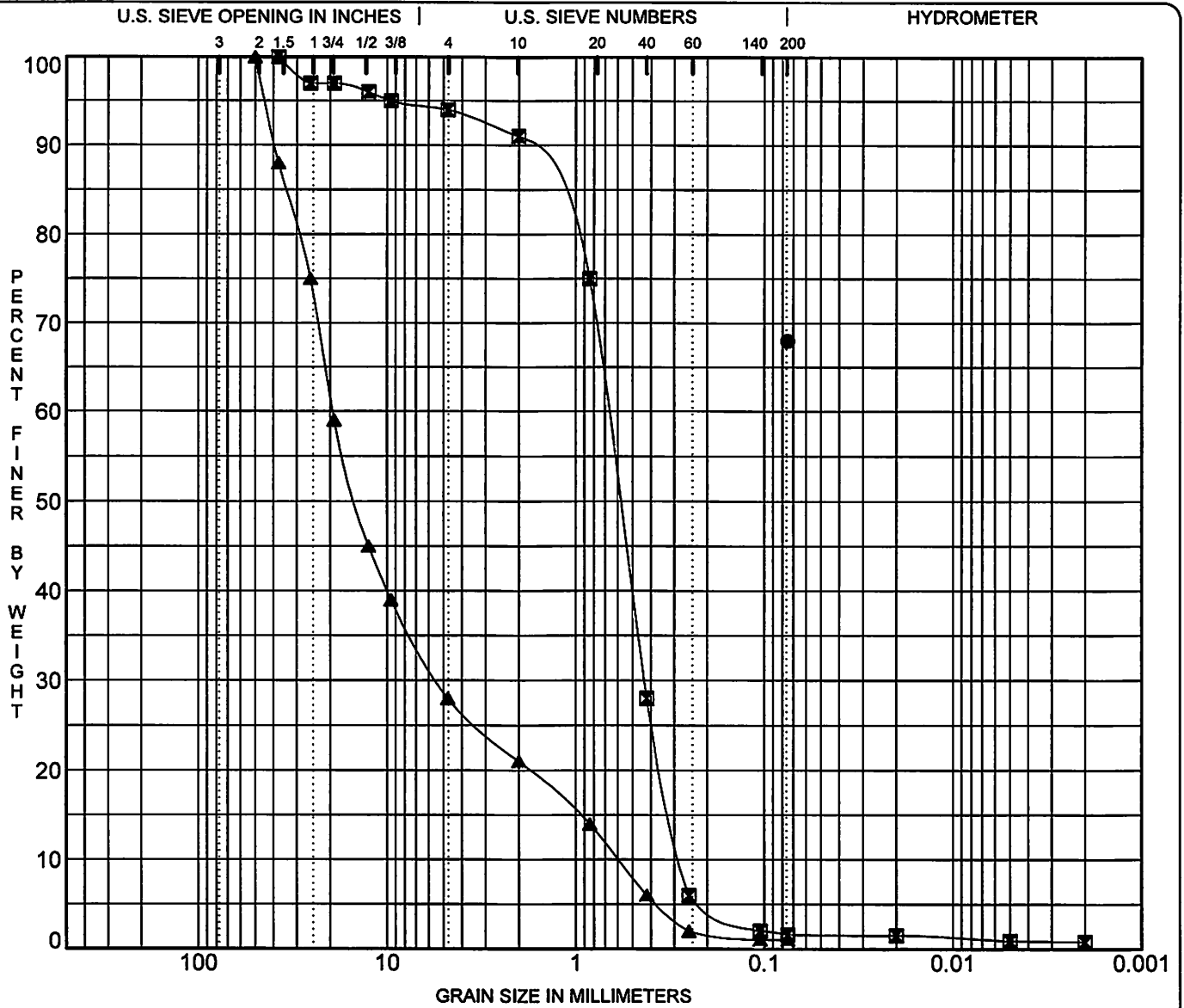
PREPARED BY:
R&M CONSULTANTS, INC.

ADNR TLO BOYD ROAD SUBDIVISION
PALMER, AK
GRADATION CURVES

PROJ.NO: 2846.01
DATE: AUG 2023
REF: GEOTECH RPT
DWG.NO: 21

CASE # 2024-068
MEETING DATE: JULY 3, 2024

HANDOUT #2
33 OF 40
CELESTIAL HEIGHTS MSP



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Borehole	Smpl. No	Interval	ASTM Class	FROST Class	MC%	LL	PL	PI	Cc	Cu
●	RM23-02	2	1.0- 3.0	ML*	F4*	24.0					
☒	RM23-02	3	3.0- 5.0	SP	NFS	2.5				1.0	2.5
▲	RM23-02	4	5.0- 8.0	GW	NFS	2.3				2.5	33
	Borehole	Smpl. No	D100	D60	D30	D10	%Gravel	%Sand	%Fines	P.02	
●	RM23-02	2							68		
☒	RM23-02	3	37.5	0.67	0.43	0.27	6	92	2	1.5	
▲	RM23-02	4	50	19.35	5.39	0.59	72	27	1		

*Estimated Classification

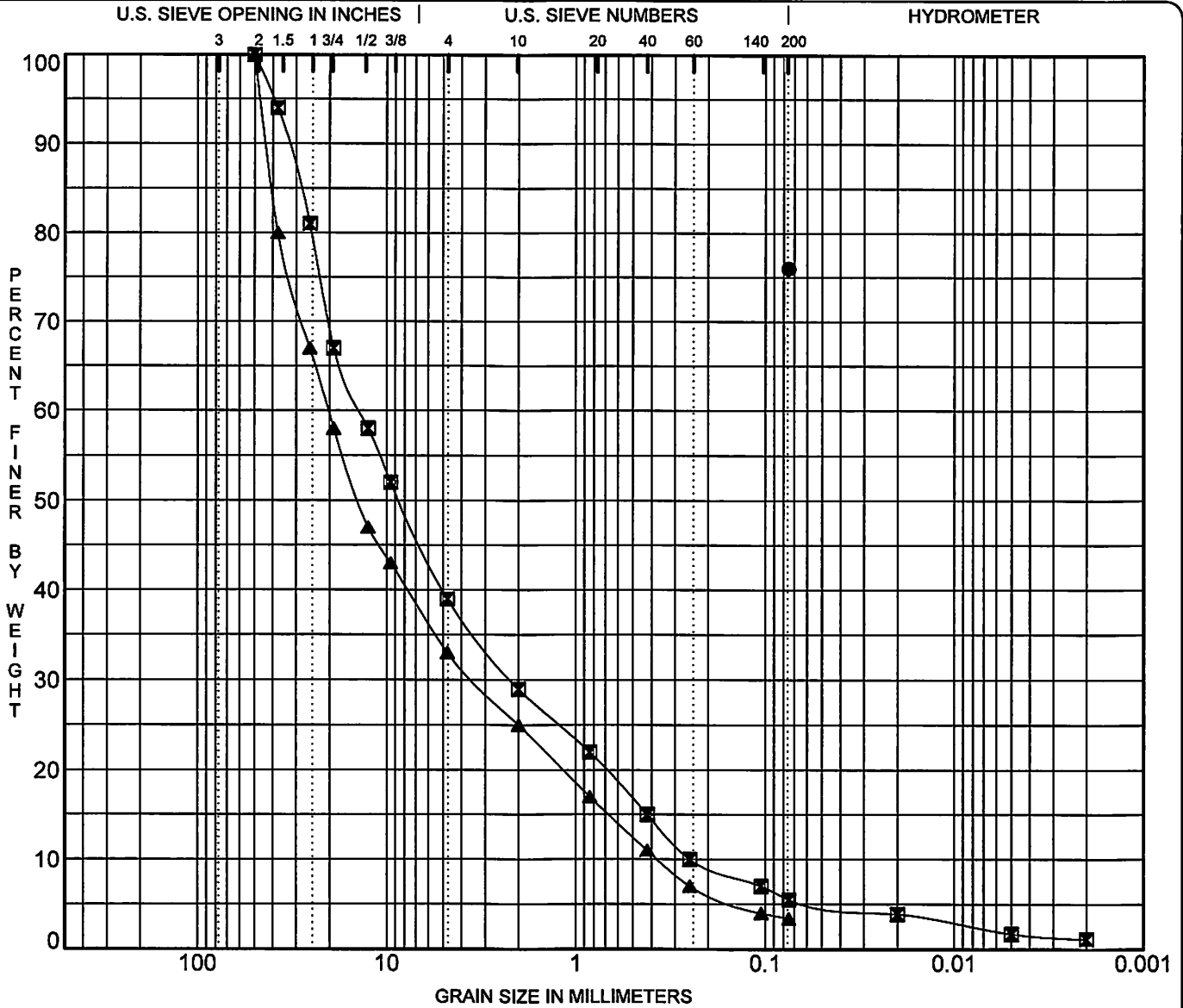
PREPARED BY:
R&M CONSULTANTS, INC.

