MATERIALS TESTING & INSPECTION

❑ Environmental Services ❑ Geotechnical Engineering ❑ Construction Materials Testing ❑ Special Inspections

GEOTECHNICAL ENGINEERING REPORT
of
Replace Perimeter Detection System, IMSI, Idaho Department of Corrections Kuna, ID

Prepared for:

Idaho Division of Public Works
PO Box 83720
Boise, ID 83720

MTI File Number B130332g
IDPW Project Number 13-060

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Re: Geotechnical Engineering Report
Replace Perimeter Detection System, IMSI, Idaho Department of Corrections
Kuna, ID

Dear Mr. Santoyo:

In compliance with your instructions, we have conducted a soils exploration and foundation evaluation for the above referenced development. Fieldwork for this investigation was conducted on 12 April 2013. Data have been analyzed to evaluate pertinent geotechnical conditions. Results of this investigation, together with our recommendations, are to be found in the following report. We have provided a PDF copy and one paper copy for your review and distribution.

Often questions arise concerning soil conditions because of design and construction details that occur on a project. MTI would be pleased to continue our role as geotechnical engineers during project implementation. Additionally, MTI would be pleased in providing materials testing and special inspection services during construction of this project. If you will advise us of the appropriate time to discuss these engineering services, we will be pleased to meet with you at your convenience.

MTI appreciates this opportunity to be of service to you and looks forward to working with you in the future. If you have questions, please call (208) 376-4748.

Respectfully Submitted,
Materials Testing & Inspection, Inc.

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INTRODUCTION

This report presents results of a geotechnical investigation and analysis in support of data utilized in design of structures as defined in the 2009 International Building Code (IBC). Information in support of groundwater and storm water issues pertinent to the practice of Civil Engineering is included. Observations and recommendations relevant to the earthwork phase of the project are also presented. Revisions in plans or drawings for the proposed development from those enumerated in this report should be brought to the attention of the soils engineer to determine whether changes in foundation recommendations are required. Deviations from noted subsurface conditions, if encountered during construction, should also be brought to the attention of the soils engineer.

Project Description

The proposed development is within the southernmost portion of the City of Kuna, Ada County, ID, and occupies a portion of the center of Section 28, Township 2 North, Range 2 East, Boise Meridian. The project is expected to consist of a series of upgrades to the existing exterior fence system. As we understand, upgrades will include additional electronic security devices added to the fence supports, as well as a support cable through the upper edge of the fence that will require tensioning. The tensioning system may require added intermediate and end supports along the fence line. New items will include pole foundations and ¼ mile of trenching for a 3 foot deep low-voltage line. Retaining walls are not anticipated as part of the project. MTI has not been informed of the proposed grading plan.

Authorization

Authorization to perform this exploration and analysis was given in the form of a written authorization to proceed from Mr. Tim Mason of Idaho Division of Public Works to David Cram of Materials Testing and Inspection, Inc. (MTI), on 25 March 2013. Said authorization is subject to terms, conditions, and limitations described in the Professional Services Contract entered into between Idaho Division of Public Works and MTI. Our scope of services for the proposed development has been provided in our proposal dated 21 March 2013 and repeated below.

Purpose

The purpose of this Geotechnical Engineering Report is to determine various soil profile components and their engineering characteristics for use by either design engineers or architects in:

- Preparing or verifying suitability of foundation design and placement
- Providing lateral earth pressures for installation of support poles
- Indicating issues pertaining to earthwork construction, including depth to basalt and rippability of cemented silts

Scope of Investigation

The scope of this investigation included review of geologic literature and existing available geotechnical studies of the area, visual site reconnaissance of the immediate site, subsurface exploration of the site, field and laboratory testing of materials collected, and engineering analysis and evaluation of foundation materials. The scope of work did not include design recommendations for foundations or roads.

Warranty and Limiting Conditions

MTI warrants that findings and conclusions contained herein have been formulated in accordance with generally accepted professional engineering practice in the fields of foundation engineering, soil mechanics, and engineering geology only for the site and project described in this report. These engineering methods have been developed to provide the client with information regarding apparent or potential engineering conditions relating to the site within the scope cited above and are necessarily limited to conditions observed at the time of the site visit and research. **Requested exploration sites were adjusted in the field to avoid expected utilities.** Field observations and research reported herein are considered sufficient in detail and scope to form a reasonable basis for the purposes cited above.

Exclusive Use

This report was prepared for exclusive use of the property owner(s), at the time of the report, and their retained design consultants ("Client"). Conclusions and recommendations presented in this report are based on the agreed-upon scope of work outlined in this report together with the Contract for Professional Services between the Client and Materials Testing and Inspection, Inc. ("Consultant"). Use or misuse of this report, or reliance upon findings hereof, by parties other than the Client is at their own risk. Neither Client nor Consultant make representation of warranty to such other parties as to accuracy or completeness of this report or suitability of its use by such other parties for purposes whatsoever, known or unknown, to Client or Consultant. Neither Client nor Consultant shall have liability to indemnify or hold harmless third parties for losses incurred by actual or purported use or misuse of this report. No other warranties are implied or expressed.

