WATSON
ENGINEERING COMPANY, INC.

February 16, 2024

Spencer Jones
DDJ Development, LLC
PO Box 1977
Cedar City, UT 84721

Subject: The Estates at Sunrise Ranch Phase 2 - Geotechnical Investigation
Approximately 3550 N 2300 W
Cedar City, Utah
Project Number: 23-6704

Dear Spencer,

Watson Engineering Company, Inc. (Watson) has completed the geotechnical investigation for the above referenced project. Enclosed you will find the geotechnical report including the results of our field and laboratory investigation, engineering analysis, and recommendations for this property. The following table presents a summary of our findings.

Parameter	Result
Liquefaction Hazard	None
Landslide Hazard	The site is not located in a landslide hazard area
Over-excavation Requirement	Over-excavate three feet (3') below footings, two feet (2') below roadways, and eighteen inches (18") below concrete slabs and other flatwork
Expansive Soils	Minor
Soil Salt Solubility	Negligible
Concrete Placement	Do not place concrete in freezing weather and blanket all concrete in cold weather
Compaction Required	90% Relative Compaction
Final Grade Required	5% (6 inches in 10 feet)
Structural Fill	Native Material or Import Material

As always, if you have any questions or concerns regarding our testing, results, or recommendations please feel free to contact us.

472 N. 2150 W. Suite 7 | Cedar City, Utah 84721
Office: 435.586.3004 Fax: 435.586.7480 Web: www.wecinc.com

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1 INTRODUCTION

1.1 General Project Information

This report provides our findings as well as our analysis and recommendations with regards to Phase 2 of the Estates at Sunrise Ranch residential subdivision to be constructed at approximately 3550 North 2300 West in Cedar City, Iron County, Utah. The subdivision is located within Iron County jurisdiction. Watson previously provided a geotechnical report for Phase 1 of the Estates at Sunrise Ranch subdivision, dated June 2, 2021 as report number 21-5051, that report was reviewed during the preparation of this report. It is understood that new construction will consist of a new subdivision consisting of 18 lots, each about one (1) acre in size. Structures will be one (1) or two (2) story, slab-on-grade or basement level, with wood frame walls. A public street will be constructed connecting 2300 West with 2500 West. Foundations loads are expected to be light to moderate and no special considerations regarding settlement tolerances are needed. It is expected that the home will be constructed in accordance with the 2021 International Residential Code (IRC).

1.2 Site Description

The property is located in an area with some existing residential subdivisions, and some agricultural fields. The 20-acre lot is bounded on the north by the first phase of the Estates at Sunrise Ranch subdivision, on the south by agricultural fields, on the east by 2300 West followed by Monarch Meadows subdivision, and on the west by 2500 West followed by Fife Town Subdivision. At the time of our site visit, the property was an irrigated agricultural field. The site was vegetated with small grass. There was no indication of former structures or mass fill on the site.

1.3 Geologic Conditions

From the available maps and USGS interactive GIS database, the site appears to be located within two (2) miles of the Cedar Valley (west side) faults to the west and within four (4) miles of the Enoch graben and the Cedar City – Parowan Monocline, both to the east. Foundations should be designed by a qualified, registered structural engineer. Seismic Site Class "D" may be used for design.

Liquefaction may occur when water-saturated sandy soils are subjected to earthquake ground shaking. When soil liquefies, it loses strength and behaves as a viscous liquid (like quicksand) rather than as a solid. This can cause buildings to sink into the ground or tilt, empty buried tanks to rise to the ground surface, slope failures, nearly level ground to shift laterally tens of feet (lateral spreading), surface subsidence, ground cracking, and sand blows. **This project site does NOT lie in an area susceptible to liquefaction due to groundwater exceeding 50 feet in depth**. Should the groundwater elevation rise to within 50 feet of the surface, the sandy layers may become subject to liquefaction during a seismic event, the clay layers would not be

subject to liquefaction. Analyzing the risk of damage to the structures and other improvements due to liquefaction is beyond the scope of this report.

Landslides are common natural hazards in Utah. They often strike without warning and can be destructive and costly. Common types of landslides in Utah are debris flows, slides, and rock falls. Many landslides are associated with rising ground-water levels due to rainfall, snowmelt, and landscape irrigation. Therefore, landslides in Utah typically move during the months of March, April, and May, although debris flows associated with intense thunderstorm rainfall are common in July. **This project site does NOT appear to be located atop an existing Landslide, Debris Flow, or Rockfall hazard.**

1.4 Subsoil Conditions

The subsoils at the site consist of sandy silt in the upper material, underlain by lean clay with sand to the termination depth of the test pits at thirteen to fifteen feet (13' – 15') below grade. The soil was visually classified as 'moist'. No groundwater was encountered during the investigation.

Bulk samples were collected from the upper layers. The laboratory testing results indicate that the soil classifies as lean clay with sand and sandy, silty-clay. Testing indicates the soil has a liquid limit of 20 to 23, and a plasticity index of 4 to 9. Modified proctors (ASTM D1557) indicate a maximum dry density of 119.1 pcf to 122.5 pcf at moisture contents of 13.3 and 11.8 percent, respectively. Soluble salt presence in the soil is negligible. Corrosion testing was performed, and the results are provided later in this report.

The liquid limit is the moisture content at which a soil begins to flow like a liquid. The plastic limit is the moisture content at which a soil can be deformed without crumbling. The plasticity index is the difference between the liquid limit and the plastic limit. It is a measure of how much and what type of clay is in the soil.