ADNR TLO BOYD ROAD SUBDIVISION
PALMER, AK
GRADATION CURVES

PROJ.NO: 2846.01
DATE: AUG 2023
REF: GEOTECH RPT
DWG.NO: 22

CASE # 2024-068
MEETING DATE: JULY 3, 2024

HANDOUT #2
34 OF 40
CELESTIAL HEIGHTS MSP



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Borehole	Smpl. No	Interval	ASTM Class	FROST Class	MC%	LL	PL	PI	Cc	Cu
●	RM23-03	1	0.6- 1.4	ML*	F4*	61.7					
☒	RM23-03	2	3.0- 6.0	GW-GM*	S1	3.2				1.4	55
▲	RM23-03	3	10.0- 13.0	GW*	S1*	2.5				1.6	55
	Borehole	Smpl. No	D100	D60	D30	D10	%Gravel	%Sand	%Fines	P.02	
●	RM23-03	1							76		
☒	RM23-03	2	50	13.72	2.18	0.25	61	34	6	3.9	
▲	RM23-03	3	50	20.27	3.43	0.37	67	30	3		

*Estimated Classification

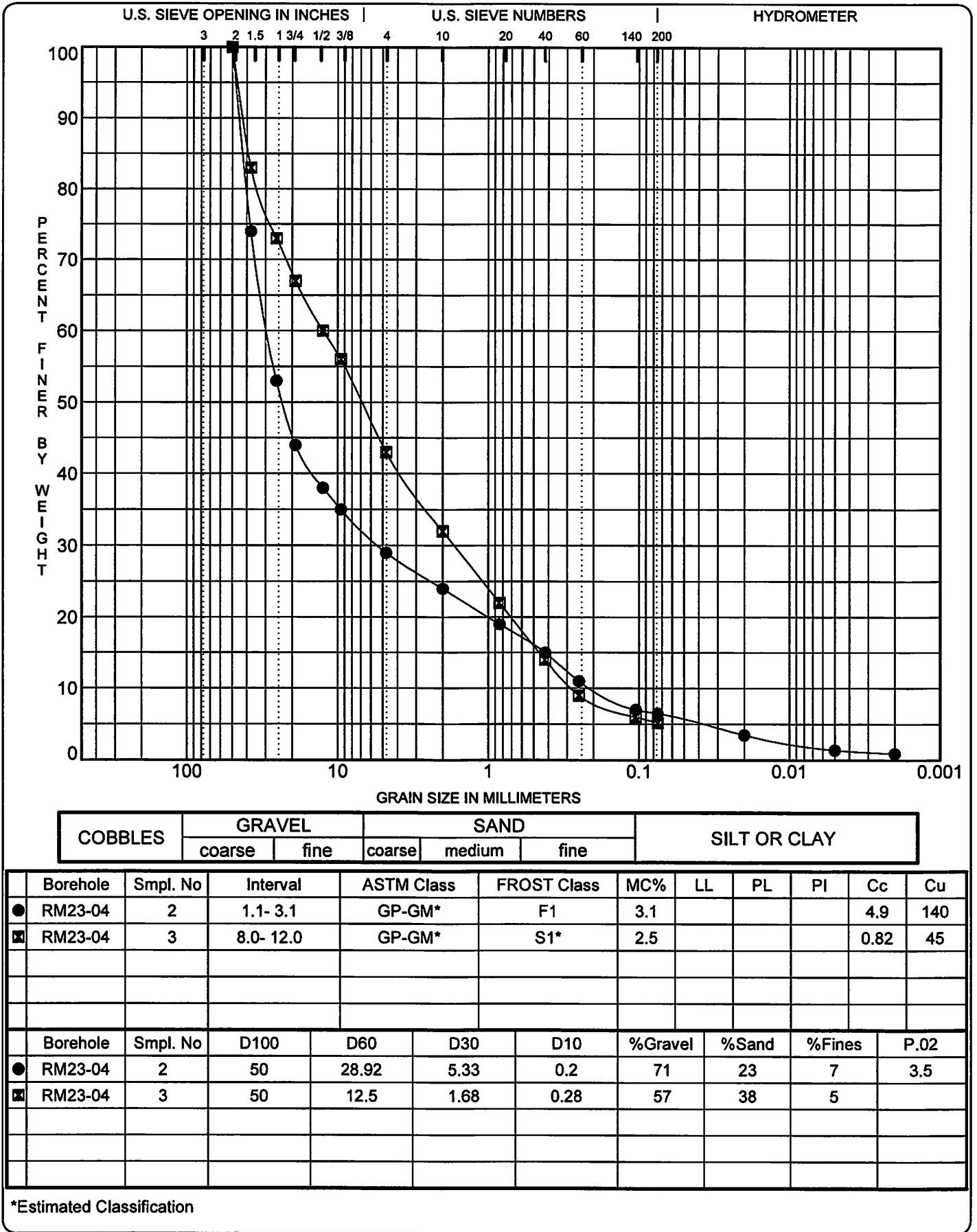
PREPARED BY:
R&M CONSULTANTS, INC.