Report Recommendation are Limited and Subject to Misinterpretation

There is a distinct possibility that conditions may exist that could not be identified within the scope of the investigation or that were not apparent during our site investigation. Findings of this report are limited to data collected from noted explorations advanced and do not account for unidentified fill zones, unsuitable soil types or conditions, and variability in soil moisture and groundwater conditions. To avoid possible misinterpretations of findings, conclusions, and implications of this report, MTI should be retained to explain the report contents to other design professionals as well as construction professionals.

Since actual subsurface conditions on the site can only be verified by earthwork, note that construction recommendations are based on general assumptions from selective observations and selective field exploratory sampling. Upon commencement of construction, such conditions may be identified that required corrective actions, and these required corrective actions may impact the project budget. Therefore, construction recommendations in this report should be considered preliminary, and MTI should be retained to observe actual subsurface conditions during earthwork construction activities to provide additional construction recommendations as needed.

Since geotechnical reports are subject to misinterpretation, **do not** separate the soil logs from the report. Rather, provide a copy, or authorize for their use, of the complete report to other design professional or contractors.

This report is also limited to information available at the time it was prepared. In the event additional information is provided to MTI following publication of our report, it will be forwarded to the client for evaluation in the form received.

Environmental Concerns

Comments in this report concerning either onsite conditions or observations, including soil appearances and odors, are provided as general information. These comments are not intended to describe, quantify, or evaluate environmental concerns or situations. Since personnel, skills, procedures, standards, and equipment differ, a geotechnical investigation report is not intended to substitute for a geoenvironmental investigation or a Phase II/III Environmental Site Assessment. If the potential for petroleum or hazardous materials contamination or other environmental hazards relating to the site exists, MTI must be informed prior to the commencement of the geotechnical investigation. If environmental services are needed, MTI can provide, via a separate contract, those personnel who are trained to investigate and delineate soil and water contamination.

SITE DESCRIPTION

Site Access

Access to the site may be gained via Interstate 184 to the South Orchard Street exit. Proceed south approximately 1.5 miles to where it turns into its West Gowen Road. Continue in this direction an additional 0.5 mile to Pleasant Valley Road, then turn south. From this intersection, proceed just short of 5 miles to the entrance road for the Idaho correctional facilities. Turn to the east and continue along this access road, an additional ½ mile, to the facility entrance. The site is immediately to the north. Presently the site exists as multiple corrections housing and day use facilities, and surrounding landscaping. The location is depicted on site map plates included in the **Appendix**.

Regional Geology

The project site is located within the western Snake River Plain of southwestern Idaho and eastern Oregon. The plain is a northwest trending rift basin, about 45 miles wide and 200 miles long, that developed about 14 million years ago (Ma) and has since been occupied sporadically by large inland lakes. Geologic materials found within and along the plain's margins reflect volcanic and fluvial/lacustrine sedimentary processes that have led to an accumulation of approximately 1 to 2 km of interbedded volcanic and sedimentary deposits within the plain. Along the margins of the plain, streams that drained the highlands to the north and south provided coarse to fine-grained sediments eroded from granitic and volcanic rocks, respectively. About 2 million years ago the last of the lakes was drained and since that time fluvial erosion and deposition has dominated the evolution of the landscape. The project appears to be underlain by "Basalt Flows of Indian Creek, Undivided" as mapped by Othberg and Stanford (1993). This volcanic deposit is composed of multiple flows of medium to dark gray olivine basalt. These flows erupted from numerous vents found south

of the Boise River and north of the Snake River, southeast of the City of Boise, Idaho. At the time of eruption lavas flowed into and down ancestral Indian Creek and Boise River valleys. Northwest-trending, gently sloping escarpments suggest faulting of the basalt. These basalts are mantled with loess 2-12 feet thick that contains about 35% pedogenic clay and a duripan that can be 3 feet thick.

General Site Characteristics

This proposed work is to be conducted within an area that has undergone significant development. Grading through the areas has required both cuts and fills to flatten the area, and surface materials are somewhat variable as a result. Throughout the majority of the site, near surface soils consisted of fine-grained silts, usually under limited fills. Vegetation was limited to spare volunteer grasses and weed growth.

Regional storm drainage is to the north and west, eventually to the Boise River Drainage. Storm water drainage for the site is achieved predominately by percolation through surficial soils. No significant off-site storm water should drain onto the project site. Storm water drainage collection and retention systems were not in place near the selected exploration sites.

Regional Site Climatology and Geochemistry

According to the Western Regional Climate Center, the average precipitation for Treasure Valley is on the order of 10 to 12 inches per year, with an annual snowfall of approximately 20 inches and a range from 3 to 49 inches. The monthly mean daily temperatures range from 21° F to 95° F with daily extremes ranging from -25° F to 111° F. Winds are generally from the northwest or southeast with an annual average wind speed of approximately 9 miles per hour (mph) with a maximum of 62 mph. Soils and sediments in the area are primarily derived from siliceous materials and exhibit low electro-chemical potential for corrosion of metals or concretes. Local aggregates are generally appropriate for Portland cement and lime cement mixtures. Surface waters, groundwaters, and soils in the region typically have pH levels ranging from 7.2 to 8.2.

Geoseismic Setting

Soils on site are classed as Site Class D in accordance with Chapter 16 of the 2009 edition of the IBC. Structures constructed on this site should be designed per IBC requirements for such a seismic classification. Our investigation did not reveal hazards resulting from potential earthquake motions including: slope instability, liquefaction, and surface rupture caused by faulting or lateral spreading. Incidence and anticipated acceleration of seismic activity in the area is low.