2 ENGINEERING ANALYSIS AND RECOMMENDATIONS

2.1 Analysis

The soil is sufficient to support the relatively shallow spread footings subject to remedial earthwork.

It is recommended that foundations bear on structural fill extending at least three feet (3') below the bottom of footing elevation, or three feet (3') below existing grades, whichever is deeper. Structural fills under foundations should extend horizontally at least three feet (3') beyond the edge of the foundation. Structural fill shall consist of native or import material which has been prepared in accordance with the Fill and Backfill section (2.5) of this report. It is recommended that any slabs-on-grade,

basement slabs, and exterior concrete and asphalt flatwork (driveways and sidewalks) be supported on at least eighteen inches (18″) of structural fill. Public roadways should be supported on at least two feet (2′) of structural fill.

Structural fill should be placed in eight inch (8″) maximum lifts, and compacted to at least 90 percent of the maximum dry density as determined by ASTM D1557. In landscape areas the compaction may be reduced to 85 percent of the maximum dry density.

Based on our limited investigation it appears that excavation operations should be able to proceed with standard equipment. While groundwater was not an issue during our investigation, ingress nuisance moisture may occur during construction depending on the time of year of construction. If there is standing water or it is wet, the subgrade should be allowed to dry out prior to placing footings or flatwork.

2.2 Site Preparation

The vegetation should be cleared along with large root systems, debris and loose soils should be removed in their entirety. The foundation and roadway subgrades should be over-excavated as necessary.

Precautions should be taken during and after construction to eliminate saturation of foundation soils. All drainage and grading next to the structure foundation shall be constructed in accordance with the requirements of section R401.3 of the International Residential Code (IRC). Over-wetting the soils prior to or during construction may result in softening and pumping causing equipment mobility problems and difficulty in achieving compaction. Saturation of the soils after construction may cause distress to the foundations and flatwork. Positive drainage should be established away from the exterior walls of the structures. Positive grade is defined by having a minimum drainage slope in landscaped areas of six inches (6″) for a minimum distance of ten feet (10′) away from the foundation of the structure (five percent (5%)) and in hard surface pavement areas, two inches (2″) for a minimum distance of eight feet (8′) away from the structure (two percent (2%)). **This positive grade shall be maintained throughout the life of the structure to minimize the amount of moisture infiltrating the soils against the concrete foundation wall, and that a minimum of six inches (6″) of separation from the top of the concrete foundation wall to any landscaping be maintained.** Watering adjacent to the structure should be eliminated and irrigation systems should be properly maintained to prevent over-watering. Roof runoff and other sources of moisture should not be allowed to infiltrate the soils in the vicinity of, or upslope from, the structures. Special care should be taken to properly channel roof runoff and other sources of moisture, this may require other solutions than just site grading.

Prior to placing fills, the excavation bottoms should be scarified to a depth of eight inches (8″), moisture conditioned to within two percent (2%) of optimum and

recompacted to at least 90 percent of the maximum dry density as determined by ASTM D1557 (Modified Proctor). Backfill should be placed as specified in the Fill and Backfill section (2.5) of this report. Once excavation is complete and prior to backfilling it is recommended that a representative of the engineer visit the site and ensure that the subgrade meets the requirements set forth herein.

Pavement areas should be scarified and compacted in a similar manner. Any import fill should comply with the requirements as specified in the Fill and Backfill section (2.5) of this report.

2.3 Foundations

It is recommended that foundations bear on structural fill or native gravelly material. The foundation should bear at least 10 inches below the bottom of slab, and at least 30 inches below grade for frost protection. If site preparation is carried out as specified herein **an allowable bearing capacity of 1,500 psf** may be used for design.

This bearing capacity is a net pressure and may be increased 1/3 for wind, seismic, and other transient loads of a short duration. It is recommended that a representative of Watson observe the excavations, once complete to ensure adequate bearing stratum. Re-compacted materials should be tested to ensure they meet the requirements herein. Spread footings should be a minimum of 20 inches wide in order to meet Utah state building code. Total settlement is estimated to be on the order of ½ to 1 inch with differential settlement less than half of the total settlement for spread footings.

This bearing capacity relies on the dry strength of the native soils. Increased moisture could cause the foundations to move, it is therefore imperative that proper grades be established and runoff controlled to limit moisture infiltration within five feet (5') of the structure. Irrigation should be kept at a minimum within five feet (5') of the structure in order to prevent additional moisture increases to the supporting soils.

2.4 Lateral Pressures

The following lateral pressures may be utilized for the proposed construction:

- Active Pressures (Unrestrained walls) 35 psf/ft
- At-Rest Pressures (Restrained walls) 60 psf/ft
- Passive Pressures
  - Continuous Footings 300 psf/ft
  - Spread Footings or Drilled Piers 350 psf/ft
- Coefficient of Friction
  - with passive pressure 0.35
  - without passive pressure 0.45

All backfill must be compacted to at least ninety percent (90%) (ASTM D1557) to mobilize these passive pressures at low strain. Expansive soils should not be used as retaining wall or basement wall backfill, except as a surface seal to limit moisture infiltration. The expansive pressures could greatly increase the active pressures.

2.5 Fill and Backfill

Native material is suitable for use as general grading and structural fill under footings.