ADNR TLO BOYD ROAD SUBDIVISION
PALMER, AK
GRADATION CURVES

PROJ.NO: 2846.01
DATE: AUG 2023
REF: GEOTECH RPT
DWG.NO: 23

CASE # 2024-068
MEETING DATE: JULY 3, 2024

HANDOUT #2
35 OF 40
CELESTIAL HEIGHTS MSP



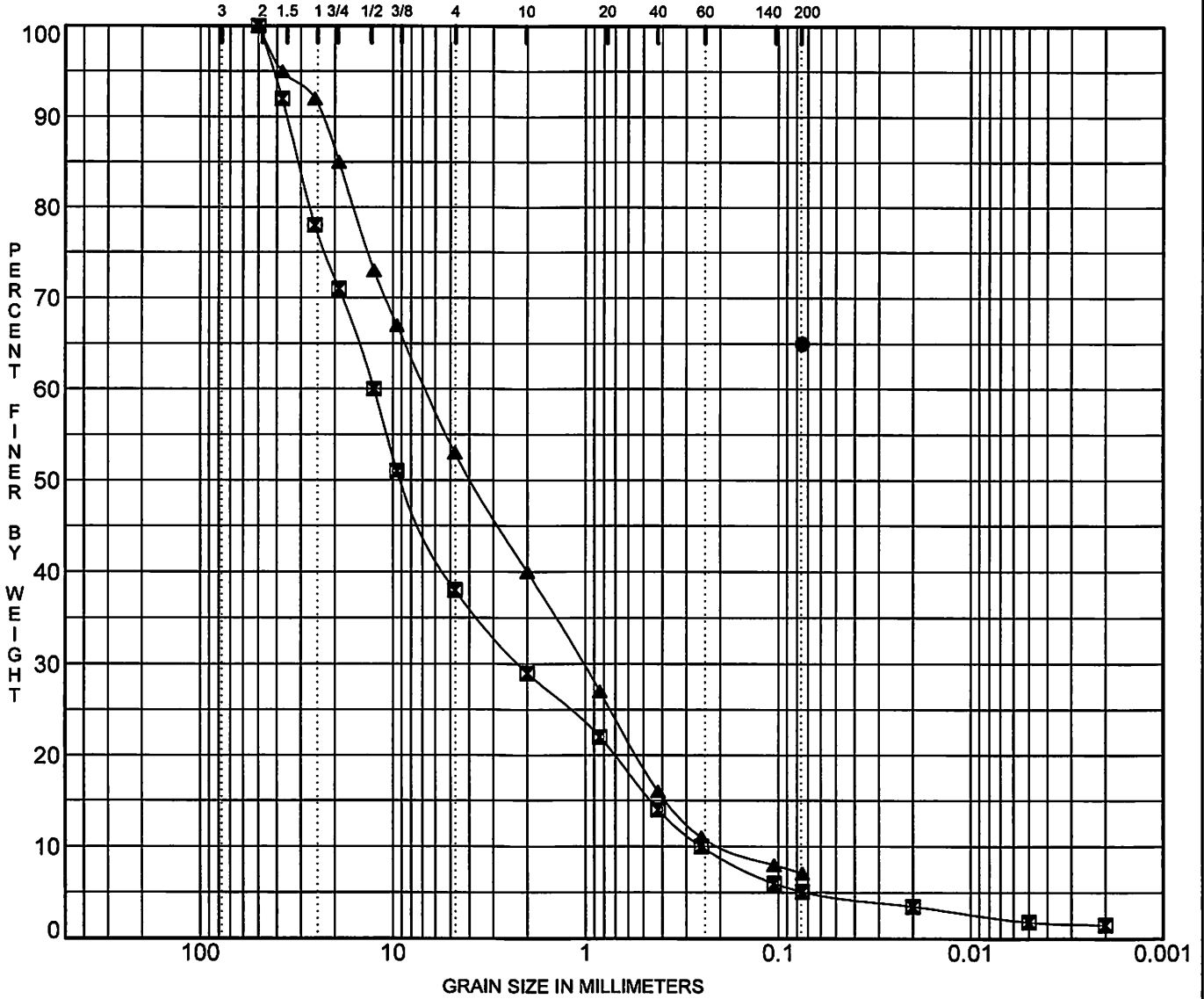
*Estimated Classification

PREPARED BY:
R&M CONSULTANTS, INC.

ADNR TLO BOYD ROAD SUBDIVISION
PALMER, AK
GRADATION CURVES

PROJ.NO: 2846.01
DATE: AUG 2023
REF: GEOTECH RPT
DWG.NO: 24

U.S. SIEVE OPENING IN INCHES | U.S. SIEVE NUMBERS | HYDROMETER



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Borehole	Smpl. No	Interval	ASTM Class	FROST Class	MC%	LL	PL	PI	Cc	Cu
●	RM23-05	1	0.0- 2.0	ML	F4*	42.0	NV	NV	NP		
☒	RM23-05	3	2.9- 4.5	GW-GM*	S1	2.8				1.6	50
▲	RM23-05	6	10.0- 12.0	GP-GM*	S1*	3.1				0.84	36
	Borehole	Smpl. No	D100	D60	D30	D10	%Gravel	%Sand	%Fines	P.02	
●	RM23-05	1							65		
☒	RM23-05	3	50	12.5	2.2	0.25	62	33	5	3.5	
▲	RM23-05	6	50	6.72	1.03	0.19	47	46	7		

*Estimated Classification

CASE # 2024-068
MEETING DATE: JULY 3, 2024

HANDOUT #2
36 OF 40
CELESTIAL HEIGHTS MSP

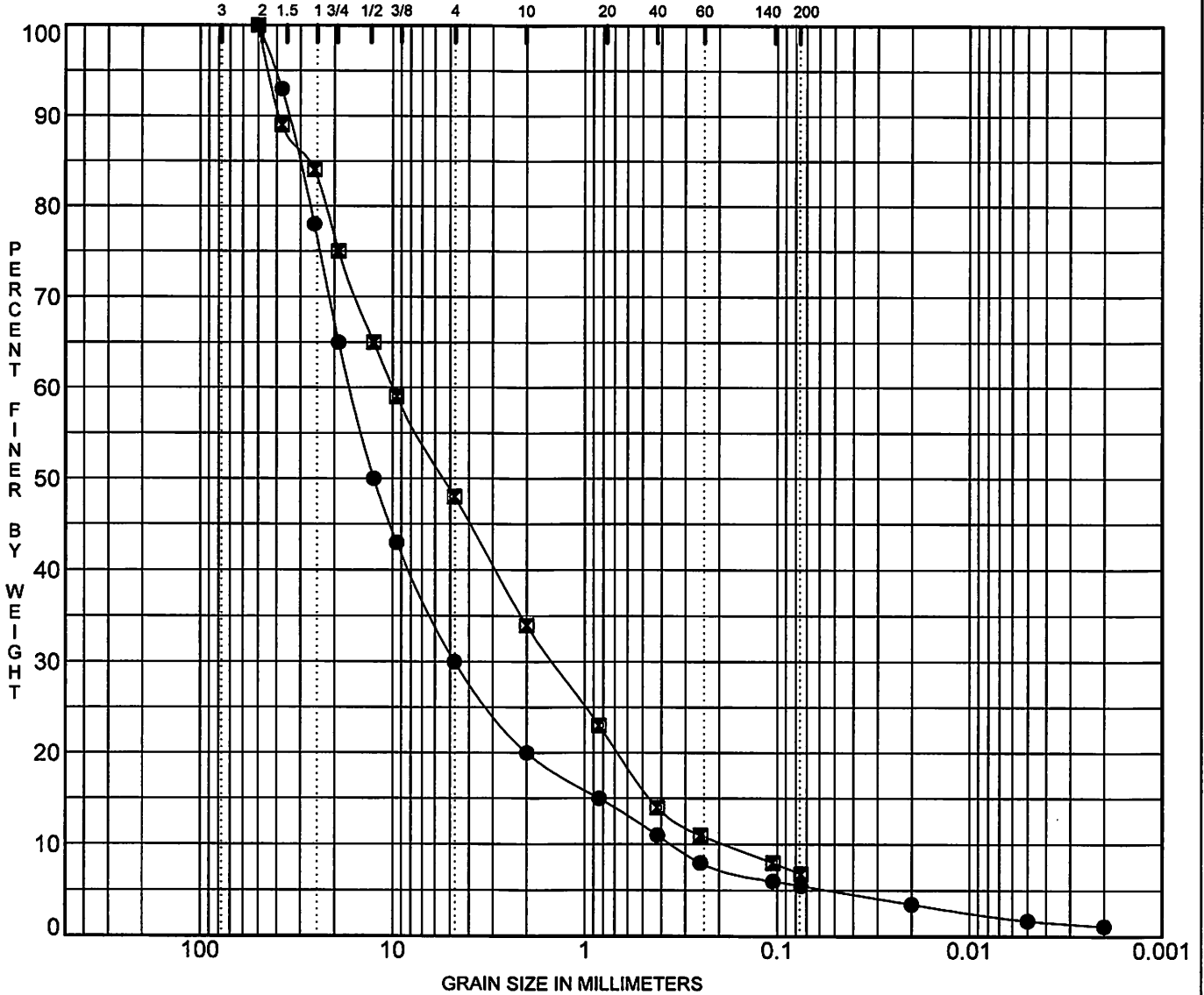
PREPARED BY:
R&M CONSULTANTS, INC.