SOILS EXPLORATION

Exploration and Sampling Procedures

Field exploration conducted to determine engineering characteristics of subsurface materials included a reconnaissance of the project site and investigation by test pit. Test pit sites were located in the field by means of visual approximation from on-site features or known locations and are presumed to be accurate to within a few feet. Upon completion of investigation, each test pit was backfilled with loose excavated

materials. Re-excavation and compaction of these test pit areas are required prior to construction of overlying structures.

In addition, samples were obtained from representative soil strata encountered. Samples obtained have been visually classified in the field by professional staff, identified according to test pit number and depth, placed in sealed containers, and transported to our laboratory for additional testing if deemed necessary. Subsurface materials have been described in detail on logs provided in the **Appendix**. Results of field and laboratory tests are also presented on these logs. MTI recommends that these logs **not** be used to estimate fill material quantities.

Soil and Sediment Profile

The profile below represents a generalized interpretation for the project site. Note that on site soils strata, encountered between test pit locations, may vary from the individual soil profiles presented in the logs, which can be found in the **Appendix**.

The materials encountered during exploration were quite typical for the geologic area mapped as Basalt Flows of Indian Creek Undivided. Native surficial soils were predominately silts. This soil type typically was tan to whitish in color, generally exhibited moisture contents of slightly moist to dry, and had consistencies commonly from very stiff to hard with many of these firmer soil horizons containing some degree of calcium carbonate cementation (hardpan). Most of the cemented layers were characterized in the field as strong to very strong in cementation. Lean clay was noted in test pit 2 only, and may have been removed from other areas during grading. This soil was dark brown, slightly moist, and very stiff to hard. Organic materials were present exterior to the facilities only, and consisted of volunteer grasses.

At relatively shallow depths we encountered the upper surface of the locally present Indian Creek Basalt formation. This appears to vary from solid widely fractured basalt to very strongly cemented basalt blocks. However, at depths of 3.2 to 6.3 feet, the backhoe used encountered refusal at these basalt surfaces, and was not able to continue to depth.

Competency of test pit walls varied little across the site. The fine grained soils were stable, especially as much of the profile was cemented. Moisture contents will affect wall competency for the uncemented thickness' if they are saturated, under load, and unsupported.

Volatile Organic Scan

No environmental concerns were identified prior to commencement of the investigation. Therefore, soils obtained during on-site activities were not assessed for volatile organic compounds by portable photoionization detector. Samples obtained during our exploration activities exhibited no odors or discoloration typically associated with this type contamination. No groundwater was encountered.

SITE HYDROLOGY

Existing surface drainage conditions are defined in the **General Site Characteristics** section. Information provided in this section is limited to observations made at the time of the investigation. Either regional or local ordinances may require information beyond the scope of this report.

Groundwater

During our field investigation, groundwater was not encountered in test pits advanced to depths of 6.3 feet bgs. Additionally, soil moistures in the test pits were commonly slightly moist to dry.
Maximum groundwater elevations likely occur during late spring to early summer runoff season. According to active USGS monitoring well data approximately 1 mile from the project site, groundwater was measured at a depth of 450 feet bgs, which equates to elevation of 2,594 feet above mean sea level (MSL). Therefore, for construction purposes, groundwater depth can be assumed to remain greater than 20 feet bgs throughout the year.

Soil Infiltration Rates

Soil permeability, which was not tested in the field, is a measure of the ability of a soil to transmit a fluid. Given the absence of these measurements, for this report an estimation of fluid transport is presented using generally recognized values for each soil type and gradation. Of soils comprising the generalized soil profile for this study, lean clay and silt soils generally offer little permeability, with typical hydraulic infiltration rates of less than 2 inches per hour; though calcium carbonate cementation encountered within cemented silt soils may reduce this value to near zero. Infiltration rates through basalt rock can be highly variable, ranging from nearly zero to greater than 6 inches per hour in some cases. Infiltration testing is required to determine site-specific infiltration rates for drainage design once proposed locations of infiltration facilities are determined.

LATERAL EARTH PRESSURES

Pole base foundations will be subject to lateral earth pressures, as a result of fence tensioning. The following sliding frictional coefficient values should be used: 1) 0.35 for pole base/footings bearing on native sandy silt/silty sand sediments and 2) 0.45 for footings bearing on granular structural fill or basalt rock. Below-grade light pole footings should be designed based on passive pressures. Passive pressures are used for conditions where the pole base moves toward the soil mass at failure. A passive lateral earth pressure of 349 pounds per square foot (psf) should be used for silt soils. For compacted sandy gravel fill, a passive lateral earth pressure of 496 psf should be used.

FOUNDATION RECOMMENDATIONS

Light pole bases are expected to extend up to 6 feet below ground surface. Based on this depth, it is expected that the base/footing will be supported on basalt rock or strongly cemented silt. Based on this condition, an allowable net soil bearing capacity of 4,000 pounds per square foot is suitable for support, with a $^1/_3$ increase for short-term loading, which is defined by seismic events or designed wind speeds. It is recommended MTI personnel to verify the bearing soil suitability for each foundation at the time of construction.