All fill placed for the support of foundations shall be at least three feet (3′) thick, extend at least three feet (3′) below existing grade, and extend horizontally at least three feet (3′) beyond the edge of the foundation. That placed for slabs-on-grade, exterior concrete flatwork, and driveways shall consist of at least eighteen inches (18″) of structural fill. Structural fill placed within the public right-of-way should extend at least two feet (2′) below the subgrade elevation.

Structural fill shall consist of approved native or imported low plasticity soils (having a remolded swell potential less than 4% under a 60 psf surcharge). Structural fill should have a solubility of less than 3%, be free of vegetation and debris, and contain no inert materials larger than four inches (4″) in nominal size.

Structural fill should be placed in maximum eight inch (8″) loose lifts and compacted on a horizontal plane, unless otherwise approved by the Geotechnical Engineer. **Structural fills shall be compacted to at least 90 percent of the maximum dry density, in accordance with ASTM D1557.** The moisture content should be within ±2% of optimum for granular soils and at optimum to 2% above optimum for fine grained soils; however this is only a guide to assist earth work contractors. Any pumping areas of soil shall be excavated and removed from the foundation. Any imported fill materials should be approved prior to importing. Also, prior to placing any fill, the excavations should be observed by the Geotechnical Engineer to observe that unsuitable materials have been removed and that it has been compacted to a suitable density.

2.6 Slab on Grade

All exterior slabs adjacent to the structure should be tied into the structural foundation with #4 rebar extending from the foundation into the exterior slab at least twelve inches (12″). Stem walls should be tied into interior slabs on grade with #4 rebar placed so that it extends fully into the stem wall and a minimum of approximately 30 bar diameters into the slab. Type-II/V concrete should be used for all footings or wherever concrete will come into direct contact with the onsite soils.

Concrete slabs-on-grade and exterior concrete flatwork shall be supported by a four inch (4″) layer of compacted gravel overlying a zone of properly placed and compacted structural fill. The layer of compacted gravel shall consist of Type II Aggregate Base, or Type I pit-run gravel.

All concrete slabs should be designed to minimize cracking as a result of shrinkage. Additionally, all concrete slabs should be reinforced and poured with Type II/V concrete to resist sulfate attack. The steel reinforcement in floor slabs should be doweled into the foundation to aid in resistance of the contraction/expansion potential. We recommend that concrete floor slabs be reinforced as recommended by the Structural Engineer. Reinforcement should be installed at mid-height in the slab unless directed otherwise by the Structural Engineer.

Special precautions must be taken during the placement and curing of all concrete slabs. Excessive slump (greater than 4") of the concrete and/or improper curing procedures used during either hot or cold weather conditions could lead to excessive shrinkage, cracking or curling in the slabs. We recommend that all concrete placement and curing operations be performed in accordance with the American Concrete Institute (ACI) Manual R318-19. In addition, we recommend concrete placement be in accordance with ACI standard 306.1: Standard Specification for Cold Weather Concreting; ACI standard 306R: Cold Weather Concreting; ACI standard 305.1: Specification for Hot Weather Concreting; and, ACI standard 305R: Hot Weather Concreting.

2.7 Pavement Recommendations

Pavement sections should be chosen based on expected traffic loads. The Following table presents the minimum pavement thickness specific to the site. It is expected that the roadways will be dedicated public streets. The minimum pavement section for local streets is included in the table below.

Pavement is designed based on the number of times an 18-kip single axle load equivalent (ESAL) truck drives along a roadway. A delivery truck and a garbage truck are examples of a 1 ESAL load. It takes approximately 1,200 passenger cars to be equal to 1 ESAL. The table below provides the expected Daily ESAL capacity for various asphalt and concrete pavement designs. These are based on a 20 year lifespan.

Location	Daily ESALs	Traffic Index (TI)	Asphalt (in)	Aggregate Base (in)	Structural Fill (in)	Note
Local Streets	4	5.9	2.5	6.0/8.0	24	1

Notes:

1. This section requires 2.5 inches of asphalt, supported by six inches (6") of aggregate base, supported by eight inches (8") of pit-run subbase. This pavement section meets the minimum allowable pavement section per the Iron County Engineer for this roadway classification.

All asphalt pavements will crack and will require a continued maintenance program. The thicker asphalt sections will have more durability in that they will require less maintenance over the life of the pavement than a thinner section. The pavement subgrade should consist of at least two feet (2') of structural fill. Where structural fill or embankment fill is to be placed, the bottom of the fill should be scarified, moisture conditioned, and re-compacted to at least 90 percent of the maximum dry density as determined by ASTM D1557. The aggregate base shall consist of Type II Aggregate Base and aggregate subbase shall consist of Type I pit-run gravel. Both should be compacted to at least 95% of the maximum dry density. Pavements and materials placed within streets should meet the requirements of the Iron County Engineering Department.

Onsite concrete (PCC) placed for trash enclosures, sidewalks, and other non-drive/parking areas should consist of a minimum of four inches (4") of concrete placed on at least four inches (4") of aggregate base. Concrete pavement should consist of at least five inches (5") of concrete supported on four inches (4") of aggregate base.

2.8 Corrosion

The soil has a pH of 7.1, a Redox potential of 421 mV, and a laboratory resistivity of 866 Ω-cm. Chloride is at 60 ppm. The soils present a high corrosion potential to directly buried metal. Buried metal piping should be designed accordingly.