ADNR TLO BOYD ROAD SUBDIVISION
PALMER, AK

GRADATION CURVES

PROJ.NO: 2846.01
DATE: AUG 2023
REF: GEOTECH RPT
DWG.NO: 25

U.S. SIEVE OPENING IN INCHES | U.S. SIEVE NUMBERS | HYDROMETER



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Borehole	Smpl. No	Interval	ASTM Class	FROST Class	MC%	LL	PL	PI	Cc	Cu
●	RM23-06	3	3.3- 4.5	GP-GM*	S1	2.8				3.9	47
■	RM23-06	6	10.0- 12.0	GW-GM*	S1*	2.9				1.1	53
	Borehole	Smpl. No	D100	D60	D30	D10	%Gravel	%Sand	%Fines	P.02	
●	RM23-06	3	50	16.52	4.75	0.35	70	25	6	3.5	
■	RM23-06	6	50	9.94	1.46	0.19	52	41	7		

*Estimated Classification

CASE # 2024-068
MEETING DATE: JULY 3, 2024

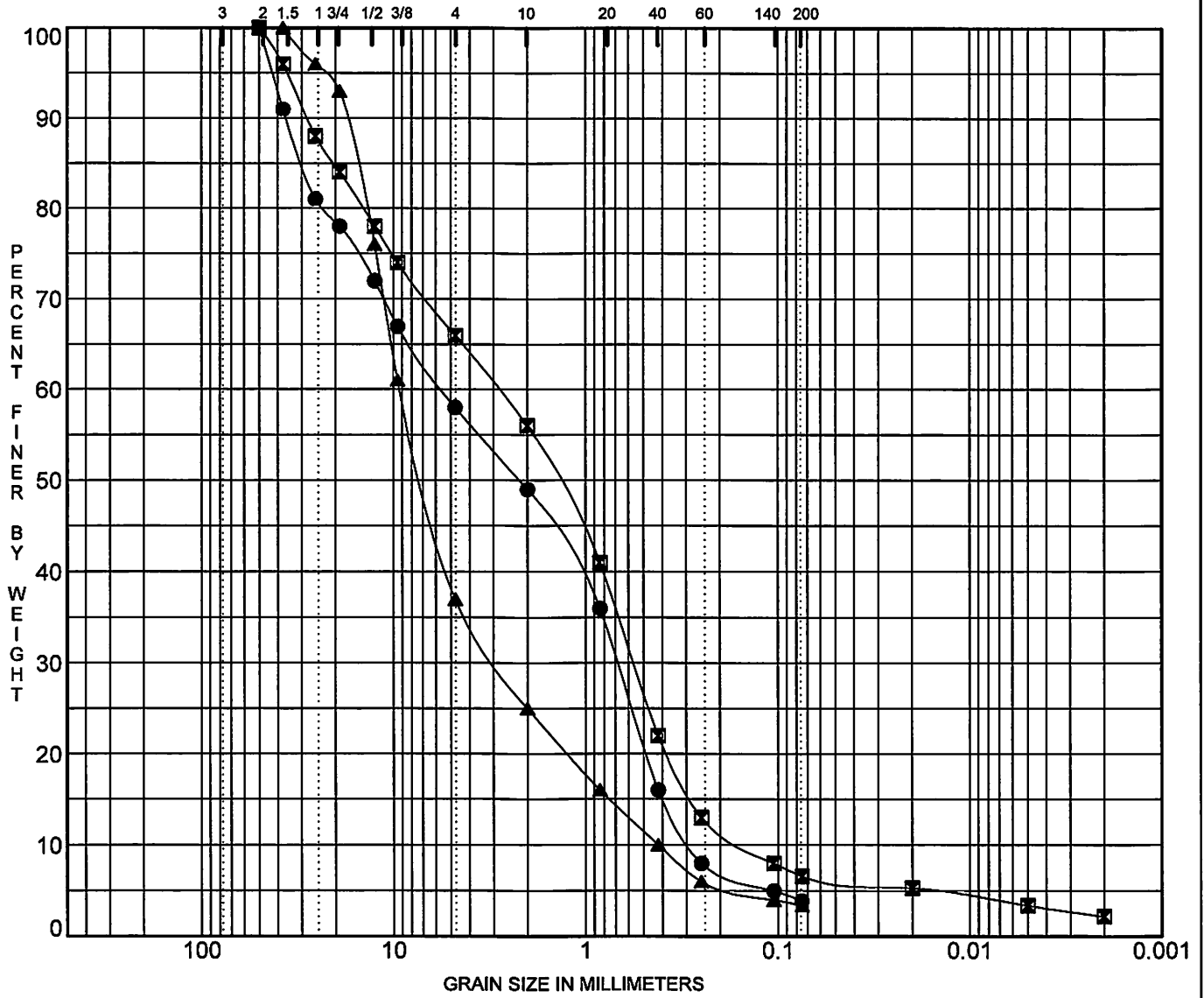
HANDOUT #2
37 OF 40
CELESTIAL HEIGHTS MSP

PREPARED BY:
R&M CONSULTANTS, INC.

ADNR TLO BOYD ROAD SUBDIVISION
PALMER, AK
GRADATION CURVES

PROJ.NO: 2846.01
DATE: AUG 2023
REF: GEOTECH RPT
DWG.NO: 26

U.S. SIEVE OPENING IN INCHES | U.S. SIEVE NUMBERS | HYDROMETER



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Borehole	Smpl. No	Interval	ASTM Class	FROST Class	MC%	LL	PL	PI	Cc	Cu
●	RM23-07	3	3.0- 4.5	SP	NFS*	3.8				0.30	19
☒	RM23-07	4	5.0- 7.0	SP-SM*	S2	3.9				0.75	19
▲	RM23-07	6	10.0- 12.0	GW	PFS*	3.9				2.1	22
	Borehole	Smpl. No	D100	D60	D30	D10	%Gravel	%Sand	%Fines	P.02	
●	RM23-07	3	50	5.54	0.68	0.28	42	54	4		
☒	RM23-07	4	50	2.83	0.56	0.15	34	59	7	5.3	
▲	RM23-07	6	37.5	9.23	2.87	0.42	63	34	3		