CONSTRUCTION CONSIDERATIONS

Recommendations in this report are based upon the perimeter additions being supported within the silt to cemented silt formations, with lateral support from either locally derived backfills or structural fill materials. The onsite silt soils can be used as backfill for the utility trench, but will require moisture control and relatively thin lifts in order to obtain the specified compaction, as outlined in further detail in the **Structural Fill** section of this report.

Earthwork

Excavation activities will extend 3 feet below grade for utility lines and up to 6 feet for pole bases. These depths will extend into basalt formations at some locations, and into the very strongly cemented silts at others. Specifically, intact basalt rock can be expected at depths of just over 3 feet in the location of Test Pit 1, and at greater depths in the remaining locations. See logs for specific depths, relative to planned structural elements. The upper 1 foot of cemented silt overlying the basalt rock is considered rippable, but is strongly cemented and will require some effort, for removal.

Structural Fill

Soils recommended for use as structural fill are those classified as GW, GP, SW, and SP in accordance with the Unified Soil Classification System (USCS) (ASTM D2487). Use of silty soils (USCS designation of GM, SM, and ML) as structural fill, for backfill of utility lines, may be acceptable. However, these materials require very high moisture contents for compaction and require a long time to dry out if natural moisture contents are too high and may also be susceptible to frost heave under certain conditions. Therefore these materials can be quite difficult to work with as moisture content, lift thickness, and compactive effort becomes difficult to control. If silty soil is used for structural fill, lift thicknesses should not exceed 6 inches (loose), and fill material moisture must be closely monitored at both the working elevation and the elevations of materials already placed. Following placement, silty soils must be protected from degradation resulting from construction traffic or subsequent construction.

Recommended granular structural fill materials, those classified as GW, GP, SW, and SP, should consist of a 6-inch minus select, clean, granular soil with no more than 50 percent oversize (greater than ¾-inch) material and no more than 12 percent fines (passing No. 200 sieve). These fill materials should be placed in layers not to exceed 12 inches in loose thickness. Prior to placement of structural fill materials, surfaces must be

prepared as outlined in the **Construction Considerations** section. Structural fill material should be moisture-conditioned to achieve optimum moisture content prior to compaction. For structural fill below footings, areas of compacted backfill must extend outside the perimeter of the footing for a distance equal to the thickness of fill between the bottom of foundation and underlying soils, or 5 feet, whichever is less. All fill materials must be monitored during placement and tested to confirm compaction requirements, outlined below, have been achieved.

Each layer of structural fill must be compacted, as outlined below:

- Below Structures and Rigid Pavements: A minimum of 95 percent of the maximum dry density as determined by ASTM D1557.
- Below Flexible Pavements and Utility Line Backfill: A minimum of 92 percent of the maximum dry density as determined by ASTM D1557 or 95 percent of the maximum dry density as determined by ASTM D698.

The ASTM D1557 test method must be used for samples containing up to 40 percent oversize (greater than ¾-inch) particles. If material contains more than 40 percent but less than 50 percent oversize particles, compaction of fill must be confirmed by proof rolling each lift with a 10-ton vibratory roller (or equivalent) until the maximum density has been achieved. Density testing must be performed after each proof rolling pass until the in-place density test results indicate a drop (or no increase) in the dry density, defined as the maximum density or "break over" point. The number of required passes should be used as the requirement on the remainder of fill placement. Material should contain sufficient fines to fill void spaces, and must not contain more than 50 percent oversize particles. Testing and monitoring of fill placement shall conform to ISPWC requirements.

Backfill of Walls

Backfill materials must conform to the requirements of structural fill, as defined in this report. For wall heights greater than 2.5 feet, the maximum material size should not exceed 4 inches in diameter. Placing oversized material against rigid surfaces interferes with proper compaction, and can induce excessive point loads on walls. Backfill shall not commence until the wall has gained sufficient strength to resist placement and compaction forces. Further, retaining walls above 2.5 feet in height shall be backfilled in a manner that will limit the potential for damage from compaction methods and/or equipment. It is recommended that only small hand-operated compaction equipment be used for compaction of backfill within a horizontal distance equal to the height of the wall, measured from the back face of the wall.

Backfill should be compacted in accordance with the specifications for structural fill, except in those areas where it is determined that future settlement is not a concern, such as planter areas. In nonstructural areas, backfill must be compacted to a firm and unyielding condition.

Excavations

Shallow excavations that do not exceed 4 feet in depth may be constructed with side slopes approaching vertical. Below this depth, it is recommended that slopes be constructed in accordance with Occupational Safety and Health Administration (OSHA) regulations, section 1926, subpart P. Based on these regulations, on-site soils are classified as type "C" soil, and as such, excavations within these soils should be constructed

at a maximum slope of 1½ foot horizontal to 1 foot vertical (1½H:1V) for excavations up to 20 feet in height. Excavations in excess of 20 feet will require additional analysis. Note that these slope angles are considered stable for short-term conditions only, and will not be stable for long-term conditions.

During our subsurface exploration, test pit sidewalls generally exhibited little indication of collapse. It is understood that deep excavations will not be required. Care must be taken to ensure that excavations are properly backfilled in accordance with procedures outlined in this report.

Shallow soil cementation (caliche) was observed throughout the site and may cause difficulties during utility placement. Cemented soils should be anticipated throughout the site at depths below a foot bgs.

Groundwater Control

Groundwater was not encountered during the investigation and is anticipated to be below the depth of construction. Special precautions may be required for control of surface runoff and subsurface seepage. It is recommended that runoff be directed away from open excavations. Silty or clayey soils may become soft and pump if subjected to excessive traffic during time of surface runoff. Ponded water in construction areas should be drained through methods such as trenching, sloping, crowning grades, nightly smooth drum rolling, or installing a French drain system. Additionally, temporary or permanent driveway sections should be constructed if extended wet weather is forecasted.

GENERAL COMMENTS

When plans and specifications are complete, or if significant changes are made in the character or location of the proposed development, consultation with MTI should be arranged as supplementary recommendations may be required. Suitability of subgrade soils and compaction of structural fill materials must be verified by MTI personnel prior to placement of structural elements. Additionally, monitoring and testing should be performed to verify that suitable materials are used for structural fill and that proper placement and compaction techniques are utilized.

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APPENDICES

ACRONYM LIST

AASHTO:	American Association of State Highway and Transportation Officials
ACCP:	Asphalt Cement Concrete Pavement
ACHD:	Ada County Highway District
ASTM:	American Society for Testing and Materials
AU:	Auger sample
bgs:	below ground surface
CB:	Carbide bit
CBR:	California Bearing Ratio
D:	natural dry unit weight, pcf
DB:	diamond bit
DM:	Dames & Moore sampling tube
GS:	grab sample
IBC:	International Building Code
ISPWC:	Idaho Standards for Public Works Construction
ITD:	Idaho Transportation Department
LL:	Liquid Limit
M:	water content
MSL:	mean sea level
N:	Standard "N" penetration: blows per foot, Standard Penetration Test
NP:	nonplastic
PCCP:	Portland Cement Concrete Pavement
PERM:	vapor permeability
PI:	Plasticity Index
PID:	photoionization detector
PVC:	polyvinyl chloride
Qc:	cone penetrometer value, unconfined compressive strength, psi
Qp:	Penetrometer value, unconfined compressive strength, tsf
Qu:	Unconfined compressive strength, tsf
SPT:	Standard Penetration Test (140:pound hammer falling 30 in. on a 2:in. split spoon)
SS:	split spoon (13/8:in. inside diameter, 2:in. outside diameter, except where noted)
ST:	shelby tube (3:in. outside diameter, except where noted)
USCS:	Unified Soil Classification System
USDA:	United States Department of Agriculture
UST:	underground storage tank
V:	vane value, ultimate shearing strength, tsf
WT:	apparent groundwater level

GEOTECHNICAL GENERAL NOTES

RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION			
Coarse-Grained Soils	**SPT Blow Counts (N)**	**Fine-Grained Soils**	**SPT Blow Counts (N)**
Very Loose:	< 4	Very Soft:	< 2
Loose:	4-10	Soft:	2-4
Medium Dense:	10-30	Medium Stiff:	4-8
Dense:	30-50	Stiff:	8-15
Very Dense:	>50	Very Stiff:	15-30
		Hard:	>30

Moisture Content	
Description	**Field Test**
Dry	Absence of moisture, dusty, dry to touch
Moist	Damp but not visible moisture
Wet	Visible free water, usually soil is below water table

Cementation	
Description	**Field Test**
Weakly	Crumbles or breaks with handling or slight finger pressure
Moderately	Crumbles or beaks with considerable finger pressure
Strongly	Will not crumble or break with finger pressure

PARTICLE SIZE					
Boulders:	>12 in.	Coarse-Grained Sand:	5 to 0.6 mm	Silts:	0.075 to 0.005 mm
Cobbles:	12 to 3 in.	Medium-Grained Sand:	0.6 to 0.2 mm	Clays:	<0.005 mm
Gravel:	3 in. to 5 mm	Fine-Grained Sand:	0.2 to 0.075 mm		

UNIFIED SOIL CLASSIFICATION SYSTEM			
Major Divisions		**Symbol**	**Soil Descriptions**
Coarse-Grained Soils <50% passes No.200 sieve	Gravel & Gravelly Soils <50% coarse fraction passes No.4 sieve	GW	Well-graded gravels; gravel/sand mixtures with little or no fines
		GP	Poorly-graded gravels; gravel/sand mixtures with little or no fines
		GM	Silty gravels; poorly-graded gravel/sand/silt mixtures
		GC	Clayey gravels; poorly-graded gravel/sand/clay mixtures
	Sand & Sandy Soils >50% coarse fraction passes No.4 sieve	SW	Well-graded sands; gravelly sands with little or no fines
		SP	Poorly-graded sands; gravelly sands with little or no fines
		SM	Silty sands; poorly-graded sand/gravel/silt mixtures
		SC	Clayey sands; poorly-graded sand/gravel/clay mixtures
Fine Grained Soils >50% passes No.200 sieve	Silts & Clays LL < 50	ML	Inorganic silts; sandy, gravelly or clayey silts
		CL	Lean clays; inorganic, gravelly, sandy, or silty, low to medium-plasticity clays
		OL	Organic, low-plasticity clays and silts
	Silts & Clays LL > 50	MH	Inorganic, elastic silts; sandy, gravelly or clayey elastic silts
		CH	Fat clays; high-plasticity, inorganic clays
		OH	Organic, medium to high-plasticity clays and silts
Highly Organic Soils		PT	Peat, humus, hydric soils with high organic content