Water soluble sulfate in the soil was below the detectable limit of 0.0700 percent. This presents a low sulfate corrosion potential. No special requirements for concrete corrosion protection are anticipated.

2.9 Radon Gas

Radon is an odorless, tasteless gas created in the ground where uranium and radium exist. The more uranium found beneath the home, the higher the potential for elevated radon levels within a building constructed upon that soil. Radon is classified as a "Group A" carcinogen, defined as a substance known to cause cancer in humans.

According to a map of Utah which shows the incidence and estimated concentration of Radon gas on a county-by-county basis, concentrations of Radon gas on or beneath this site appear to be below 4.0 pCi/L and the site is therefore considered to be a risk to occupants. Should the homeowners be concerned with exposure to radon they may visit www.radon.utah.gov for more information, and to obtain test kits to measure the radon in their home.

3 GENERAL DISCUSSION

This report has been prepared for the exclusive use of the addressee and their authorized agents. This report is not intended for use by others and the information contained herein is not applicable to other sites not named herein. This report is valid

only until the governing jurisdiction recognizes a new building code. If this occurs prior to construction Watson should be consulted for updated recommendations.

Watson structures our services to meet the specific needs of our clientele; each study and prepared report is unique and prepared solely for the specific client project site(s). No other party may rely on our products or services unless Watson agrees, in writing, to allow such use. Within the limitations of scope, schedule and budget, our services have been executed in accordance with our Agreement with the Client and generally accepted geotechnical practices in the area the work was performed at the time this report was prepared.

You may NOT rely on this report if such report was:

- Not prepared for you
- Not prepared for your project
- Not prepared for the specific site explored
- Completed before important project changes were made
- Function of proposed structure has changed
- Evaluation, configuration, location, orientation or weight of the proposed structure has changed
- Composition of the design team has changed
- Project ownership has changed
- Not paid for in full

Our interpretations of subsurface conditions are based on a limited number of field and subsurface observations. Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Watson's professional judgment was applied to a limited number of field observations and laboratory analyses. The recommendations put forward in this report result from a very limited number of observations; such limited observations were constrained by budget. Watson's conclusions and interpretations should not be construed as a warranty of the subsurface conditions. A greater degree of accuracy for those observations, interpretations and conclusions offered may be increased by increasing the number of observation points for comparative analysis.

Hazardous materials or environmental contamination discovered at the site during or as a result of field observations or subsurface exploration do not fall within the scope of services for this investigation. Watson cannot and will not be held liable for any such discovery or the spoils left by such discovery. Such hazardous materials are and remain the liability of the property owner.

Do not over-rely on the preliminary construction recommendations included herein; these recommendations are not final as they were formed, as explained above, from a limited number of observation points and a limited number of laboratory tests.

Watson's recommendations may only be 'finalized' by our personnel directly observing actual subsurface conditions revealed during construction. Watson cannot and will not assume responsibility or liability for the recommendations contained herein if Watson does not perform construction observation and testing services.

The recommendations contained in this report are based on the field explorations, laboratory tests, and our understanding of the proposed construction. The subsurface data used in the preparation of this report were obtained from the explorations made for this investigation. It is possible that variations in the soil and groundwater conditions could exist between the points explored. The nature and extent of variations may not be evident until construction occurs. If any conditions are encountered at this site which are different from those described in this report, our firm should be immediately notified so that we may make any necessary revisions to recommendations contained in this report. In addition, if the scope of the proposed construction changes from that described in this report, our firm should also be notified.

It is the Client's responsibility to see that all parties to the project, including the Designer, Contractor, Subcontractors, etc., are made aware of this report in its entirety. The use of information contained in this report for bidding purposes should be done at the Contractor's option and risk.

This report is valid for 18 months from the below signed date, or the next code change, whichever comes first. If construction has not commenced prior to expiration of this report, Watson should be contacted to review and provide an update addendum to this report.

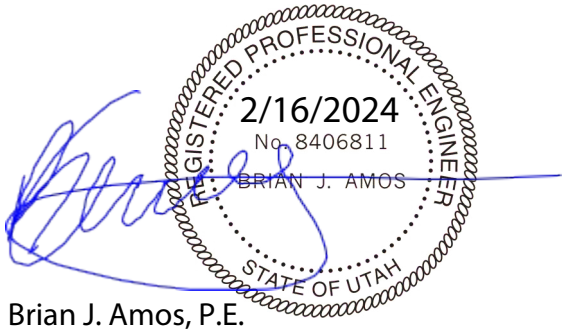
4 ADDITIONAL SERVICES

The recommendations made in this report are based on the assumption that an adequate program of tests and observations will be made during the construction to verify compliance with these recommendations. These tests and observations should include, but not necessarily be limited to, the following:

- ✓ Observations and testing during site preparation, earthwork and structural fill placement.
- ✓ Observation of footing excavations.
- ✓ Consultation as may be required during construction.

We also recommend that project plans and specifications be reviewed by us to verify compatibility with our conclusions and recommendations. Additional information concerning the scope and cost of these services can be obtained from our office.