*Estimated Classification

CASE # 2024-068
MEETING DATE: JULY 3, 2024

HANDOUT #2
38 OF 40
CELESTIAL HEIGHTS MSP

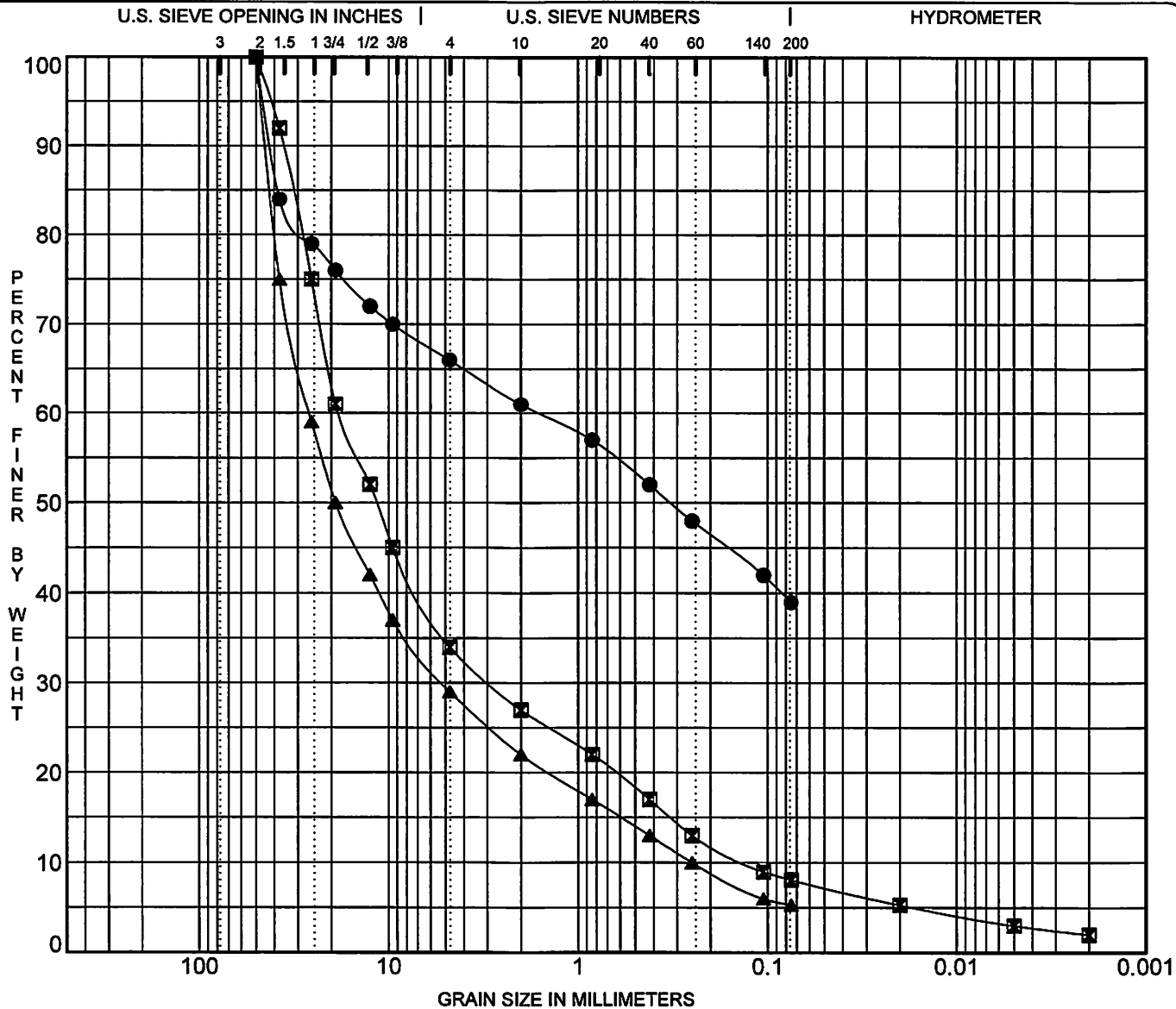
PREPARED BY:
R&M CONSULTANTS, INC.

ADNR TLO BOYD ROAD SUBDIVISION
PALMER, AK
GRADATION CURVES

PROJ.NO: 2846.01
DATE: AUG 2023
REF: GEOTECH RPT
DWG.NO: 27

CASE # 2024-068
MEETING DATE: JULY 3, 2024

HANDOUT #2
39 OF 40
CELESTIAL HEIGHTS MSP



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Borehole	Smpl. No	Interval	ASTM Class	FROST Class	MC%	LL	PL	PI	Cc	Cu
●	RM23-08	2	2.5- 4.5	GM*	F3*	21.2					
☒	RM23-08	3	5.0- 7.0	GP-GM*	S1	4.0				3.5	140
▲	RM23-08	4	7.5- 9.5	GP-GM*	S1*	2.9				4.1	100
	Borehole	Smpl. No	D100	D60	D30	D10	%Gravel	%Sand	%Fines	P.02	
●	RM23-08	2	50	1.61			34	27	39		
☒	RM23-08	3	50	18.14	2.9	0.13	66	26	8	5.3	
▲	RM23-08	4	50	26.03	5.18	0.25	71	24	5		

*Estimated Classification

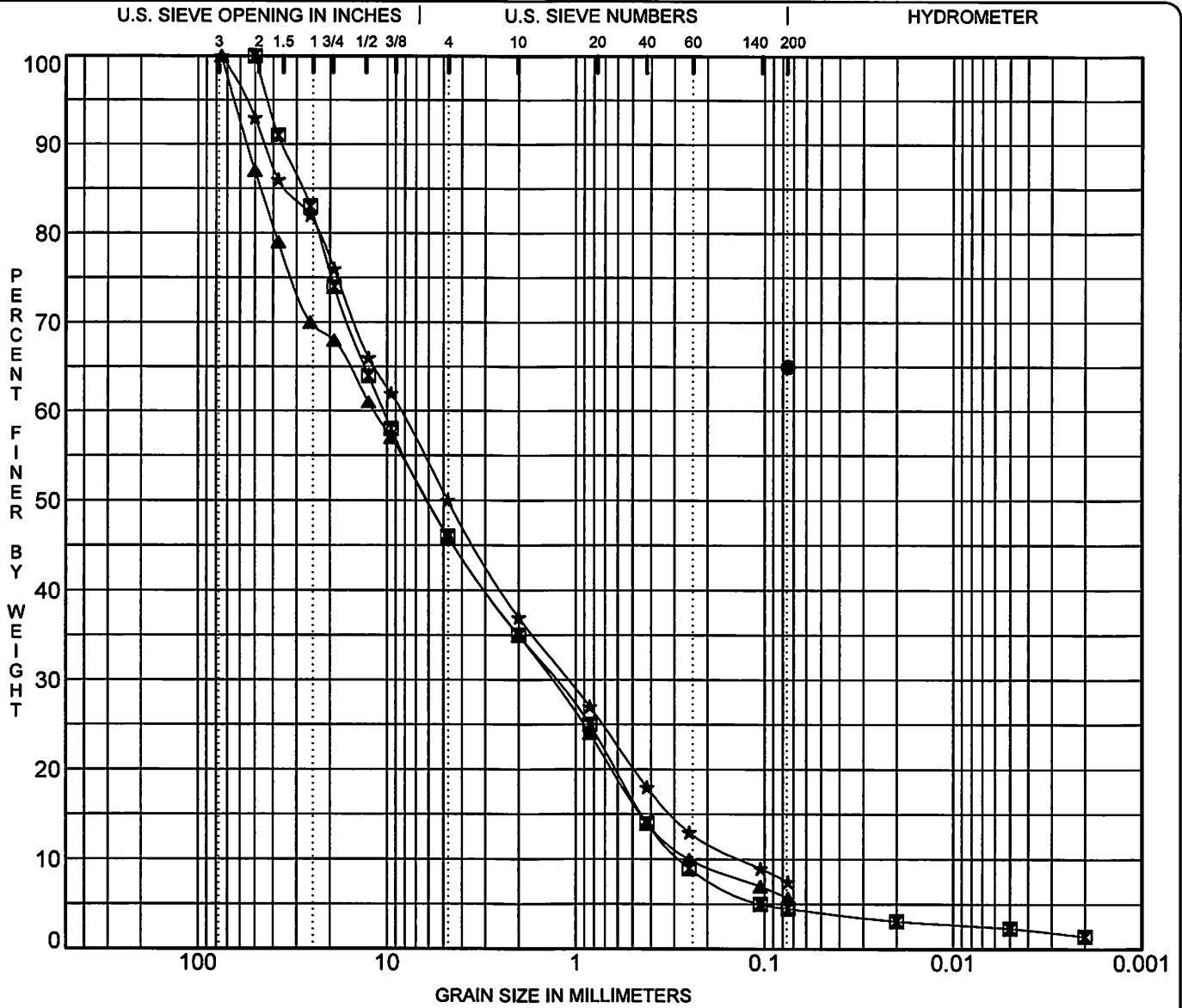
PREPARED BY:
R&M CONSULTANTS, INC.

ADNR TLO BOYD ROAD SUBDIVISION
PALMER, AK
GRADATION CURVES

PROJ.NO: 2846.01
DATE: AUG 2023
REF: GEOTECH RPT
DWG.NO: 28

CASE # 2024-068
MEETING DATE: JULY 3, 2024

HANDOUT #2
40 OF 40
CELESTIAL HEIGHTS MSP



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Borehole	Smpl. No	Interval	ASTM Class	FROST Class	MC%	LL	PL	PI	Cc	Cu
●	RM23-09	1	0.0- 2.0	ML	F4*	42.2	NV	NV	NP		
■	RM23-09	3	3.2- 4.5	GP*	PFS	3.7				0.58	38
▲	RM23-09	4	5.0- 7.0	GP-GM*	S1*	3.9				0.62	47
★	RM23-09	6	15.0- 17.0	GW-GM*	S1*	3.1				1.1	65

	Borehole	Smpl. No	D100	D60	D30	D10	%Gravel	%Sand	%Fines	P.02
●	RM23-09	1							65	
■	RM23-09	3	50	10.41	1.3	0.28	54	42	5	3.1
▲	RM23-09	4	75	11.67	1.35	0.25	54	40	6	
★	RM23-09	6	75	8.46	1.09	0.13	50	43	8	

*Estimated Classification

PREPARED BY:
R&M CONSULTANTS, INC.