ROCK CLASSIFICATION SYSTEM

WEATHERING	
WEATHERING	**FIELD TEST**
Fresh	No sign of decomposition or discoloration. Rings under hammer impact.
Slightly Weathered	Slight discoloration inwards from open fractures, otherwise similar to Fresh.
Moderately Weathered	Discoloration throughout. Weaker minerals such as feldspar decomposed. Strength somewhat less than fresh rock but cores cannot be broken by hand or scraped with a knife. Texture preserved.
Highly Weathered	Most minerals somewhat decomposed. Specimens can be broken by hand with effort or shaved with knife. Core stones present in rock mass. Texture becoming indistinct but fabric preserved.
Completely Weathered	Minerals decomposed to soil but fabric and structure preserved. Specimens easily crumbled or penetrated.

FRACTURING	
SPACING	**DISCRIPTION**
6 ft.	Very widely
2 – 6 ft.	Widely
8 – 24 in.	Moderately
2 ½ - 8 in.	Closely
¾ - 2 ½ in.	Very Closely

ROCK QUALITY DESIGNATION (RQD)	
RQD (%)	**ROCK QUALITY**
90 – 100	Excellent
75 – 90	Good
50 – 75	Fair
25 – 50	Poor
0 - 25	Very Poor

COMPETENCY			
STRENGTH	**CLASS**	**FIELD TEST**	**APPROXIMATE RANGE OF UNCONFINED COMPRESSIVE STRENGTH (tsf)**
Extremely Strong	I	Many blows with geologic hammer required to break intact specimen.	>2000
Very Strong	II	Hand-held specimen breaks with pick end of hammer under more than one blow.	2000 - 1000
Strong	III	Cannot be scraped or peeled with knife, hand-held specimen can be broken with single moderate blow with pick end of hammer.	1000 - 500
Moderately Strong	IV	Can just be scraped or peeled with knife. Indentations 1 mm to 3 mm show en specimen with moderate blow with pick end of hammer.	500 - 250
Weak	V	Material crumbles under moderate blow with pick end of hammer and can be peeled with a knife, but is hard to hand-trim for triaxial test specimen.	250 - 10
Friable	VI	Material crumbles in hand.	N/A

GEOTECHNICAL INVESTIGATION TEST PIT LOG

Test Pit Log #: **TP-1** Date Advanced: **12 Mar 2013** Logged by: **Kevin L. Schroeder, P.G.**

Excavated by: **Struckman's Backhoe Service** Location: **See Site Map Plates**

Depth to Water Table: **Not Encountered** Total Depth: **3.2 Feet bgs**

Depth (Feet bgs)	Field Description and USCS Soil and Sediment Classification	Sample Type	Sample Depth (Feet bgs)	Qp	Lab Test ID
0.0-0.9	Silty Gravel Fill (FILL-GM): *Brown, slightly moist, loose to medium dense.* *--Organic material through the upper ½ foot.*				
0.9-3.2	Silt (ML): *Brown to light brown, slightly moist to dry, hard.* *--Moderate to very strong calcium carbonate cementation from 1.7 to 3.2 feet of depth.*	GS	0.9-1.7	4.5+	A
Below 3.2	Basalt: *Dark gray, dry, met with refusal on cemented silt and basalt.*				

Test Pit Log #: **TP-2** Date Advanced: **12 Mar 2013** Logged by: **Kevin L. Schroeder, P.G.**

Excavated by: **Struckman's Backhoe Service** Location: **See Site Map Plates**

Depth to Water Table: **Not Encountered** Total Depth: **4.8 Feet bgs**

Depth (Feet bgs)	Field Description and USCS Soil and Sediment Classification	Sample Type	Sample Depth (Feet bgs)	Qp	Lab Test ID
0.0-1.8	Silty Sand to Gravel Fill (FILL-GM/SM): *Brown, slightly moist, loose to medium dense.*				
1.8-2.7	Clay (CL): *Dark brown, slightly moist, very stiff to hard.*			4.0-4.5+	
2.7-4.8	Silt (ML): *Brown, slightly moist, hard.* *--Very strong calcium carbonate cementation below 3.2 feet of depth.*			4.5+	
Below 4.8	Basalt: *Dark gray, dry, met with refusal on cemented silt and basalt.*				

GEOTECHNICAL INVESTIGATION TEST PIT LOG

Test Pit Log #: **TP-3** Date Advanced: **12 Mar 2013** Logged by: **Kevin L. Schroeder, P.G.**

Excavated by: **Struckman's Backhoe Service** Location: **See Site Map Plates**

Depth to Water Table: **Not Encountered** Total Depth: **3.8 Feet bgs**

Depth (Feet bgs)	Field Description and USCS Soil and Sediment Classification	Sample Type	Sample Depth (Feet bgs)	Qp	Lab Test ID
0.0-3.8	Silt (ML): *Tan to whitish, slightly moist, stiff.* *--Weak to moderate calcium carbonate cementation from 1.2 to 1.8 feet of depth.* *--Moderate to very strong calcium carbonate cementation from 1.8 to 3.8 feet of depth.*				
Below 3.8	Basalt: *Dark gray, dry, met with refusal on cemented silt and basalt.*				

Test Pit Log #: **TP-4** Date Advanced: **12 Mar 2013** Logged by: **Kevin L. Schroeder, P.G.**

Excavated by: **Struckman's Backhoe Service** Location: **See Site Map Plates**

Depth to Water Table: **Not Encountered** Total Depth: **4.8 Feet bgs**

Depth (Feet bgs)	Field Description and USCS Soil and Sediment Classification	Sample Type	Sample Depth (Feet bgs)	Qp	Lab Test ID
0.0-0.3	Silty Sand to Fine Gravel Fill (FILL-GM/SM): *Brown, slightly moist, loose to medium dense.*				
0.3-4.9	Silt (ML): *Tan, slightly moist to dry, very stiff to hard.* *--Weak to moderate calcium carbonate cementation from 0.6 to 1.2 feet of depth.* *--Weak to moderate calcium carbonate cementation from 2.9 to 4.9 feet of depth.*			4.0-4.5+	
Below 4.9	Basalt: *Dark gray, dry, met with refusal on cemented silt and basalt.*				

GEOTECHNICAL INVESTIGATION TEST PIT LOG

Test Pit Log #: **TP-5** Date Advanced: **12 Mar 2013** Logged by: **Kevin L. Schroeder, P.G.**

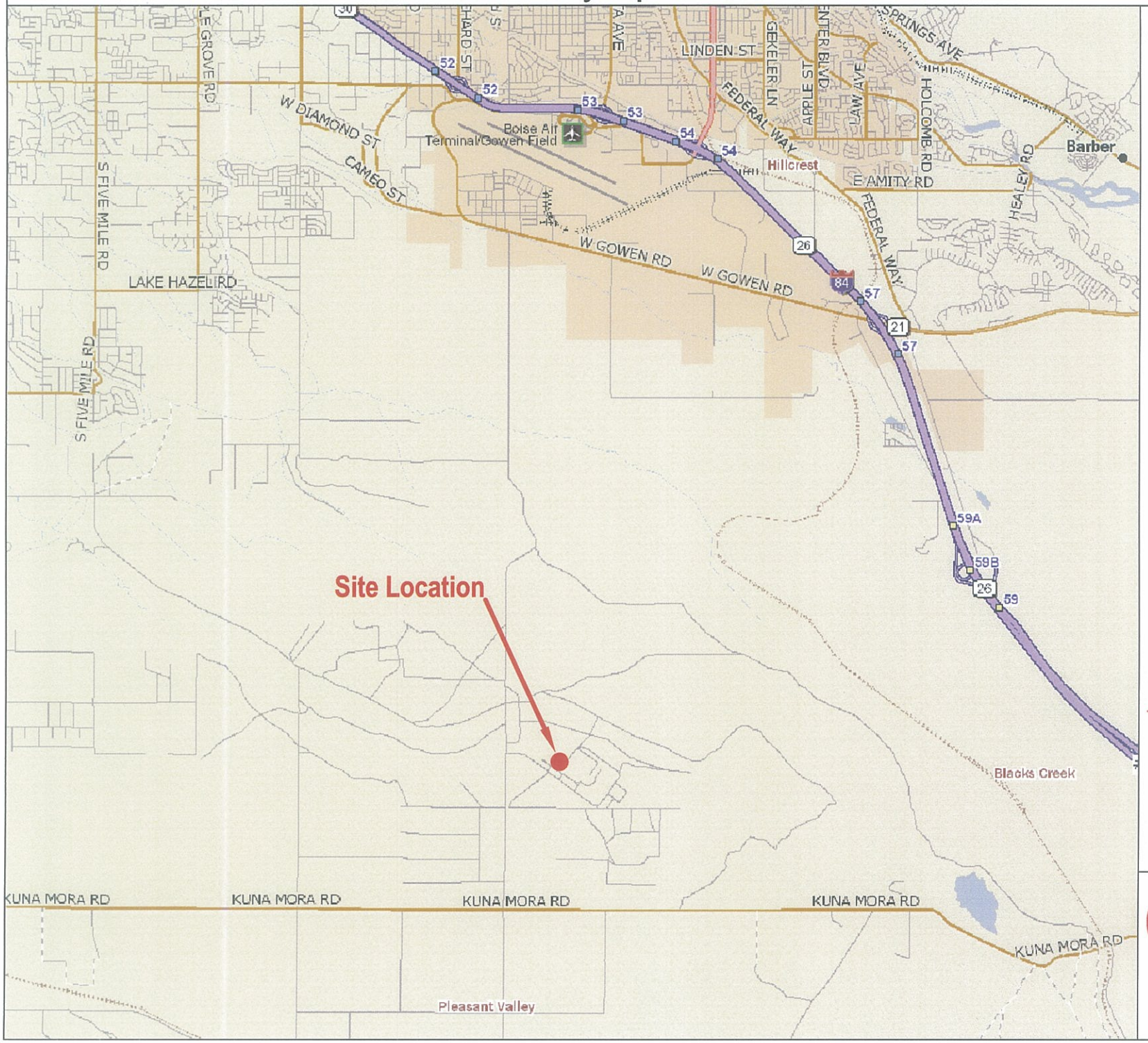
Excavated by: **Struckman's Backhoe Service** Location: **See Site Map Plates**

Depth to Water Table: **Not Encountered** Total Depth: **6.3 Feet bgs**

Depth (Feet bgs)	Field Description and USCS Soil and Sediment Classification	Sample Type	Sample Depth (Feet bgs)	Qp	Lab Test ID
0.0-0.3	Silty Sand to Fine Gravel Fill (FILL-GM/SM): *Brown, slightly moist, loose to medium dense.*				
0.3-6.3	Silt (ML): *Tan to light gray, slightly moist to dry, very stiff to hard.* --*Strong to very strong calcium carbonate cementation from 1.5 to 3.3 feet of depth.* --*Weak to moderate calcium carbonate cementation from 3.3 to 6.3 feet of depth.*			4.0-4.5+	
Below 6.3	Basalt: *Dark gray, dry, met with refusal on cemented silt and basalt.*				

Vicinity Map

Plate 1



MAP NOTES:

- Delorme Street Atlas
- Not to Scale

LEGEND

Approximate Site Location

N

Replace Perimeter Detection System - IMSI - DPW #13-060

Idaho Department of Corrections
Kuna, ID

Modified from DeLorme by: MHS
15 April 2013
Drawing: B130332g

MATERIALS TESTING & INSPECTION

2791 S. Victory View Way
Boise, ID 83709-2835

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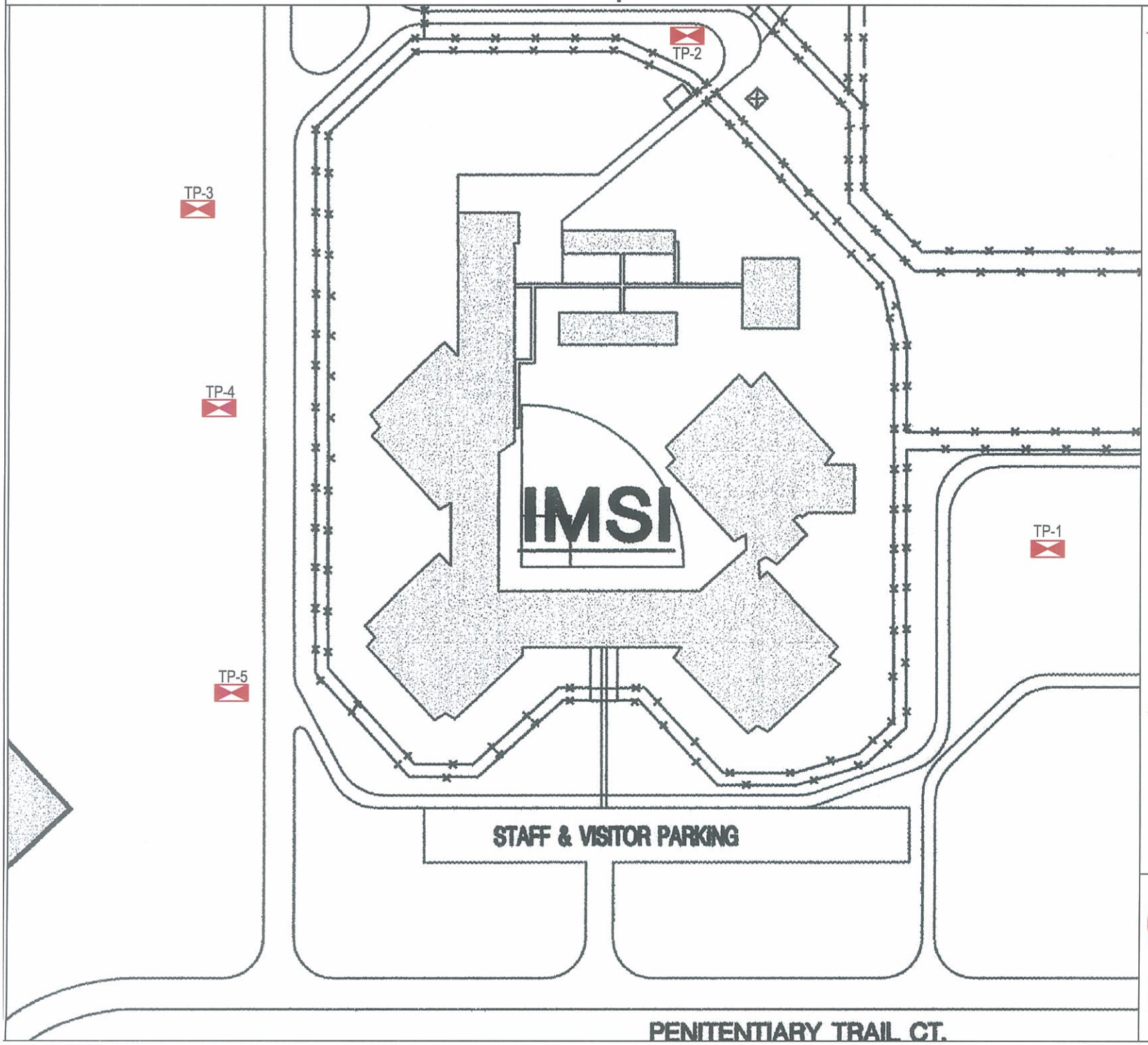
Site Map

Plate 2



NOTES:

- Not to Scale

LEGEND

Approximate MTI Test Pit Location

Replace Perimeter Detection System - IMSI - DPW #13-060

Idaho Department of Corrections
Kuna, ID

Modified by: MHS
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