Respectfully Submitted,



Brian J. Amos, P.E.
Geotechnical Engineer

Tim G. Watson, P.E.
President/Principal

APPENDIX

TEST PIT LOCATION PLAN

TEST PIT LOG

SUMMARY OF LABORATORY RESULTS

SUMMARY OF CORROSION TESTING

MOISTURE-DENSITY RELATIONS

GRAIN SIZE DISTRIBUTION

KEY TO SYMBOLS

SOIL CLASSIFICATION CHART

- APPROXIMATE TEST PIT LOCATION

WATSON ENGINEERING COMPANY, INC.
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TEST LOCATION PLAN

DDJ DEVELOPMENT

ESTATES AT SUNRISE RANCH PHASE 2
3550 NORTH 2300 WEST
CEDAR CITY, UTAH

DRAWN BY: B. AMOS
CHECKED BY: T. WATSON
DATE: 2/12/2024
WATSON PROJECT No.: 23-6704
SCALE: N.T.S.
FILE: TLP.DWG
sheet TLP
Sheet 1 of 1

Watson Engineering Company, Inc.
472 N. 2150 W. Ste 7
Cedar City, UT 84721
435-586-3004

TEST PIT LOG: TP-1

CLIENT: DDJ Development
PROJECT: Estates at Sunrise Phase 2
PROJECT NUMBER: 23-6704
ADDRESS: 3550 North 2300 West, Cedar City, Utah
DATE EXCAVATED 1/2/24 **LOGGED BY** B. Amos
EXCAVATION CONTRACTOR Viking Excavation
EXCAVATION METHOD Trackhoe
EXCAVATION EQUIPMENT Komatsu 138
NOTES

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	MOISTURE (%)	DRY UNIT WT. (pcf)	SPT N VALUE / PL MC LL / FINES CONTENT (%)
0		Firm Brown SANDY SILT (ML-Moist)						
		Firm Brown LEAN CLAY (CL-Moist)	GB BS-1					
5								
10								
15								

BOTTOM OF TEST PIT AT 15.0 FEET.

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Cedar City, UT 84721
435-586-3004

TEST PIT LOG: TP-2

CLIENT: DDJ Development
PROJECT: Estates at Sunrise Phase 2
PROJECT NUMBER: 23-6704
ADDRESS: 3550 North 2300 West, Cedar City, Utah
DATE EXCAVATED 1/2/24 **LOGGED BY** B. Amos
EXCAVATION CONTRACTOR Viking Excavation
EXCAVATION METHOD Trackhoe
EXCAVATION EQUIPMENT Komatsu 138
NOTES

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	MOISTURE (%)	DRY UNIT WT. (pcf)	▲SPT N VALUE▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐FINES CONTENT (%)☐ 20 40 60 80
0		Firm Brown SANDY SILT (ML-Moist)						
		Firm Brown LEAN CLAY (CL-Moist)						
5								
10								

BOTTOM OF TEST PIT AT 14.0 FEET.

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Cedar City, UT 84721
435-586-3004

TEST PIT LOG: TP-3

CLIENT: DDJ Development
PROJECT: Estates at Sunrise Phase 2
PROJECT NUMBER: 23-6704
ADDRESS: 3550 North 2300 West, Cedar City, Utah
DATE EXCAVATED 1/2/24 **LOGGED BY** B. Amos
EXCAVATION CONTRACTOR Viking Excavation
EXCAVATION METHOD Trackhoe
EXCAVATION EQUIPMENT Komatsu 138
NOTES

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	MOISTURE (%)	DRY UNIT WT. (pcf)	▲SPT N VALUE▲ 20 40 60 80 / PL MC LL / 20 40 60 80 / ☐FINES CONTENT (%)☐ 20 40 60 80
0		Firm Brown SANDY SILT (ML-Moist)						
		Firm Brown LEAN CLAY (CL-Moist)						
5								
10								

BOTTOM OF TEST PIT AT 13.0 FEET.

Watson Engineering Company, Inc.
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Cedar City, UT 84721
435-586-3004

TEST PIT LOG: TP-4

CLIENT: DDJ Development
PROJECT: Estates at Sunrise Phase 2
PROJECT NUMBER: 23-6704
ADDRESS: 3550 North 2300 West, Cedar City, Utah
DATE EXCAVATED 1/2/24 **LOGGED BY** B. Amos
EXCAVATION CONTRACTOR Viking Excavation
EXCAVATION METHOD Trackhoe
EXCAVATION EQUIPMENT Komatsu 138
NOTES

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	MOISTURE (%)	DRY UNIT WT. (pcf)	▲SPT N VALUE▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐FINES CONTENT (%)☐ 20 40 60 80
0		Firm Brown SANDY SILT (ML-Moist)	GB BS-1					H ☐
		Firm Brown LEAN CLAY (CL-Moist)						
5								
10								

BOTTOM OF TEST PIT AT 14.0 FEET.

Watson Engineering Company, Inc.
472 N. 2150 W. Ste 7
Cedar City, UT 84721
435-586-3004

SUMMARY OF LABORATORY RESULTS

CLIENT: DDJ Development **PROJECT:** Estates at Sunrise Phase 2

PROJECT NUMBER: 23-6704 **ADDRESS:** 3550 North 2300 West, Cedar City, Utah

Borehole	Depth Interval (ft)	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	Class-ification	Water Content (%)	Dry Density (pcf)	Solubility (%)	Void Ratio
TP-1	0.0-15.0	23	14	9	4.75	73	CL			< 1	
TP-4	0.0-5.0	20	16	4	4.75	52	CL-ML			< 1	