ADNR TLO BOYD ROAD SUBDIVISION
PALMER, AK
GRADATION CURVES

PROJ.NO: 2846.01
DATE: AUG 2023
REF: GEOTECH RPT
DWG.NO: 29

MATANUSKA-SUSITNA BOROUGH
PLATTING DIVISION
350 EAST DAHLIA AVENUE
PALMER, ALASKA 99645

RECEIVED
JUL 01 2024
PLATTING

2990B02L002-B 41
RICHMOND GORDON E & C D
PO BOX 3104
PALMER, AK 99645-3104

NOTIFICATION OF PUBLIC HEARING

The Matanuska-Susitna Borough **Platting Board** will consider the following:

PETITIONER/OWNER: STATE OF ALASKA MENTAL HEALTH TRUST LAND OFFICE

REQUEST: The request is to create 56 lots and 1 tract from Tax Parcel B2 in a five phase master plan, to be known as **CELESTIAL HEIGHTS**, containing 80.00 acres +/- . The parcel is located east of N. Palmer-Fishhook Road and directly south of E. Boyd Road, in Section 12 (Tax ID# 118N01E12B002); within Section 12, Township 18 North, Range 01 East, Seward Meridian, Alaska. The property is within the Fishhook Community Council and Assembly District #1.

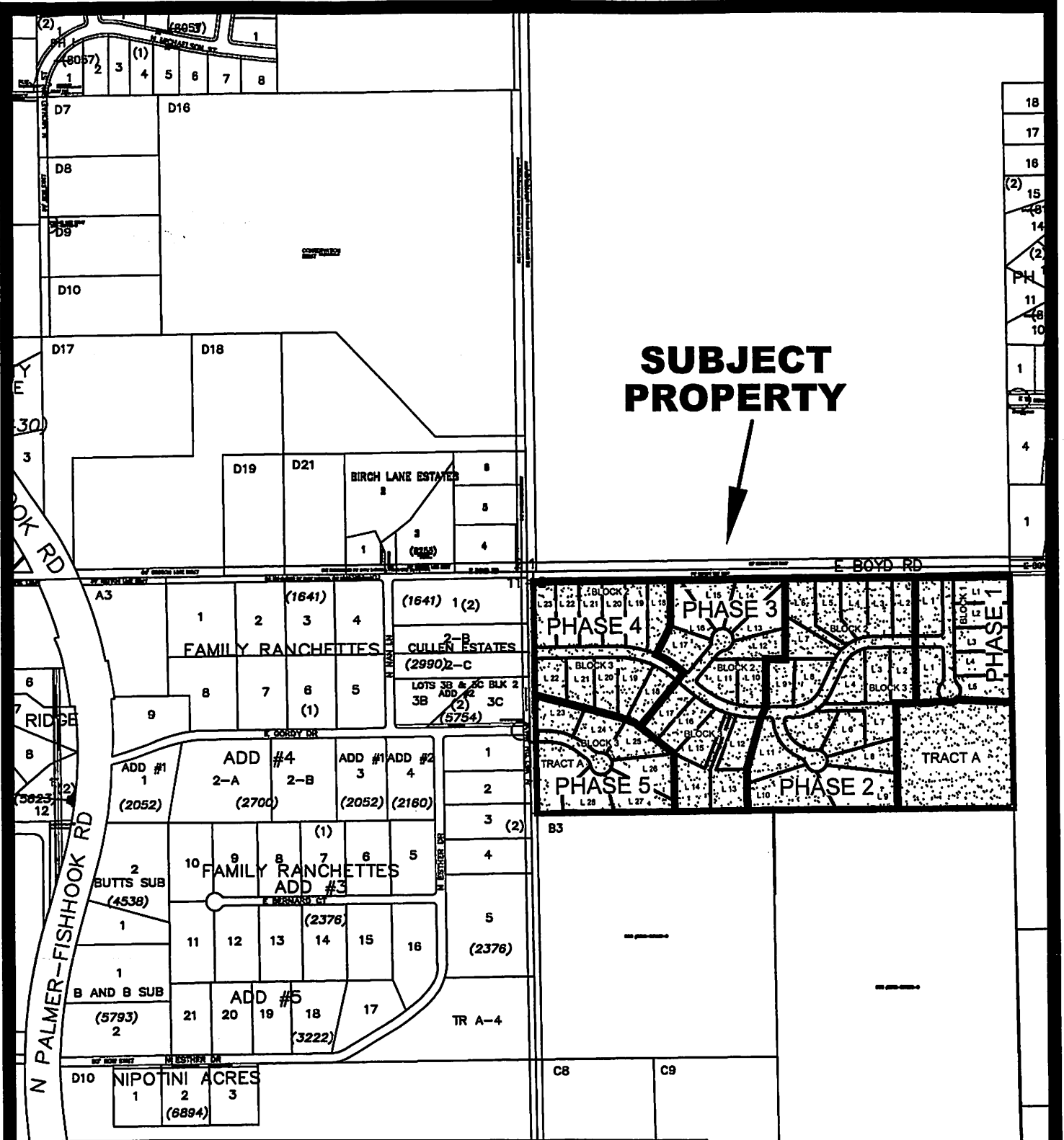
The Matanuska-Susitna Borough **Platting Board** will hold a public hearing in the **Assembly Chambers** at the **Dorothy Swanda Jones Building**, 350 E. Dahlia Avenue, Palmer, Alaska on the proposed **Subdivision**. The public hearing is scheduled for **July 3, 2024**, starting at 1:00 p.m. We are sending you this notice as required by State Law and Borough Ordinances.

For comments regarding the proposed action, this form may be used for your convenience by filling in the information below and mail this notice to the MSB Platting Division, 350 E. Dahlia Avenue, Palmer, Alaska 99645 or e-mail: platting@matsugov.us. Comments received from the public after the platting packet has been written will be given to the Platting Board in a "Hand-Out" the day of the meeting. **All public comments are due one (1) day prior, by 12:00 p.m.** To request additional information please contact the Platting Technician, **Natasha Heindel** at (907) 861-7872. To view the agenda or meeting packet please go to the following link: www.matsugov.us/boards/platting.

[] No Objection [] Objection Concern

Name: GORDON RICHMOND Address: PO. BOX 3104 PALMER, AK

Comments: SEE ATTACHMENT PLEASE



**SUBJECT
PROPERTY**

VICINITY MAP

FOR PROPOSED CELESTIAL HEIGHTS SUBDIVISION
 LOCATED WITHIN
 SECTION 12, T18N, R01E, SEWARD MERIDIAN
 ALASKA

WA01 MAP

MSB Platting Board

Comments In response to the proposed Celestial Heights Subdivision:

As a home owner adjacent to the proposed subdivision we have concerns about the newly proposed subdivision. As proposed this design would create some of the smallest lots and most densely populated housing in the vicinity. Our concerns are directly related to that issue. Not having any detailed plans nor covenants of proposed housing development some assumptions are made.

If each one of these lots containing a dwelling in the future will be on a separate well and septic that is a concern. If so this creates a concern to the volume of water consumed from the aquifer in the immediate vicinity of existing dwellings. Septic along the same lines but for outflow.

The type and quality of housing in direct relation to unknown covenants is a concern. Especially with the small lots proposed the size, quality, and usage of structures and property is unknown. The compatibility with surround properties is in question. Being quite a bit smaller lots does not compare to those in the vicinity. Family Ranchettes adjacent to the west is a minimum of 2 acres with mostly 2.5- 5 acre parcels allowing for separation and as name implies room for pets, gardens, livestock etc. It has good covenants pertaining to quality and usage of structures and property.

The Mountain Glory Heights subdivision recently developed is in the minimum of 1+ acre range and was superbly designed with stringent covenants I assume.

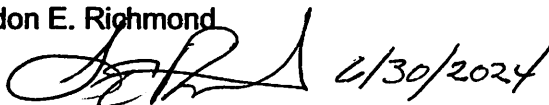
Additional traffic is a concern in the existing neighborhoods and on Palmer Fishhook in general. E Boyd Road originally installed as one of three access points to serve Family Ranchettes only, and terminated within the subdivision as was designed and intended. With that intention some homes along E Boyd were built fairly close to the easement because traffic was minimal. They now face the potential of ever increasing traffic. The recent extension of E Boyd road, though quite well designed, was intended to serve only Mountain Glory Heights Subdivision. Fishhook Road itself is already seeing a significant increase in traffic and has not had any major upgrade in many years. Continued addition of more density in population without planned improvements is a concern. The same goes for Infrastructure such as fire service, busing, snow removal, law enforcement etc.

We are not against development of the area in general if done responsibly. Top of mind is larger lots with covenants to be developed and disclosed at a minimum as to be more compatible with the vicinity. One question to developer, as a phased effort is there a timeline associated for implementation?

If property is developed I propose buffer zones be designed in from existing properties and/or that adjacent property owners be given a first right of refusal for purchase for the opportunity of creating a buffer zone if desired.

Thank you for your consideration on this matter.

Gordon E. Richmond



MATANUSKA-SUSITNA BOROUGH
PLATTING DIVISION
350 EAST DAHLIA AVENUE
PALMER, ALASKA 99645

RECEIVED
JUL 01 2024
PLATTING

1641B02L001 21
FRITTS JIMMY DON & L E
7751 N NAN LN
PALMER, AK 99645-8304

NOTIFICATION OF PUBLIC HEARING

The Matanuska-Susitna Borough **Platting Board** will consider the following:

PETITIONER/OWNER: STATE OF ALASKA MENTAL HEALTH TRUST LAND OFFICE

REQUEST: The request is to create 56 lots and 1 tract from Tax Parcel B2 in a five phase master plan, to be known as **CELESTIAL HEIGHTS**, containing 80.00 acres +/- . The parcel is located east of N. Palmer-Fishhook Road and directly south of E. Boyd Road, in Section 12 (Tax ID# 118N01E12B002); within Section 12, Township 18 North, Range 01 East, Seward Meridian, Alaska. The property is within the Fishhook Community Council and Assembly District #1.

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[] No Objection [] Objection [] Concern

Name: Jimmy and Lou Fritts Address: 7751 Nan Lane Palmer, AK, 99645

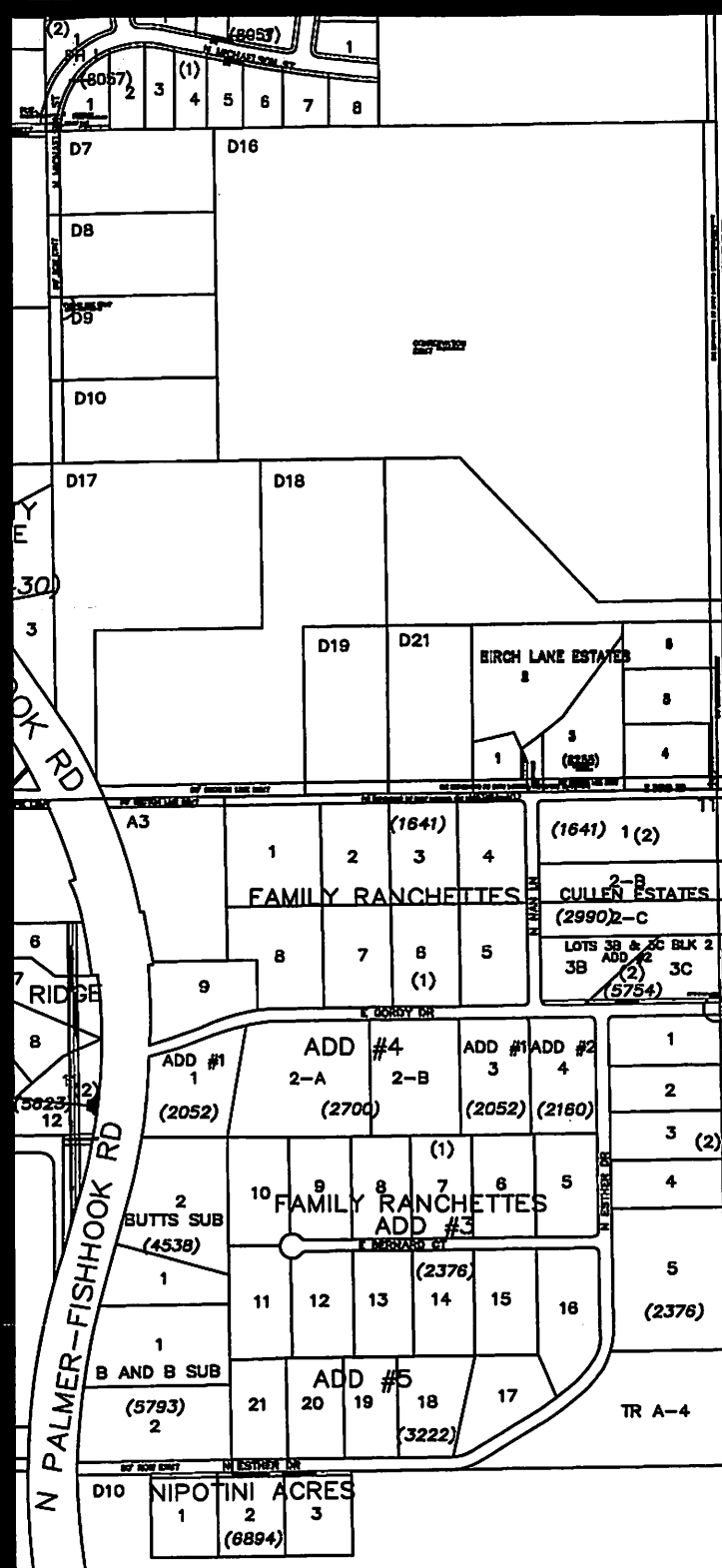
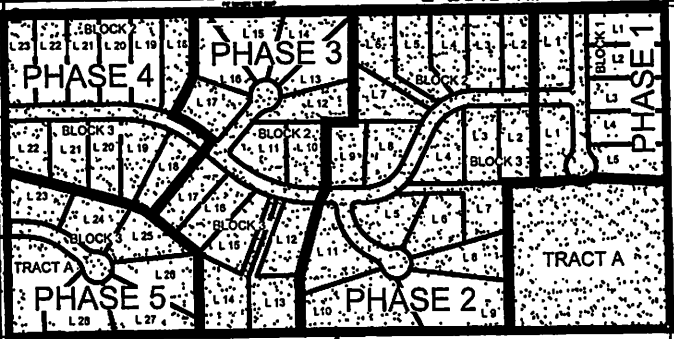
Comments: We are very concerned about our water pressure which is half what it used to be before the subdivision (Mountain Glory) went in 3 years ago. We would like to know what kind of housing this subdivision will have, Boyd Rd is not capable of handling more cars.

Case # 2024-068 NH

Note: Vicinity map Located on Reverse

HANDOUT #4
CELESTIAL HEIGHTS MSP
CASE # 2024-068
MEETING DATE: JULY 3, 2024

**SUBJECT
PROPERTY**



VICINITY MAP

FOR PROPOSED CELESTIAL HEIGHTS SUBDIVISION
LOCATED WITHIN
SECTION 12, T18N, R01E, SEWARD MERIDIAN
ALASKA

WA01 MAP

**MATANUSKA-SUSITNA BOROUGH
PLATTING DIVISION**
350 EAST DAHLIA AVENUE
PALMER, ALASKA 99645

RECEIVED
JUL 02 2024
PLATTING

7746B04L038 7
GROW MICHAEL J
COOPER VIRGINIA C
10500 E MYSTICAL VIEW CIR
PALMER, AK 99645

NOTIFICATION OF PUBLIC HEARING

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REQUEST: The request is to create 56 lots and 1 tract from Tax Parcel B2 in a five phase master plan, to be known as **CELESTIAL HEIGHTS**, containing 80.00 acres +/- . The parcel is located east of N. Palmer-Fishhook Road and directly south of E. Boyd Road, in Section 12 (Tax ID# 118N01E12B002); within Section 12, Township 18 North, Range 01 East, Seward Meridian, Alaska. The property is within the Fishhook Community Council and Assembly District #1.

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To view the agenda or meeting packet please go to the following link: www.matsugov.us/boards/platting.

[] No Objection Objection [] Concern

Name: ~~Michael Grow~~ Virginia Cooper Address: 10500 E. Mystical View Circle

Comments: We strongly oppose the proposed subdivision. First: there are environmental concerns with the aquifer that flows North to South to the head waters of Spring Creek / Wasilla Creek, a salmon habitat. There would be 56 septic systems just above this pristine water body. Second: traffic concerns - Boyd and Fishhook Road are already hazzards with the current traffic load. Examples: Blind decending roadway of Northbound traffic on Fishhook coupled with opposite road traffic entering Fishhook from New Hope Street. An additional 100+ vehicles per day would put additional strain on an already burdened

Case # 2024-068 NH

Note: Vicinity map Located on Reverse

Infrastructure.

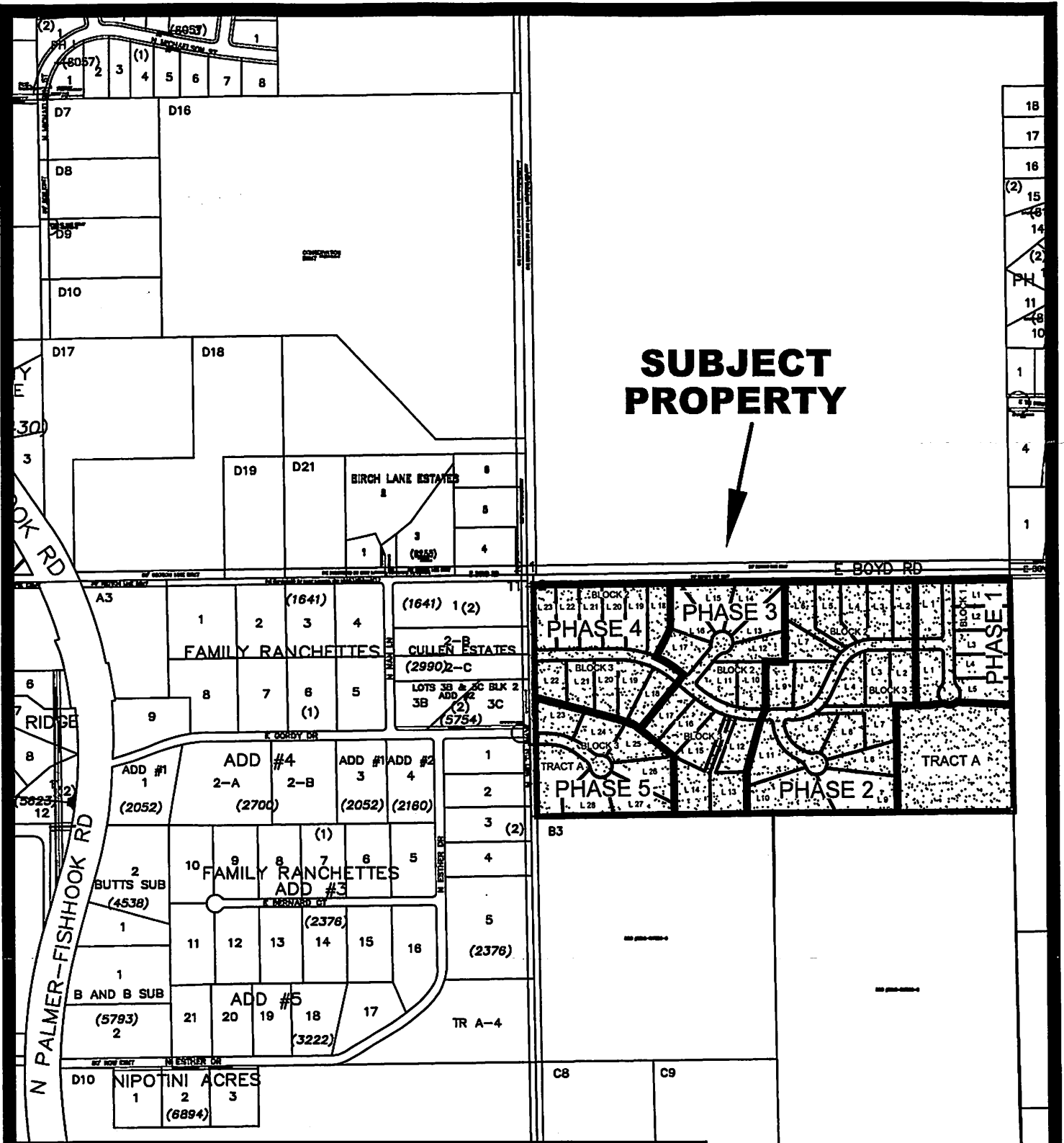
Thank you for your consideration

HANDOUT #5

CELESTIAL HEIGHTS MSP

CASE # 2024-068

MEETING DATE: JULY 3, 2024



**SUBJECT
PROPERTY**

VICINITY MAP
 FOR PROPOSED CELESTIAL HEIGHTS SUBDIVISION
 LOCATED WITHIN
 SECTION 12, T18N, R01E, SEWARD MERIDIAN
 ALASKA

WA01 MAP

Natasha Heindel

From: Kelly Gordon <nodrog.yllek@gmail.com>
Sent: Tuesday, July 2, 2024 11:36 AM
To: MSB Platting
Subject: Celestial Heights Subdivision

[EXTERNAL EMAIL - CAUTION: Do not open unexpected attachments or links.]

Mat-Su Borough Platting Board,

As a member of the RSA 16 board, I respectfully ask that the corner of Palmer Fishhook and Boyd Road be addressed before this subdivision begins.

The proposal for this subdivision states the expected average daily traffic count for a 56 lot subdivision to be 560 vehicles, half of which are expected to use Weltin Way. The total additional daily traffic expected on Boyd Road is then listed as 280 vehicles.

Applying that standard of 10 vehicles per lot per day, the Mountain Glory Heights subdivision, at 70 lots, produces an average daily traffic count of 700 vehicles. The average number of vehicles projected to use Boyd Road on any given day now sits at 840 per day.

The intersection of Boyd Road and Palmer Fishhook is not a 90 degree intersection. The degree of turn required to access Boyd Road is greater than 90, which results in vehicles cutting the curve, tearing up the apron and shoulder, and spewing rocks and gravel on the pavement. During the construction of Mountain Glory Heights, local residents cleared the rocks and gravel from the intersection almost daily. The larger size of vehicles required during the construction phase has an even greater negative impact on this area.

Please consider additional funding to RSA 16 in order to expedite a fix for this location prior to the construction of this subdivision. This issue will be presented to the board at their next meeting on the 11th of July.

Thank you for your consideration,
Kelly Gordon
RSA 16 Secretary

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