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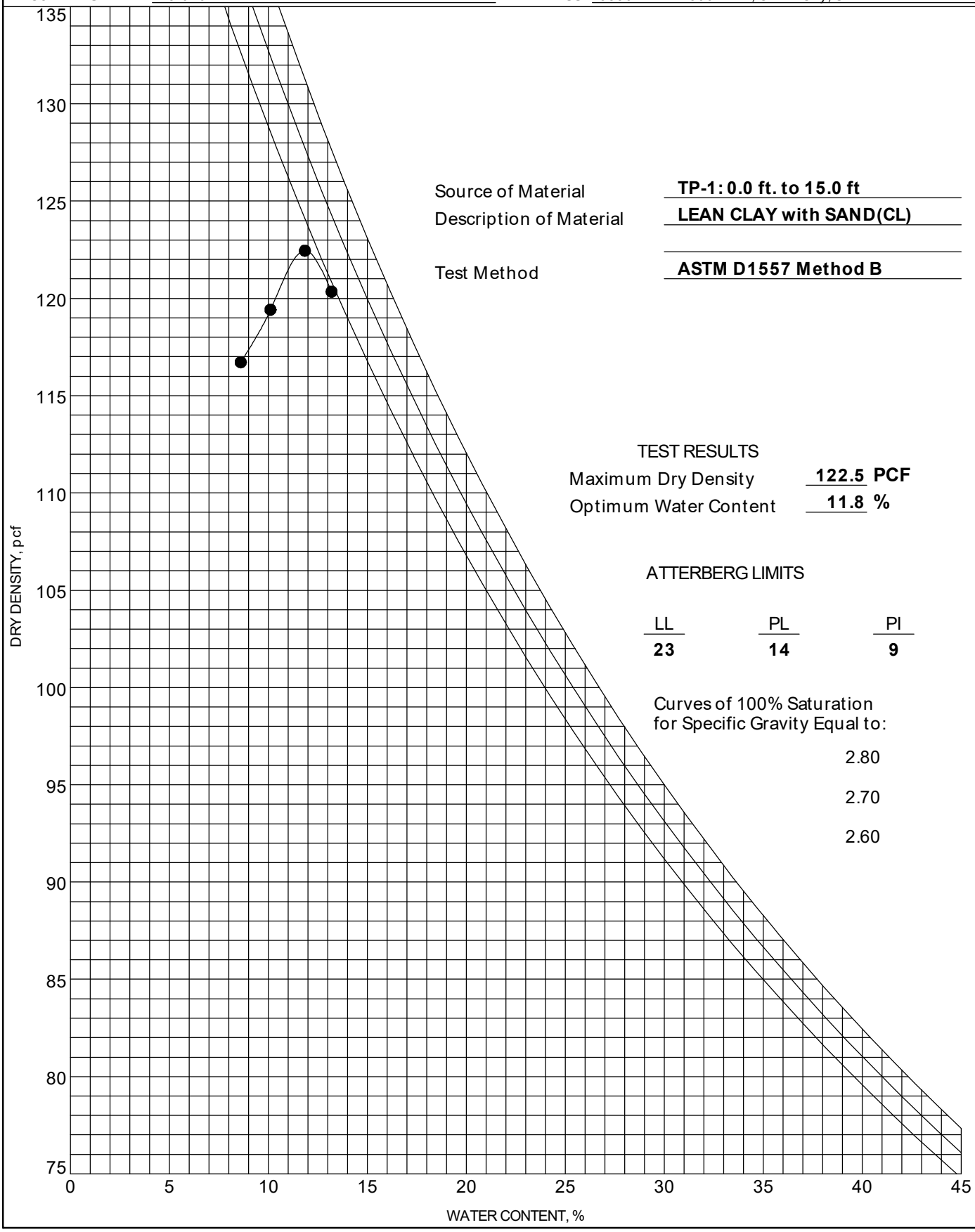
MOISTURE-DENSITY RELATIONSHIP

CLIENT: DDJ Development **PROJECT:** Estates at Sunrise Phase 2

PROJECT NUMBER: 23-6704 **ADDRESS:** 3550 North 2300 West, Cedar City, Utah



Source of Material: **TP-1: 0.0 ft. to 15.0 ft**

Description of Material: **LEAN CLAY with SAND(CL)**

Test Method: **ASTM D1557 Method B**

TEST RESULTS

Maximum Dry Density: **122.5 PCF**

Optimum Water Content: **11.8 %**

ATTERBERG LIMITS

LL	PL	PI
23	14	9

Curves of 100% Saturation for Specific Gravity Equal to:

2.80

2.70

2.60

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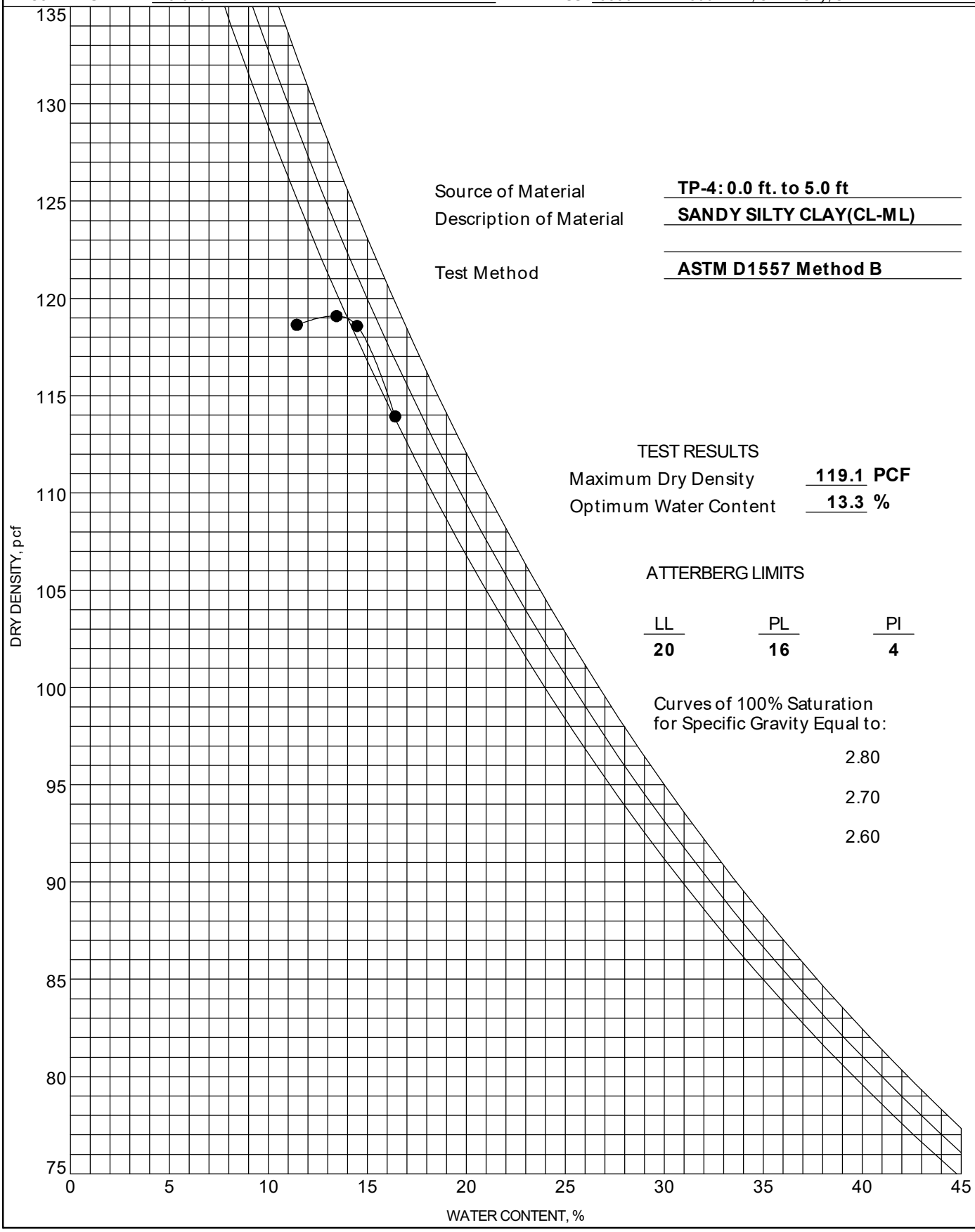
MOISTURE-DENSITY RELATIONSHIP

CLIENT: DDJ Development **PROJECT:** Estates at Sunrise Phase 2

PROJECT NUMBER: 23-6704 **ADDRESS:** 3550 North 2300 West, Cedar City, Utah



Source of Material: **TP-4: 0.0 ft. to 5.0 ft**

Description of Material: **SANDY SILTY CLAY(CL-ML)**

Test Method: **ASTM D1557 Method B**

TEST RESULTS

Maximum Dry Density: **119.1 PCF**

Optimum Water Content: **13.3 %**

ATTERBERG LIMITS

LL	PL	PI
20	16	4

Curves of 100% Saturation for Specific Gravity Equal to:

2.80

2.70

2.60

COMPACTION - 15489 - 2/12/24 16:17

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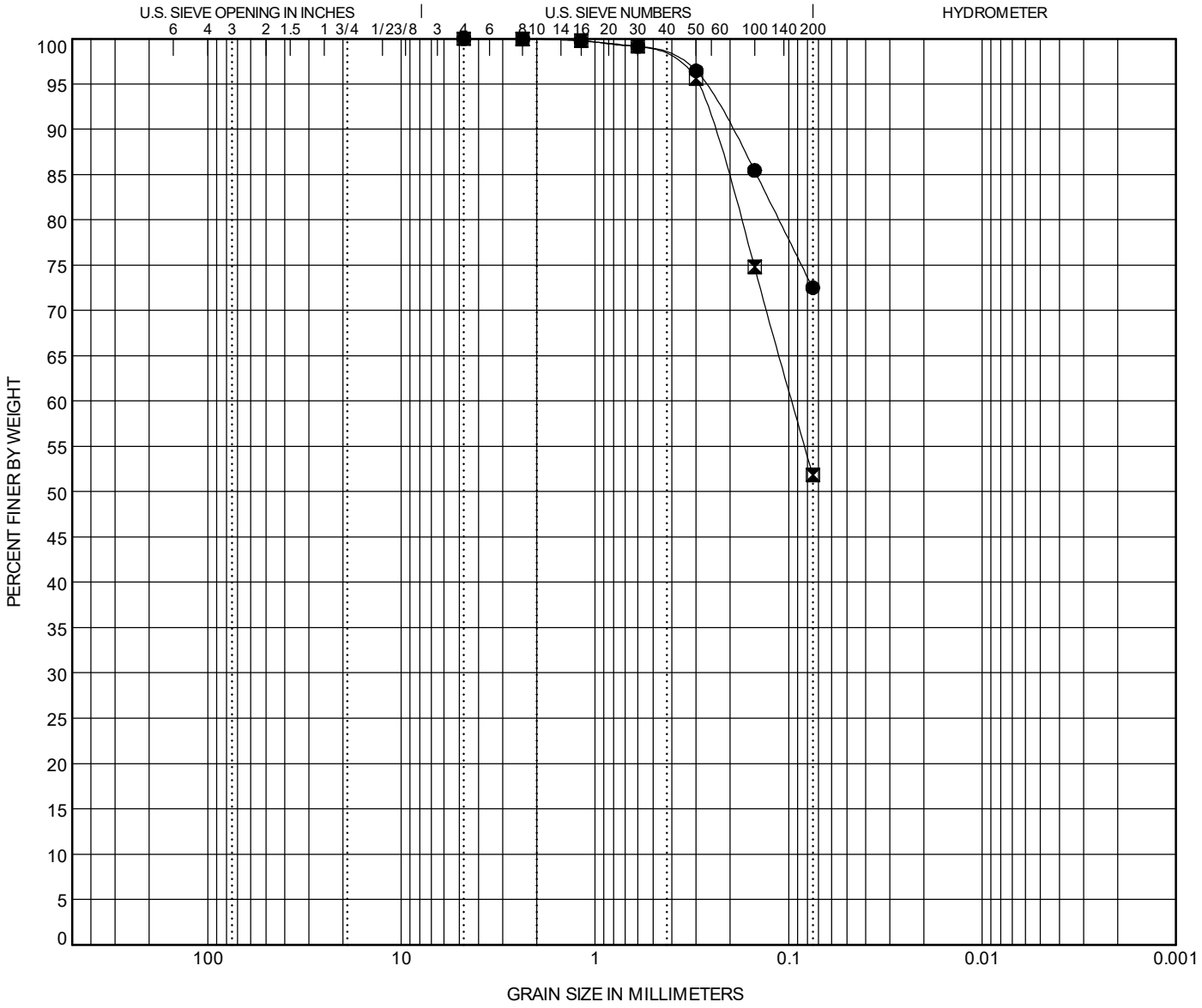
GRAIN SIZE DISTRIBUTION

CLIENT: DDJ Development **PROJECT:** Estates at Sunrise Phase 2

PROJECT NUMBER: 23-6704 **ADDRESS:** 3550 North 2300 West, Cedar City, Utah



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	TP-1	0.0	LEAN CLAY with SAND(CL)	23	14	9		
⊠	TP-4	0.0	SANDY SILTY CLAY(CL-ML)	20	16	4		

	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	TP-1	0.0	4.75				0.0	27.5	72.5	
⊠	TP-4	0.0	4.75	0.096			0.0	48.2	51.8	

Watson Engineering Company, Inc.
472 N. 2150 W. Ste 7
Cedar City, UT 84721
435-586-3004

KEY TO SYMBOLS

CLIENT: DDJ Development **PROJECT:** Estates at Sunrise Phase 2

PROJECT NUMBER: 23-6704 **ADDRESS:** 3550 North 2300 West, Cedar City, Utah

LITHOLOGIC SYMBOLS
(Unified Soil Classification System)


CLS: USCS Low Plasticity Sandy Clay


MLS: USCS Sandy Silt

SAMPLER SYMBOLS


Grab Sample

ABBREVIATIONS

LL - LIQUID LIMIT (%)
PI - PLASTIC INDEX (%)
W - MOISTURE CONTENT (%)
DD - DRY DENSITY (PCF)
NP - NON PLASTIC
-200 - PERCENT PASSING NO. 200 SIEVE
PP - POCKET PENETROMETER (TSF)

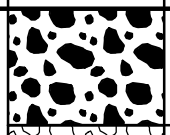
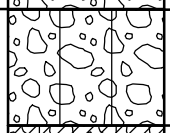
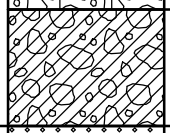
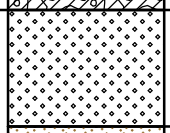
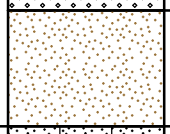
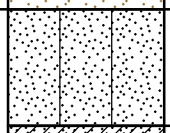
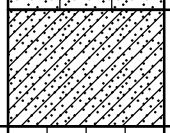
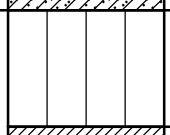
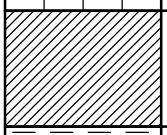
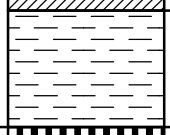
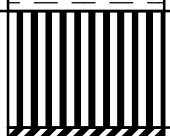
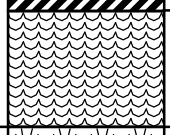
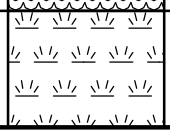
TV - TORVANE
PID - PHOTOIONIZATION DETECTOR
UC - UNCONFINED COMPRESSION
ppm - PARTS PER MILLION


Water Level at Time Drilling, or as Shown


Water Level at End of Drilling, or as Shown


Water Level After 24 Hours, or as Shown

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		(LITTLE OR NO FINES)		GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		(LITTLE OR NO FINES)		SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES		SM	SILTY SANDS, SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS