STATE OF COLORADO

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Knox Pit Groundwater Study 2nd Submittal

William Katz <wkatz@telesto-inc.com> Fri, Jan 12, 2018 at 2:02 PM
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Hello Mr. Ebert,

Attached is the Second Submittal Loveland Ready-Mix's Proposed LaPorte Operations, Knox Pit Groundwater Study. This attachment contains the text and figures. The appendices well be sent later today.

We will get the hard copies to you and the Larimer County Clerk and Recorder early next week.

If you require additional information or have questions, please contact me.

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STATE OF COLORADO

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Appendices to Laprote Operations Groundwater Study

William Katz <wkatz@telesto-inc.com> Sat, Jan 13, 2018 at 1:40 PM
To: Jared Ebert <jared.ebert@state.co.us>
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Hello Mr. Ebert,

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Second Submittal

Loveland Ready-Mix's Proposed LaPorte Operations, Knox Pit Groundwater Study

Prepared for

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January 2018

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SOLUTIONS • INCORPORATED

Second Submittal

Signature Page

First Submittal
Loveland Ready-Mix's Proposed LaPorte Operations, Knox Pit Groundwater Study

January 2018

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1.0 INTRODUCTION

A groundwater study was conducted by Telesto Solutions, Inc. (Telesto) to assess potential impacts associated with the proposed Loveland Read-Mix's LaPorte Operations, Knox Pit (Pit) sand and gravel mine. The proposed sand and gravel mine will require the dewatering of pits, transfer of groundwater, and the management of the affected groundwater levels. To gain a thorough understanding of potential outcomes of the proposed mining project, conceptual models were developed that summarize the available data and mechanics of the groundwater system. These conceptual models were used to build a numerical representation (i.e., numerical model). The numerical model was then calibrated using measured groundwater level data, and predictive scenarios that simulated mining impacts. Based on these predictive scenarios, mitigation plans and management techniques were created and tested in simulation to verify the efficacy of the mitigation plans and ensure groundwater resources would not be harmed.

1.1 Project Description

Loveland Ready-Mix Concrete, Inc. (LRM) is proposing a new sand and gravel pit, and associated concrete batch plant located adjacent to Larimer County Road 54G, approximately one-half mile west of Taft Hill Road (Site). The sand and gravel pit and associated concrete batch plant are called the LaPorte Operations (Project). LRM is seeking approval for the Project through Larimer County's Use by Special Review process. The total Project area is 126.58 acres. When sand and gravel mining has ceased, disturbed areas will be reclaimed to natural agricultural conditions with the former gravel pit areas reclaimed for pasture. The Project will include phased reclamation so that as mining progresses across the properties, mined and disturbed areas will be sequentially lined, backfilled, re-graded, and revegetated.

The Site lies approximately 4,000 feet north of the Cache la Poudre River (River) and contains alluvial sand and gravel deposited by the ancestral Poudre River. The area to the south of the Project has experienced extensive sand and gravel mining operations, both historically and currently, as seen in Figure 1.

The 126.58 acre Site is currently being used for agriculture, with irrigated hay being the primary crop. The property is relatively flat, with a gentle slope toward the southeast. The abutting properties include 17 parcels that are in use as single family residential, 4 agricultural parcels, 2 retail/service parcels, 1 multi-family residential parcel, and 1 industrial parcel.

Key features affecting groundwater in the area include multiple irrigation ditches, irrigated agricultural operations, and the afore-mentioned existing gravel mining operations (Figure 2). Another feature affecting groundwater are historical sub-surface drains used to lower the water table in area fields. The exact location of the individual pipes of the collector drain network is unknown. It is surmised that these drain networks feed two known main drain structures: the Callahan Drain, located south of the site, and the Childers Underground Drainage Ditch (Childer's Drain), located east of the site. A subset of the Callahan drain system, the Bethke Stockwater drain provides water to a small stock pond near the outlet of the Callahan drain into the Taylor and Gill ditch.

Based on interviews with Mr. Ray Stegner, the physical attributes of the Childers Drain (Stegner, 2016) are:

- The physical location of the drain appears to run on the east edge of the property and collects water from north and west of the Hwy 287/ Hwy 287 Bypass
- There are five collector drains east of Taft Hill and north of the old Hwy 287
- At least two of the collector drains were crushed in the 1980s when the Bypass was built
- Part of the water drains into the Terry Lake inlet ditch since the crushing in the 1980s
- There is no evidence of any water being collected south of Hwy 287 from the groundwater system (i.e., drain tiles are solid)
- The drain flows into a pond (off site) and the pond overflows into the Eaton Ditch

1.2 Objectives

The objectives of this report are to:

- Describe the groundwater system associated with the Project
- Predict potential impacts to groundwater and its users, including:
  - Changes in groundwater elevations that would affect residents or well users
  - Changes in flow paths for potential migration of impacted water
- Provide mitigation strategies should impacts (predicted or realized) be unacceptable

1.3 Approach

This report consolidates available information on climate, geology, surface water, and groundwater to develop a conceptual hydrogeologic model for the proposed Project and adjacent area. The conceptual model is then quantified by developing a two-dimensional numerical groundwater flow model that incorporates relevant aspects of the hydrologic system. To improve its predictive capabilities, the numerical model is calibrated to known hydraulic heads and groundwater flow rates. The focus of this effort is to provide a defensible technical basis for predicting groundwater-related impacts associated with commencement of mining, on-going operation, and future closure of the Pit, and to provide an evaluation tool for developing mitigation strategies if required.

2.0 BACKGROUND

Sand and gravel mining has occurred along the Cache La Poudre River corridor for decades. As the alluvial deposits were excavated and processed into construction materials, the gravel pit sites were depleted of sand and gravel and reclaimed for residential, agricultural, wildlife habitat, or water storage uses. In the reclamation processes, groundwater conditions reverted to conditions similar to the pre-mining status. Figure 2 shows the locations of local sand and gravel mines that have accessed Poudre River alluvium; the Colorado Department of Natural Resources, Division of Reclamation Mining and Safety (DRMS) maintains a map of sand and gravel sites (CDRMS, 2017). Following cessation of mining, many pits have been reclaimed as lakes, or reverted to open space used for grazing or wildlife habitat.

2.1 Geologic Setting

The Project lies at the western margin of the Denver-Julesburg Basin with the Northern Rocky Mountain Front Range uplift to the west. The Project terrain is characterized by low relief fields and pasture. To the west-northwest of the Project lies the Bellvue Dome anticline, which has been breached by erosion exposing the Permian-Triassic age Lykins Formation at its core (Hagardorn, 2001). Resistant beds of Permian Lyons, Satanka, and Ingleside Formations cap the top of the ridge forming the east half of the dome.

The Project overlies unconsolidated alluvial deposits of Quaternary age deposited during natural meandering of the ancestral Cache la Poudre River system. The alluvial sands and gravel were eroded from the Rocky Mountains to the west and deposited along broad areas of the river valley. Alluvial deposits underlying the Project can be characterized as poorly sorted (well graded) granite-sourced clays, silts, sands, gravel and cobbles. These alluvial deposits are exposed at the ground surface and extend approximately 1,500 feet to the north of the Project, and for some distance south across the current Cache la Poudre River floodplain. In the vicinity of the Project, the alluvium is deposited on an erosional contact with the Cretaceous Pierre Shale. The Pierre Shale is relatively impermeable and considered a bedrock aquiclude when evaluating alluvial-bedrock groundwater interactions.

2.2 Hydrologic Setting

2.2.1 Climate

The Site is located in a semi-arid region of the northern Front Range area of Colorado. The regional climate is summarized by data obtained from the Western Regional Climate Center website (WRCC, 2017).

2.2.2 Surface Water

Regional Drainage

The Site is located within the Cache la Poudre River Basin, a tributary to the South Platte River that generally drains to the east. Within Larimer County, the River drains a total area of approximately 460 square miles. Perennial flow exists in the River from the mouth of the Poudre canyon downstream past LaPorte and through the City of Fort Collins. In the spring and early summer, the River recharges an extensive valley-fill alluvial aquifer. Infiltration from irrigation diversions and roadside swales adds to the alluvial aquifer recharge from mid-summer through early fall. Dry season River flows are minimal and consist primarily of municipal wastewater plant discharges, and irrigation sourced groundwater return flows from the extensive valley-fill alluvial aquifer.

To the north of the proposed Project is a small ephemeral drainage flowing generally north to south. This unnamed drainage is partially blocked by the elevated portion of the Highway 287 by-pass. An existing 24-inch corrugated metal pipe allows a portion of this drainage flows to pass from north to south beneath the highway embankment. Perennial wetlands have formed on the north and south sides of the embankment due to this surface drainage and the aforementioned damaged irrigation drains.

Local Drainage

The Project is located within the Cache la Poudre River drainage basin. Site ground surface elevations range from 5,056 feet in the northwest corner of the property to 5,049 feet at the southeast corner. It lies outside the 100-year Cache la Poudre River regulatory floodplain as defined by FEMA. Surface runoff from the Site and surrounding area can be characterized as sheet flow off pasture and agricultural land.

Offsite storm water runoff reaching the Site flows across as sheet flow. The Little Cache la Poudre Ditch is elevated and traverses west to east across the approximate middle of the Project area, and serves as a surface drainage divide. The Little Cache la Poudre Ditch is not anticipated to intercept surface runoff. Storm water north of the Little Cache la Poudre ditch flows to the east and northeast; storm water south of the Cache la Poudre ditch flows to the southeast. Surface runoff in the area flows generally south and southeast toward the river when not intercepted by irrigation ditches or the constructed roadside drainage system of swales and culverts. There are no named natural waterways through or adjacent to the Site.

During the anticipated 10-12 years of gravel mining operations for the Project, on-site runoff and off-site runoff that historically flowed across the Site will be directed to and retained in the Pits, which will be excavated to 15 to 20 feet depths below the current ground surface. Storm water directed to the unlined Pits will be captured and utilized in the process water circuit. LRM plans to obtain the required water rights to retain this storm water.

2.2.3 Groundwater

Regional

Groundwater is a source of water for municipal, domestic, agricultural, and industrial uses within Larimer County; however, diverted Cache la Poudre river flows and trans-mountain diversions form the bulk of the water sources for these uses in urban areas along the Front Range.

The viability of the groundwater resource is dependent on characteristics of the geologic unit from which groundwater is extracted. Well yields (flow rates expressed in gallons per minute) of groundwater wells are controlled by the permeability of the host rocks.

- Metamorphic and igneous rocks have relatively small well yields [1 and 15 gallons per minute (gpm)], except in highly weathered granitic rocks that can produce higher yields. Metamorphic and igneous rocks do not provide groundwater in the Project area and will not be penetrated by any proposed mining activities
- Marine sedimentary rocks are generally poor aquifers in Larimer County. However, fractured carbonate rocks, which most commonly occur near major fault structures, can locally provide significant well yields. Marine sedimentary rocks do not provide groundwater in the Project area and will not be penetrated by any proposed mining activities
- Wells completed in consolidated and semi-consolidated Tertiary and Cretaceous clastic deposits can yield up to several hundred gpm. These deposits will not be penetrated by any proposed mining activities and do not provide groundwater in the Project area
- Unconsolidated stream alluvium along major stream channels range in thickness from 5 to 30 feet thick and can locally provide well yields up to several hundred gpm (Topper, 2003). Properties adjacent to the Site have shallow groundwater wells completed in alluvium.

LaPorte Area Wells

Local groundwater flow and levels are strongly controlled by the River, irrigation ditches and agricultural irrigation. In early summer 2017, Telesto sent questionnaires to landowners and registered well owners in the area requesting information from their wells. Telesto also offered to measure depths to groundwater in their wells. Of 269 questionnaires sent, 46 neighbors responded—35 neighbors responded that depth-to-water measurements could be taken. Of the 35 neighbors, Telesto was able to arrange times to measure 18 neighbors' wells. Copies of the questionnaires and field notes are included in Appendix A. None of the wells are used for domestic drinking water and most are used for lawn and garden watering.

Additionally, Telesto installed 14 monitoring wells on the Site. Monitoring well logs are provided in Appendix B. Early summer 2017 depth-to-groundwater measurements are summarized in Figure 3, which depicts the resulting groundwater elevations. Since the issuance of the first submittal of this report, LRM and Telesto have continued to monitor depths to water in the Project monitoring wells. Data from this effort are presented in Figure 4.

Bedrock

The Cretaceous Pierre shale (Pierre) underlies the unconsolidated sands and gravels of the alluvial aquifer. The Pierre is low permeability marine shale that is considered to be an aquiclude relative to the overlying alluvium. The groundwater wells and monitoring wells near the Site are typically screened to the top of the Pierre shale. Utilizing the Colorado Decision Support System (CDSS) groundwater well database (CDWR, 2017) and Site monitoring wells, the top of the Pierre shale was inferred as shown in Figure 5.

2.2.4 Alluvial Aquifer

The primary aquifer is hosted in the shallow alluvium of the Cache la Poudre River. This alluvial aquifer is recharged by infiltration of up gradient River flows, from storm water and snowmelt infiltration, irrigation waters applied to the ground surface and seepage from adjacent irrigation ditches when the ditches are flowing water (usually mid-April through October).

Domestic and monitoring wells completed in the alluvial aquifer in the Project vicinity indicate a saturated thickness of 20 feet or less. Figure 6 shows the thickness of the alluvial aquifer for Project area. As can be seen in Figure 6, the alluvium varies from 11 to 28 feet in thickness across the Site.

2.2.5 Groundwater Flow Patterns

Figure 7 shows groundwater elevations from depth to groundwater measurements in vicinity wells. Data for Figure 7 were collected by Telesto during monitoring well testing on site and during the neighborhood water level measurement campaign during early summer. The groundwater elevations depicted in Figure 7 represent the spring-summer irrigation season when infiltration of irrigation ditch flows raise the water table. Groundwater in the Cache la Poudre alluvial system in the vicinity generally flows from the north and northwest to the south and southeast, paralleling the Cache la Poudre River.

LRM will measure depth to groundwater in the same wells (with owner's permission) during the winter (i.e., non-irrigation season) when irrigation infiltration, rainfall, and irrigation ditch flows have ceased allowing the water table to drop.

2.2.6 Local Water Quality

It is well documented that surface and some groundwater in Northern Larimer County suffer from increased selenium concentrations (Elmund, 2014; Herr, 1977; Pierce, 2014), mostly sourced from oxidation of generally selenium-sulfide (selenium is in a reduced state) minerals dispersed throughout the Pierre shale. Where the Pierre shale outcrops and surface waters come into contact, the oxygen rich surface water oxidizes the reduced selenium minerals and produces more soluble selenium mineral phases (e.g., selenite, selenate), which are dissolved and transported in surface waters. Enhancing the mobilization of selenium is the erosion of the Pierre shale, which continually exposes fresh minerals while placing solid selenium minerals in the water column.

The same oxidation potential exists for well oxygenated alluvial groundwater where it is in contact with the Pierre shale. However, the erosion potential does not exist and the only mechanism for moving the selenium into the alluvial groundwater system is molecular diffusion (which is a slow process). Thus, alluvial groundwater generally does not exhibit the same concentrations as surface water unless it is sourced from a surface water with high selenium concentrations.

LRM collected random samples from monitoring wells MW-2, MW-6 and MW-13, and from the Cache la Poudre River nearby. Laboratory reports are provided in Appendix B. All samples reported non-detect for selenium with the exception of MW-6 (0.043 mg/L). MW-6 had a trace of sediment in the sample, which is the likely source of the selenium. LRM also collected samples of the Pierre shale and subjected them to the Environmental Protection Agency's Synthetic Precipitation Leaching Procedure (SPLP) test. SPLP subjects soil/solid samples to direct contact with slightly acidic water to examine the potential for release of chemicals from the solid. The SPLP results indicated that of the four samples taken, one had the potential to release selenium (B20, 0.13 mg/L in the leachate). Lab reports are provided in Appendix B. No other metals were detected in the SPLP results. Implications of these results are described in section 7.1

2.3 Conceptual Model

A conceptual groundwater flow model is a graphical, semi-quantitative description of the parameters and conditions that control groundwater flow. Figure 8 displays the conceptual groundwater flow model associated with the Site as limited to the model boundary shown. Components of the conceptual model are represented in the numerical flow model as various boundary conditions and variables.

2.3.1 Boundary Conditions

Model Top

The top of the conceptual model is defined by the topography (represented by the US digital elevation model, 10 m grid spacing, and Site topographic surveys), and a variable flux boundary. The flux represents natural recharge on non-irrigated areas, and excess irrigation that percolates below the rooting zone in irrigated areas. The bounding condition is assumed to be relatively constant throughout the year as irrigation induced percolation will be attenuated on its vertical path to the groundwater table. Likewise, naturally occurring precipitation driven percolation is assumed to be constant throughout the year.

Model Bottom

The bottom of the conceptual model is the Pierre Shale. As described previously, the Pierre shale acts as an aquitard and is therefore represented as a no-flow (i.e., zero flux) boundary.

Perimeter

The southern perimeter of the model is the Cache la Poudre River, which is represented as a constant head boundary that varies with time. In the spring and early summer, the height of the river is several feet above its winter flow stage. The height variability is a relative function of the staff gauge height/flow measurements taken at USGS gauging station 06752260.

The northern boundary is a flux boundary. Where bedrock outcrops, the flux is minimal, dictated by meteoric shallow groundwater flow through bedrock (mostly shales). As shown in Figure 8, there is a small deposit of terrace sediments associated with an unnamed drainage to the north that are connected to the alluvial aquifer. This small alluvial extension is treated as a steady flux boundary because the mechanisms for flow into the conceptual model are dampened by the porous media flow in this alluvial extension. Flux rates are estimated to range between 1.9 and 4.5 acre-feet/day as shown in Appendix C.

The eastern and western boundaries of the model are flux boundaries that vary in time. To represent this flux, constant head boundaries are used that are related to the stage in the river.

Internal Boundaries

Within the area of interest, several types of hydrologic boundaries exist related to groundwater flow. Old gravel ponds that have been sealed from interaction with the groundwater system have zero flux boundaries as groundwater flow through the seals is insignificantly small when compared to fluxes through the alluvial aquifer. Area ditches provide recharge and discharge opportunities for groundwater. Leakage rates can range from 10 to 25% of the flow in the ditch. Un-sealed gravel lakes and active mining pits become discharge points for the alluvial aquifer. Evaporation can be a significant sink in the summer when evaporation rates can reach up to 5.74 inches in the month of July (CDWR, 2011). While no large capacity pumping from wells is known to exist in the area, groundwater wells are documented sinks to groundwater in the area of interest. These range from 20 to 40 gpm.

2.3.2 Hydraulic Parameters

Porosity/Storage Coefficient

The storage coefficient dictates the amount of groundwater that moves in and out of the pore space as aquifer conditions change (e.g., pumping from a well or cessation of irrigation returns). Storage coefficients for the Cache la Poudre alluvium range from 15 to 25%. A typical value used in the LaPorte area is 20% (CDWR, 2017).

Saturated Hydraulic Conductivity

The saturated hydraulic conductivity dictates how easily groundwater moves through porous media (i.e., alluvium in this case). Transmissivity is a product of the saturated aquifer thickness and hydraulic conductivity. The CDSS (CDWR, 2017) indicates that the transmissivity in the LaPorte area is around 50,000 gallons/day/ft. With an average thickness of 20 feet, the associated hydraulic conductivity is 2,500 gallons/day/ft^2 (334 ft/day, or 0.12 cm/sec).

An additional method of estimating hydraulic conductivity is to apply a specific capacity evaluation to available aquifer data from the CDSS database that assumes the drillers reported flow rate is from "blowing the hole dry" and thus, the drawdown in the well is the top of water minus the total depth of the well. Applying a specific capacity test to the wells in the LaPorte area yields a range of transmissivity from 3.6 to 950 ft^2/day, as shown in Appendix D.

Telesto performed aquifer pumping test analyses on four of the 14 monitoring wells installed. Saturated hydraulic conductivity from testing ranged from approximately 40 to 260 ft/day (0.015 to 0.092 cm/sec). Appendix E documents the monitoring well aquifer tests.

3.0 NUMERICAL MODEL FRAMEWORK

3.1 Numerical Modeling Code

Telesto chose the widely-accepted groundwater flow model, MODFLOW 2005 (Harbaugh, 2017). Groundwater flow is mathematically simulated utilizing a block-centered, finite difference approach to solve the corresponding governing differential equations. MODFLOW 2005 is a series of modular subroutines that are highly independent of one another that allows flexibility in simulating a multitude of boundary and geometric conditions. Modeling input was accomplished with a variety of tools including Model Muse (Winston, 2009), Global Mapper 16 (Blue Marble Geographics, 2015) and internal codes developed by Telesto.

3.2 Numerical Modeling Domain

The modeling domain is best described as a rectangular grid oriented parallel to the main direction of groundwater flow. In MODFLOW, the modeling coordinates start in the upper left corner and are defined by rows and columns. The upper left corner of the model is located at geographical northing of 40° 38' 57.2758" N and easting of 105° 08' 05.4861" W. The modeling grid is oriented clockwise around the upper left corner at 208° 07' 29.0" from true north. The model domain is 23,609 feet (4.47 miles) in the x-dimension and 9,834 feet (1.86 miles) in the y-dimension. The model domain is gridded in the x-dimension by 158 columns ranging from 25 to 1,000 feet in width, and in the y-dimension by 147 rows ranging from 24 to 1,000 feet. The extents of the model are sufficiently large as to avoid unduly influencing the hydraulics near the Site and areas of concern. Figure 9 displays the model domain oriented against Colorado State Plane North coordinates.

3.3 Numerical Model Boundaries

Model boundaries define the hydrologic conditions of the aquifer throughout the model domain. As described in Section 2.3.1, various boundary conditions exist. Where bedrock outcrops or sub-crops, the model is inactive or has a zero flux boundary. Sealed gravel pits are also treated as zero flux boundaries and are represented by inactive cells in the model. The two main ditches influencing groundwater near the Site are the Little Cache la Poudre and the Taylor and Gill. Both are treated as general head boundaries using the MODFLOW river package. Drain boundary conditions are associated with the Callahan and Childers drains. Figure 10 quantifies and further describe the numerical boundaries utilized in the model.

3.4 Model Parameters

Appendix F summarizes the range of individual parameters utilized in the modeling effort along with the value used in the model.

3.5 Model Timeframe

The groundwater system within the model domain is quite dynamic due to the seasonal nature of the irrigation ditches, river flows, and water supply deliveries. From Site monitoring wells, the groundwater system reaches a new equilibrium relatively quickly after ditches start to flow in the spring. For this effort, Telesto chose to utilize a steady-state model representing the irrigation-season groundwater levels (highest levels). The steady-state model provides the basis for a series of transient models that simulate groundwater behavior as the stresses associated with mining progress. The timeframe of the transient models is one year, representing one-half of each phase of mining as described in the mine plan. The total simulated time is 10 years, representing the five phases of mining. Reclamation (after 10 years) is simulated by imposing the drains and liners on to the steady-state model.

4.0 MODEL CALIBRATION

Calibration is the process by which model parameters are adjusted within the range of measured/known values until a set of "targets" is matched. For a groundwater model, targets are drainage discharge rates, increases or losses to surface water features, but most commonly groundwater elevations measured in wells.

4.1 Calibration Targets

For this modeling effort, the calibration targets are the spring and early summer groundwater elevation measurements from the Site monitoring wells and from the neighbor's wells. Although the neighbor's wells were not professionally surveyed like Site monitoring wells, equal credibility was given to every well to evaluate model calibration.

4.2 Calibration Results

The model was set up in a step-wise fashion, adding boundaries (ditches, drains, ponds) one model-run at a time until the model was built. Once the model was running, adjustments were made to boundary conditions within ranges as defined previously that represented the early irrigation season (May-July). This time period was chosen as representative of the first round of groundwater elevations measurements. The adjustments to boundary conditions were made until the model represented the distribution of measured groundwater elevations in the monitoring and neighborhood wells. Hydraulic conductivity and porosity were set as defined by the CDSS (CDWR, 2017) database in order to provide consistency with LRM's substitute water supply plan submitted to the DWR.

Simulated groundwater elevations from the model cells representing wells on the date measurements were compared against measured elevations as shown in Figure 11. Also, shown in Figure 11 are results of regression analyses (coefficient of determination-r^2, regression line slope and intercept) and the sum of the difference squared between simulated and measured groundwater elevations indicating the capacity of the model to accurately simulate groundwater levels in the wells. Figure 12 is a contour plot of the simulated groundwater elevations representative of the early irrigation season. Comparison of Figure 12 to Figure 3 shows good correlation between model simulated groundwater elevations and flow directions and those measured in the field.

4.3 Parameter/Boundary Sensitivity

A sensitivity analysis examines how changing variables within their acceptable range affects the calibration results. Because the model domain contains so many internal boundaries, the model is relatively insensitive to hydraulic parameters. It is very sensitive to the physical construct of the internal boundaries. For example, changing the elevation of the bottom of the ditch in the area of the nearby wells has a direct correlation to the simulated water elevation in the well. Because the physical nature of ditches and other internal boundaries are fairly well known or limited (e.g., agricultural drains are typically less than five and no more than 10 feet below ground surface), the model sensitivity is less critical.

4.4 Discussion

The statistics and plot showing in Figure 11 indicate that the model successfully mimicked groundwater elevation distributions near the Site for the existing conditions. Visual examination of the scatter around the best fit line and calculated slope of the best fit line of 1.0 indicates that the model does not have bias in the groundwater level predictions and the groundwater flow direction. During the irrigation season, the model is highly constrained, meaning that water elevations are significantly controlled by internal boundary conditions (i.e., irrigation ditches). Given that the approach for this modeling effort was to use CDSS parameters, the main adjustments that could be made were to the behavior of the irrigation ditches.

On the Front Range of Colorado, a rule of thumb is that irrigation ditches lose from 10% to 25% of the water diverted from the river (known as shrink). Using this as a guide, the overall leakage from the Little Cache and the Taylor and Gill were adjusted until an acceptable match between the simulated and observed heads was achieved.

5.0 MODEL PREDICTIONS

The previous four sections of this report describe the building of the numerical model to provide a base upon which potential impacts from LRM's proposed operations can be evaluated. The good calibration provides a high level of comfort that the model can accurately identify problematic areas that might produce impacts from the operational scenarios.

The overall mine plan related to groundwater is to excavate a dewatering sump and remove groundwater to the water management pond where water is re-infiltrated into the alluvial aquifer. From the initial sump excavation, mining will progress and is described by five phases depicted in Figures 13 through 15. A perimeter drain (Figure 15) will be placed along the outer perimeter of the excavation that will serve during mining to dewater the toe of the high wall to maintain stability, and direct groundwater to the dewatering sump. As reclamation materials become available, a compacted earth barrier (i.e., sometimes referred to as a seal or liner) will be installed over the perimeter drain such that the drain is hydraulically connected to the surrounding alluvial aquifer and hydraulically separated from the interior of the gravel pit. Once the gravel pit perimeter is entirely sealed, the perimeter drain will serve to route groundwater around the barrier by maintaining a high permeability adjacent to the compacted backfill.

Five phases of mining describe the mine plan and are modeled to predict potential impacts on the groundwater system. Sealed portions of the mine pits were simulated as no-flow boundaries. The perimeter drains were simulated using a higher hydraulic conductivity at a factor of 2 times higher than the CDSS value used for the rest of the model. This conductivity value is lower than the calculated equivalent (Appendix F) hydraulic conductivity that the drain system will provide, lending a level of conservatism to the preditions.

Most wells in the area range in depth from 5 to 20 feet. Thus, for the purposes of describing modeling predictions, we considered drawdowns of five feet or more during the irrigation season (when wells are used) to indicate a potential area for concern from dewatering impacts. Similarly, we considered a mound (shown as negative value contours on the figures) of two feet or more to indicate areas where a potential may exist for increases in groundwater levels that could pose an issue. This value was chosen because the standard deviation was 2.1 feet, meaning predicted values above this become statistically significant in terms of potential impacts.

5.1 Mining Plan–Phases 1 through 5

Figure 16 through Figure 20 display predicted drawdowns at the ends of Phases 1 through 5, respectively. As the simulation moves through the phases, the areas of greatest potential impact (considered to be a drawdown of 5 feet or more and mound of 2 feet or more) are clearly seen. The potential for impacts progresses from the south side of the Site to the north over the 10-year model timeframe.

The largest off-site drawdowns occur from the mining north of the Little Cache la Poudre ditch. No wells are known to exist in this area north of the Site. The most significantly impacted wells are those in the “enclave” at the south side of the mine (the Cherry and the West wells). Although the Plantorium Greenhouse and Nursery did not respond to Telesto’s questionnaire, we know that they have an irrigation well used to water their greenhouse plants. The Plantorium is inside the five-foot impact zone during the end of the first half of Phase 1. These three wells may require mitigation.

5.2 Mine Plan–Reclamation

Figure 21 shows the model-predicted drawdowns after reclamation is complete. No off-site drawdowns greater than 5 feet are predicted. The largest is 3 feet in the enclave area. Three feet is statistically significant in this model, thus, that is one area to provide monitoring and mitigation if necessary after mining. The model predicts mounding in the statistically significant range up to approximately 370 feet west of the western Site boundary.

5.3 Results Discussion

5.3.1 Drawdown

Overall, the model predicts that five wells (Cherry, West, two Morgan Timber and the Plantorium) may be impacted for a period of time during the advancement of mining. The Cherry and West wells are predicted to be essentially dry while the other wells will maintain a saturated thickness that could allow continued production. Despite the remaining capacity, mitigation measures may be required for those wells.

Mitigation measures could include: 1) providing a water tap from the West Fort Collins Water District, 2) deepening wells to ensure there is still adequate saturated thickness from which groundwater can be extracted, and 3) re-introducing pumped groundwater through a leach field or injection well back into the aquifer near the impacted well.

5.3.2 Mounding

As exhibited in Figure 16 though Figure 20, slight mounding is predicted up gradient of the pits west boundary. The area that is predicted to be statistically significant (above 2 feet) extends occurs after reclamation. The most significant predicted mounding is due to reinjection into the water management pond. The predicted maximum rise in the groundwater adjacent to the water management pond is predicted to be 4 feet as dewatering is initiated in Phase 1. As mining progresses the projected dewatering rate is anticipated to be less. In the predictions, it was assumed that the maximum dewatering rates would be sent to the water management pond to maintain conservatism in the predictions. The maximum rise is 3 feet or less as the Phases progress and the drawdown impacts expand to provide extra storage capacity in the alluvium.

5.3.3 Ditch / Drain Effects

Potential ditch and drain effects were evaluated by comparing the steady-state numerical model simulated ditch loss or drain flows to the individual predicted flows during each phase. No measurements of flows are losses were made for this effort and we relied on the rule of thumb to evaluate if the model simulation and predictions were reasonable.

The simulated, pre-mining loss rates for the ditches were 6.98, 2.57, and 6.02 cfs for the Little Cache la Poudre, Taylor and Gill, and Larimer and Weld ditches, respectively. Due to its distance from the Site, no impacts were predicted on the Larimer and Weld ditch. The simulated pre-mining discharge for the Callahan and Childer's drains were 0.93 and 5.37 cfs, respectively.

Little Cache la Poudre Ditch

The model predictions indicate that additional losses to the Little Cache la Poudre ditch are minimal during the first half of mining of Phase 1. This is primarily due to the "silting up of the ditch" (silt layer restricts flow into and out of the ditch). Personal communications with Jeff Smith, manager of the ditch at the time indicate that they measured inflow and outflow of the ditch as it passes through the Site. They did not measure any ditch losses at that time, corroborating the model predictions. The model shows that there is a potential to decrease the ditch loss by approximately 4% after reclamation because the pit liners reduce loss through the Site.

Taylor and Gill

Due to the drawdown downgradient of the Site (south of 54G), the model predicts that there could be a potential increase in ditch loss of up to 7% (0.1 cfs). After reclamation, predictions are that the additional potential ditch loss is essentially zero (0.03 cfs). Because ditch losses were not measured, the accuracy of the predictions cannot be verified. However, given the small potential change in flows indicated, we do not anticipate that the Taylor and Gill will be impacted.

Drains

The model predicted the maximum reduction in the Callahan drain of 15.8% (0.14 cfs) to occur during Phases 1 through 3. After reclamation, the drain flow is predicted to increase by 2.1% (0.02 cfs). Given the small potential change in flows indicated, we do not anticipate that the Callahan drain will be significantly impacted. If flows do decrease significantly, dewatering water can be returned to the Taylor and Gill ditch to make up the reduction.

5.3.4 Water Quality

One of the concerns voiced by neighbors during the neighborhood meeting was the potential for water quality impacts from the Site. No constituents of concern are produced on site that could significantly impact water quality. Constituents of concern contained in fuel, cement, and admixtures are fully contained and tracked. Primary containment is backed up by secondary containment (e.g., buildings, storm water containment, secondary containers/liners). Thus, there is no exposure of waters to chemicals. Additionally, all surface and storm water will be contained on site. Thus, there can be no off-site impacts to surface water. Similarly, the direction of groundwater flow during all phases of mining is towards the dewatering sump. Thus, there can be no off-site migration of groundwater should the unlikely event of a release occur.

5.4 Discussion

5.4.1 Model Stability

The model converged to a solution during every iteration for the calibration and predictive scenarios, meeting the minimum error criteria in the heads of 0.001 foot. No other significant errors were reported in the model runs. These statistics provide confidence that the model runs were numerically accurate and that the results are numerically sound.

5.4.2 Predictive Results

Based on the good correlation and numerical stability of the model, confidence can be placed in the predictive results. The predictions provide a good indicator of areas that will require special attention as dewatering progresses and gives the opportunity for LRM and neighbors to be pro-active.

6.0 MITIGATION STRATEGIES

Prior to implementing any mitigation strategies for neighboring wells that could potentially be impacted, LRM will discuss the options with neighbors and evaluate suitability of the three mitigation strategies described in Section 5.3.1. To aid in the evaluation, the reinjection strategy is simulated for the Plantorium and Morgan Timber wells. Unfortunately, the West and Cherry wells are too close to the mine boundary for a reinjection scenario to be practicable. They will require water supplied to them via a water tap from West Fort Collins Water District (LRM has 23 taps available) or a feed from the sump dewatering system. LRM commits to working with the Wests and Mr. Cherry and has reached an agreement with them to mitigate their wells. It could be that the Plantorium and Morgan Timber may desire water taps as well.

6.1 Plantorium Potential Mitigation

One potential mitigation strategy for the Plantorium's well is to supply pumped groundwater to an injection well installed south of County Road 54 G. This plan would require state permitting and crossing under the county road with a water supply pipe. Given that the mitigation would only be required for a short period of time, this option, while physically viable, may have too many other constraints. Again, LRM commits to working with the Plantorium, and has reached an agreement with them to develop the best mitigation solution for both parties.

6.2 Morgan Timber Potential Mitigation

One potential mitigation strategy for the Morgan Timber's wells is to supply pumped groundwater to a shallow French drain east of the Site. This plan would also require state permitting. If mitigation is required, LRM commits to working with Morgan Timber to develop the best mitigation solution for both parties.

6.3 Water Management Pond

Current minimum depth to groundwater from ground surface in the summer in the area is approximately 4 feet. The predictions indicate that during Phase 1, additional water management activities may be necessary to maintain the water table below the ground surface adjacent to the pond. This could include increasing the water management pond footprint by approximately 10% to accommodate the additional area needed to keep the water table below ground surface. The pond infiltration capacity area can also be increased by installing shallow drains radially around the outer edge of the pond perpendicular to the sides. Additionally, areas in the pit can be utilized to manage excess water during Phase 1 dewatering activities. After Phase 1, predictions indicate that the water management pond should have capacity to adequately manage water and maintain approximately 1.5 feet of freeboard. This is more than enough capacity for a 100 year storm event.

7.0 MONITORING PLAN

This modeling effort was completed prior to implementation of the mining process. It is calibrated to the early summer timeframe. As time goes by and more data are collected, the model will be updated and verified. The updated model will provide more accurate predictions and therefore will provide more confidence in the predictive results. The model can be used as a tool to evaluate water supply and other groundwater related issues during operations. The model, however, is only as good as the data on which it is based. Thus, ongoing monitoring of the groundwater is essential.

7.1 Monitoring Plan

The mining plan for the Pit assumes a ten-year mine life during which the active pit excavations will be dewatered. Upon closure, a compacted backfill liner with perimeter drain will exist around the perimeter of the mined area. The backfill liner and perimeter drain will be constructed congruent to mining. Concerns have been raised as to the potential for mining activities and the perimeter drain to mobilize selenium. Taking a very conservative approach (Appendix F show an example for the southern drain) that selenium is present everywhere that the perimeter drain is installed and it has not leached from the top 1 cm of the Pierre shale, the resulting concentration in the collected drain water is estimated at 0.0006 mg/L, which is below the laboratory reporting limit of 0.006 mg/L. A more reasonable assumption is that the depth to the first selenium is 2.5 feet (depth of sample). This results in a concentration of 0.000008 mg/L. Regardless, LRM is committing to monitoring for selenium as described herein.

In addition to this preliminary water quality sampling, LRM has initiated a pre-mining groundwater monitoring program. The monitoring program consists of monthly depth to ground water measurements of the 14 on-site monitoring wells. Depth monitoring of on-site monitoring wells will shift to quarterly schedule after one-years’ worth of data are collected and until active operations are completed. One round of neighborhood well depth to groundwater measurements were taken. LRM is reaching out to inquire about a February neighborhood round of depth measurements.

7.1.1 Monitoring Locations

To facilitate monitoring groundwater immediately adjacent to the Site, LRM constructed 14 new monitoring wells on the Site properties in April 2017 under State Engineering Office approved monitoring well permits. Monitoring well locations are shown in Figure 3 and well construction permits are included in Appendix B. With the cooperation and permission of neighbors, LRM also intends to monitor the 24 neighbor wells.

7.1.2 Purpose of Monitoring Locations

The proposed monitoring locations can be easily accessed by LRM to provide real-time groundwater elevation data. These monitoring locations are intended to provide baseline data representative of pre-mining groundwater levels for the area. It should be noted that the wells on neighboring properties have been pumped at a variety of times and rates and utilized for residential, agricultural, and commercial purposes over past years. The effects of this variation in pumping times, rates and water uses will be captured in any monitoring event. Once mining and pit dewatering commences, the monitoring locations will serve as indicators of dewatering impacts, and provide a base upon which model predicted impacts can be judged and updated.

7.1.3 Potential Impacts from Mining Operations

As described previously, potential dewatering impacts are predicted to occur at five neighboring well locations during the mining operation. In two wells (Cherry and West), the drawdown is predicted to be significant enough to require mitigation. In the remaining wells, adequate saturated thickness is predicted that would allow continued production.

If monitoring results show mounding in the areas that the model predicts are a potential for mounding and flooding of neighbors' properties occurs, LRM will take immediate action to determine the cause for the change. If it is in fact due to mounding, LMR could immediately pump from the perimeter drain to reduce the mound and find a long-term solution. Long-term solutions may be to increase drain capacity by adding another drain higher in the profile or implementing siphons from the perimeter drain.

7.1.4 Data Collection

As mentioned previously, LRM has already installed 14 monitoring wells and monthly depth-to-water measurements are already being taken. LRM has committed to collecting groundwater monitoring data monthly for the first 12 months of mining operations, and quarterly thereafter for the duration of mining at the Site. LRM proposes, with neighbors permission, to monitor elevations in these neighboring wells semi-annually prior to and throughout mine dewatering. Attempts will be made to sample during times when the neighbors' wells have not been pumped to help distinguish between mine-related and pumping-related drawdown.

7.1.5 Water Quality

Groundwater quality is not expected to be impacted by mining at the Site. However, the Little Cache la Poudre ditch has requested that water quality be monitored. Thus, LRM has committed to monitoring for pH, iron, selenium and TDS in MW-13. In addition. LRM has committed to monitoring for these parameters plus oil sheens in the water management pond and ditch. These are the typical sector-specific benchmarks tested in CDPHS discharge permits for sand and gravel pits and batch plants. The water quality monitoring plan is attached as Appendix G.

7.1.6 Proposed Trigger Levels and Corrective Actions

LRM proposes use of a five-foot drawdown as a trigger that would initiate more intensive monitoring and discussions of potential mitigation measures with neighbors. If required, LRM will negotiate in good faith to implement corrective actions that are amenable to both parties. Corrective actions could include: 1) providing a water tap from the West Fort Collins Water District, 2) deepening wells (there is typically an extra 10 feet to bedrock in most domestic wells surveyed) to ensure there is still adequate saturated thickness from which groundwater can be extracted, and 3) re-introducing pumped groundwater through a leach field or injection well back into the aquifer near the impacted well.

8.0 CONCLUSIONS

In addition to the objectives summarized in this section, this study describes just a few of the potential mitigation measures available, and emphasizes the collaborative strategies that LRM would implement toward neighbors if needed. LRM will work with neighbors to ensure that they have access to, and are able to interpret the well monitoring results available on the DRMS website, and will continue to collaborate directly with individual landowners as requested. LRM is committed to maintaining communication with neighbors, and has taken steps to share the results of this study with adjacent well owners as practical.

The modeling efforts met the objectives as outlined in Section 1.2 as follows:

- The conceptual model described in detail the groundwater system associated with LRM's Site
- The numerical model mimicked existing conditions and then was used to predict impacts. It showed:
  - Changes in groundwater elevations affecting known well users, and provided maps of zones of potential drawdown impacts
  - Groundwater flow paths were shown to be towards the dewatering sumps
- Potential mitigation strategies were discussed and evaluated and a plan to monitor and implement corrective actions was provided.

As with all models, this model is a numerical representation of the physical system that mimics trends and magnitudes of physical values. While great effort is taken to ensure the most accurate representation of the groundwater system, there are still uncertainties resulting from the required assumptions used during the modeling effort. Thus, the model is most useful in identifying areas of potential concern so that management plans can be made to mitigate any potential issues. Again, these areas are where groundwater is predicted to drawdown more than five feet or mound higher than 2 feet.

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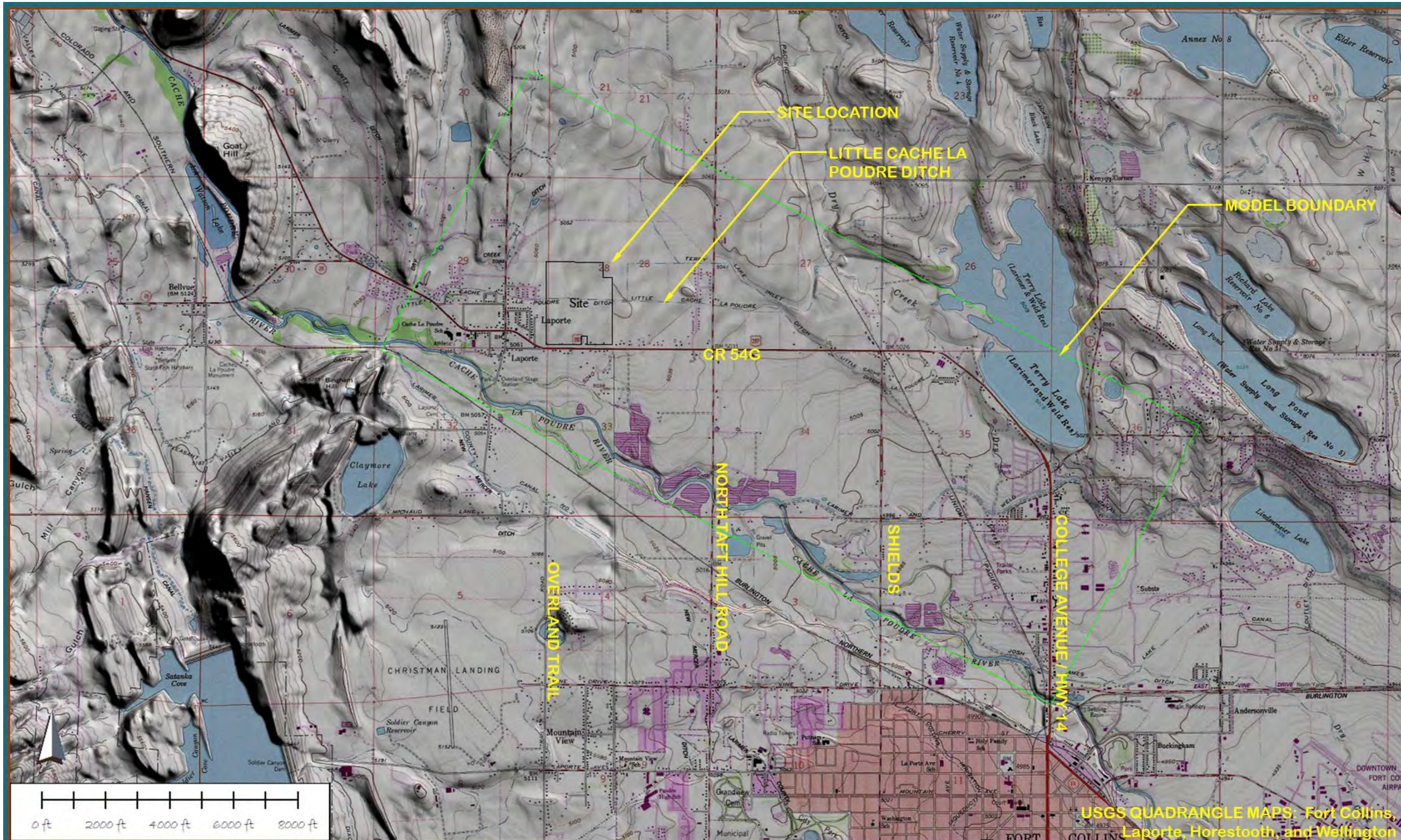
Figures



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PROJECT: 360100	TASK: 08	PREPARED FOR: LOVELAND READY-MIX CONCRETE	FIGURE 1 PROJECT LOCATION AND AREA FEATURES
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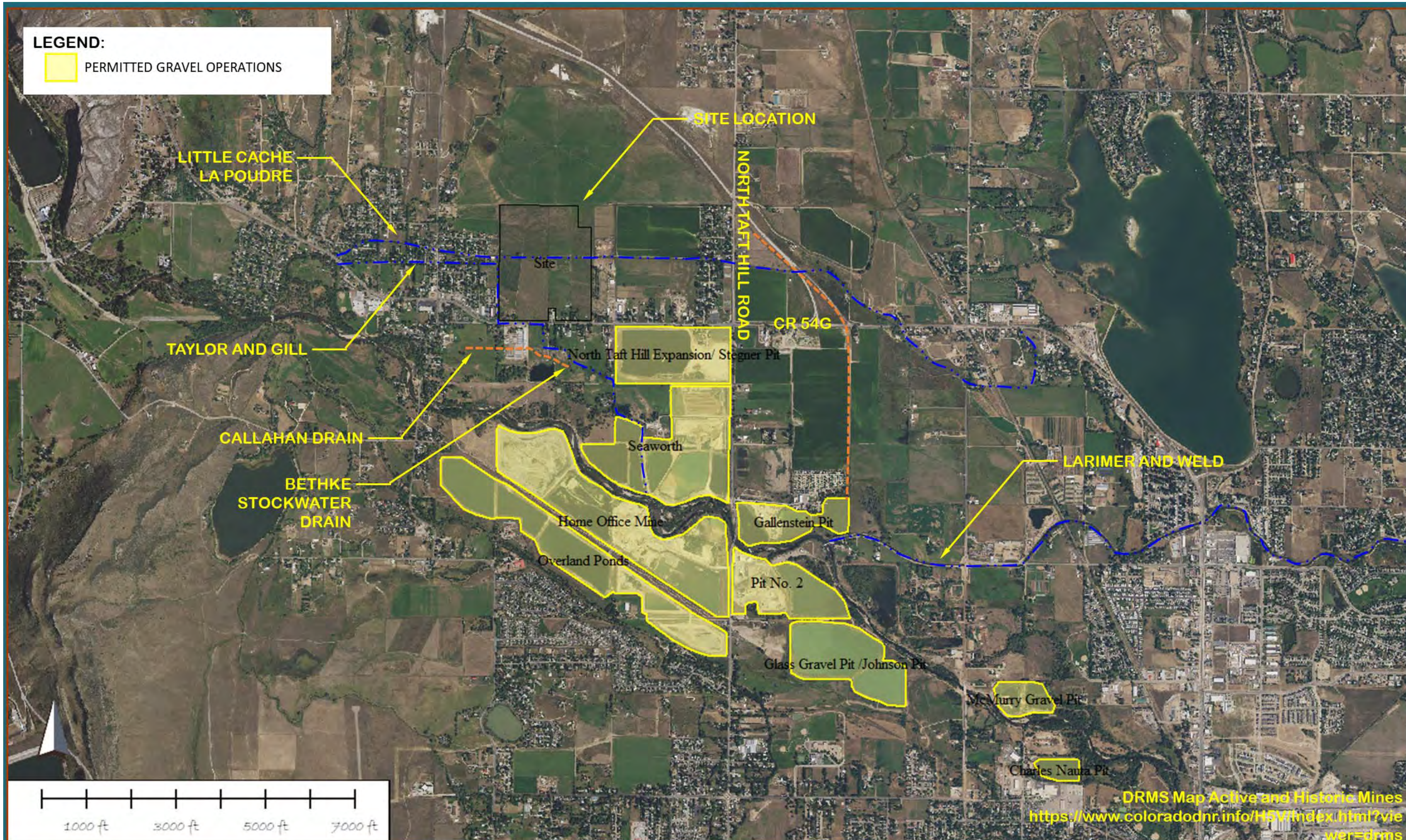

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FIGURE 2
DITCHES, DRAINS AND PERMITTED GRAVEL OPERATIONS

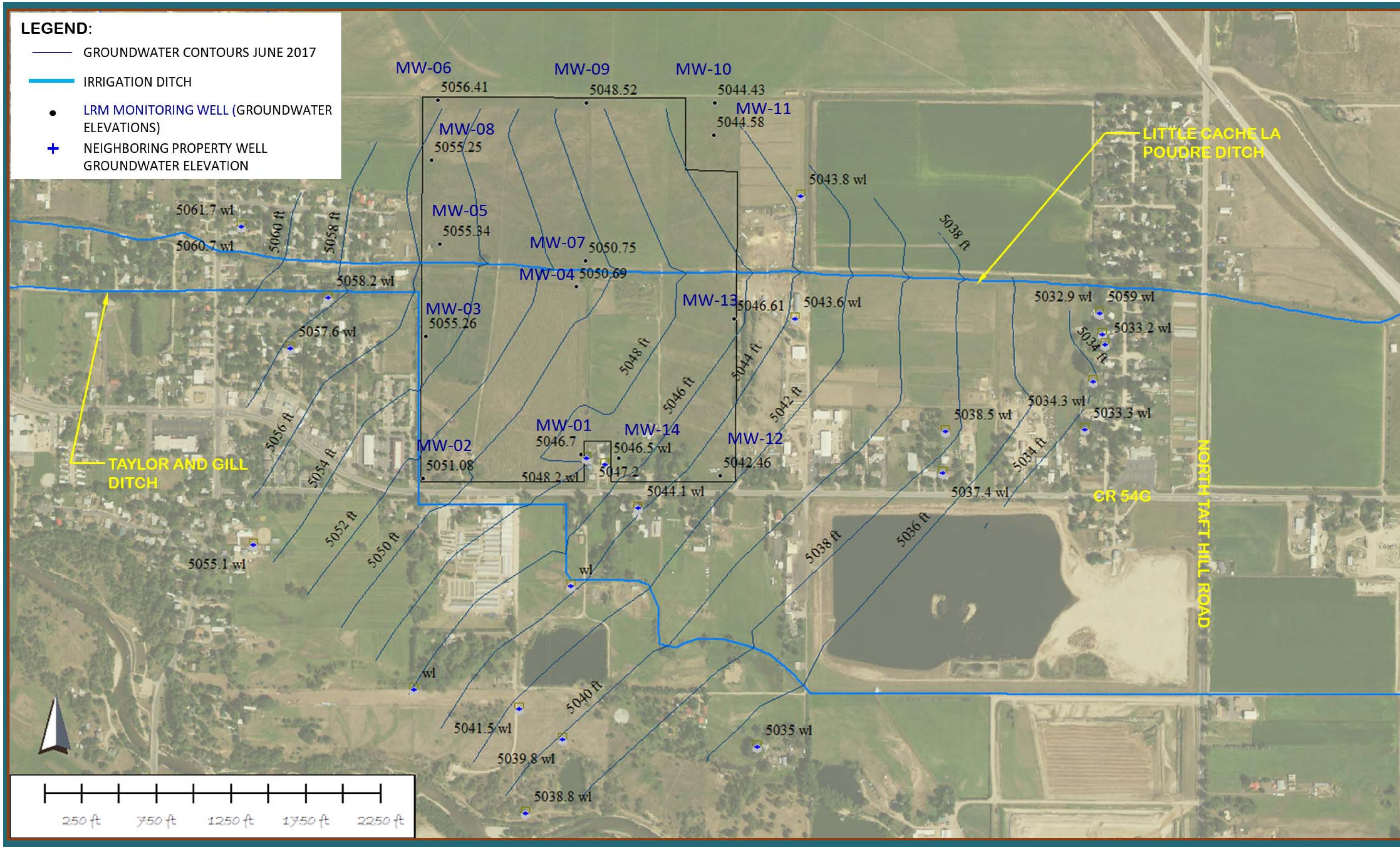

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FIGURE 3
SUMMER 2017 GROUNDWATER ELEVATIONS

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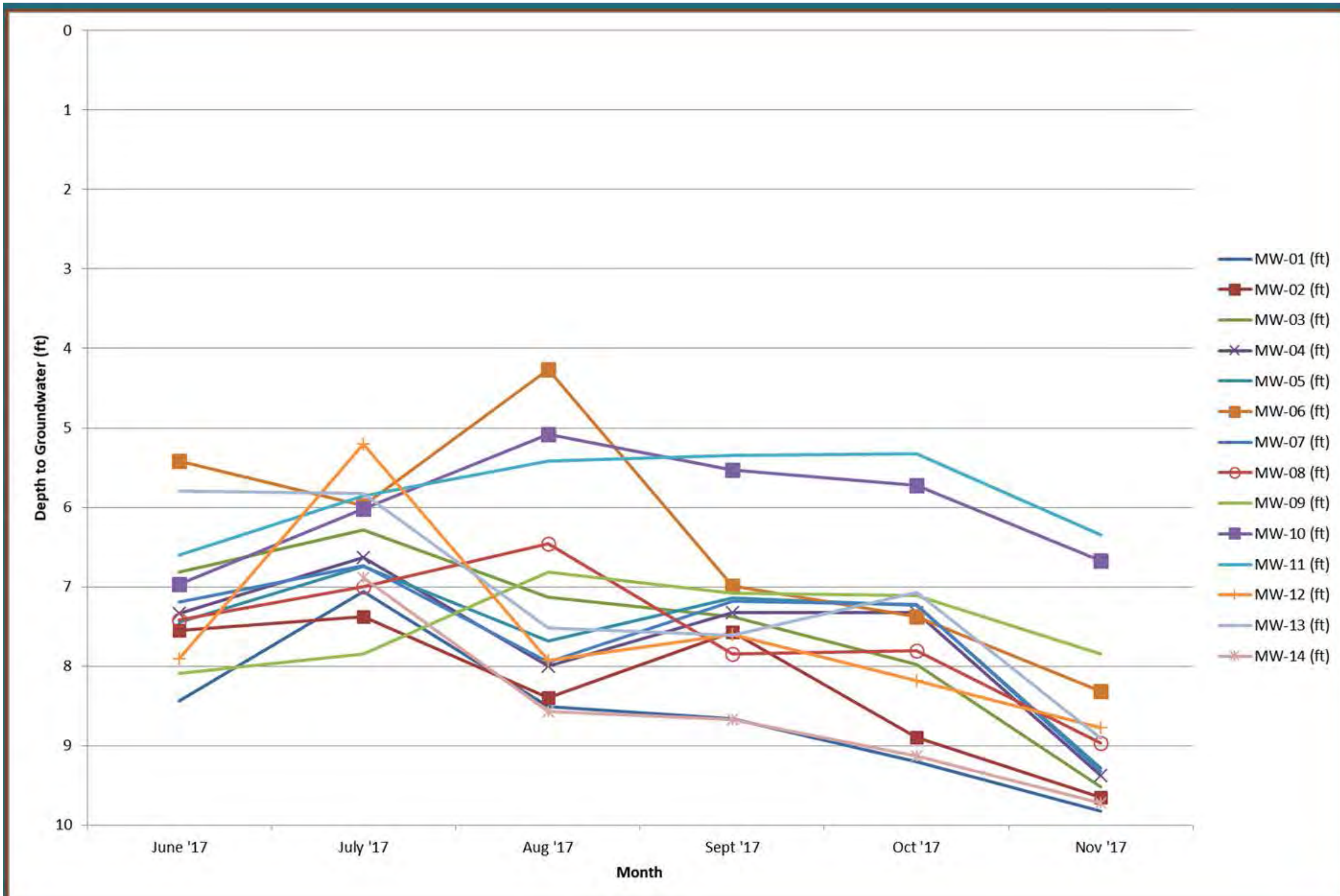

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FIGURE 4
PROJECT MONITORING WELL DEPTHS TO GROUNDWATER

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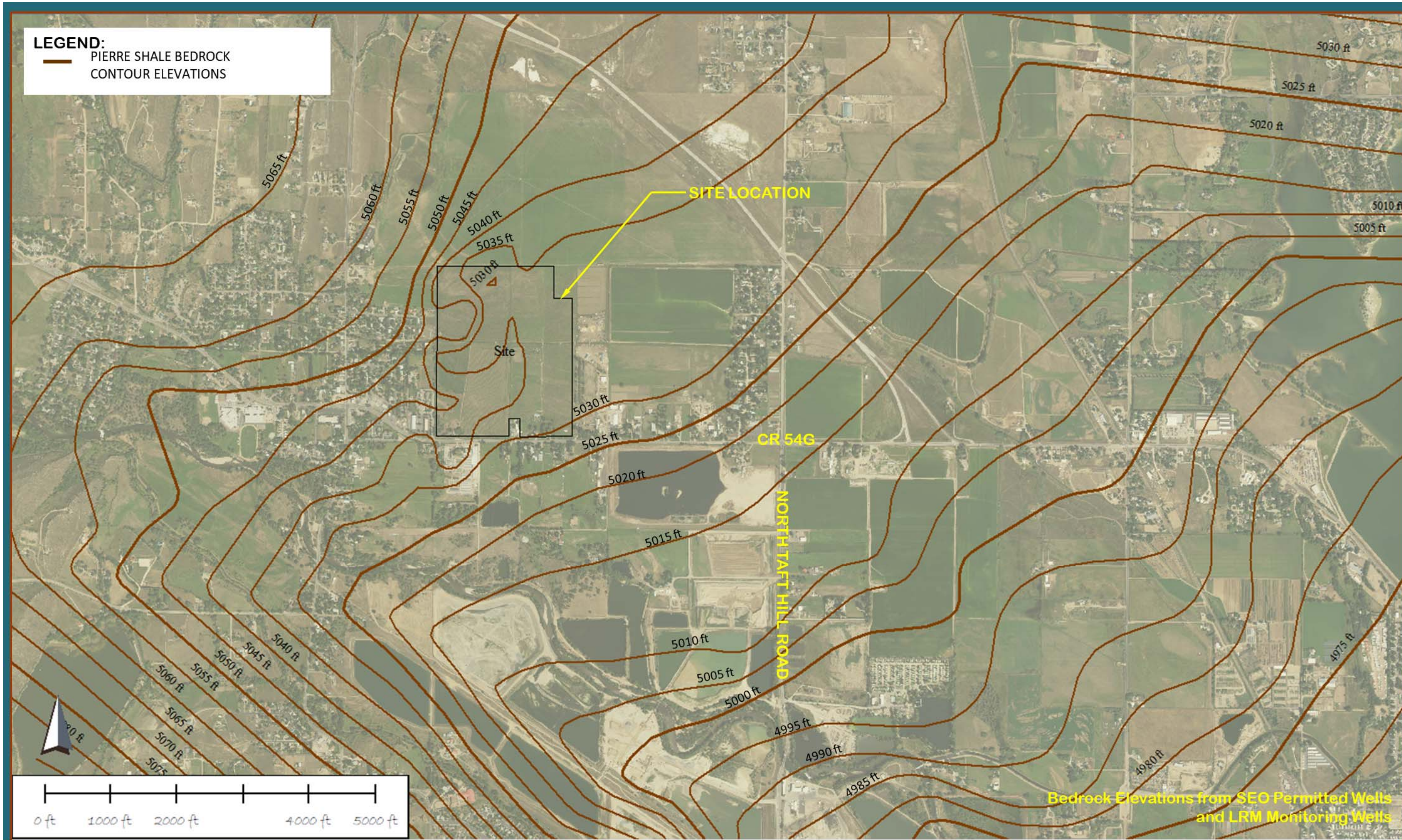

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PREPARED FOR:
LOVELAND READY-MIX CONCRETE

FIGURE 5
TOP OF PIERRE SHALE

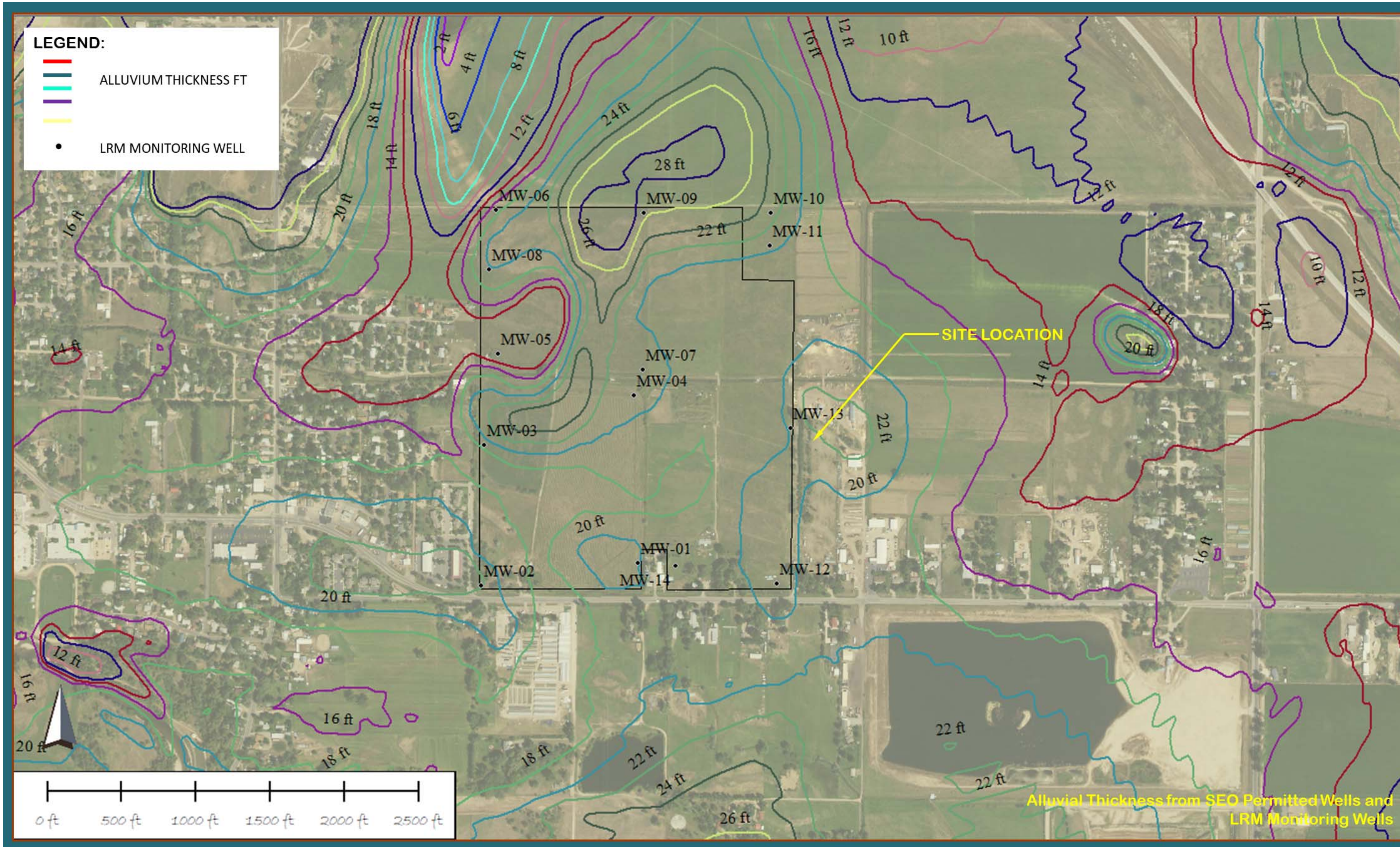

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FIGURE 6
ALLUVIAL AQUIFER THICKNESS

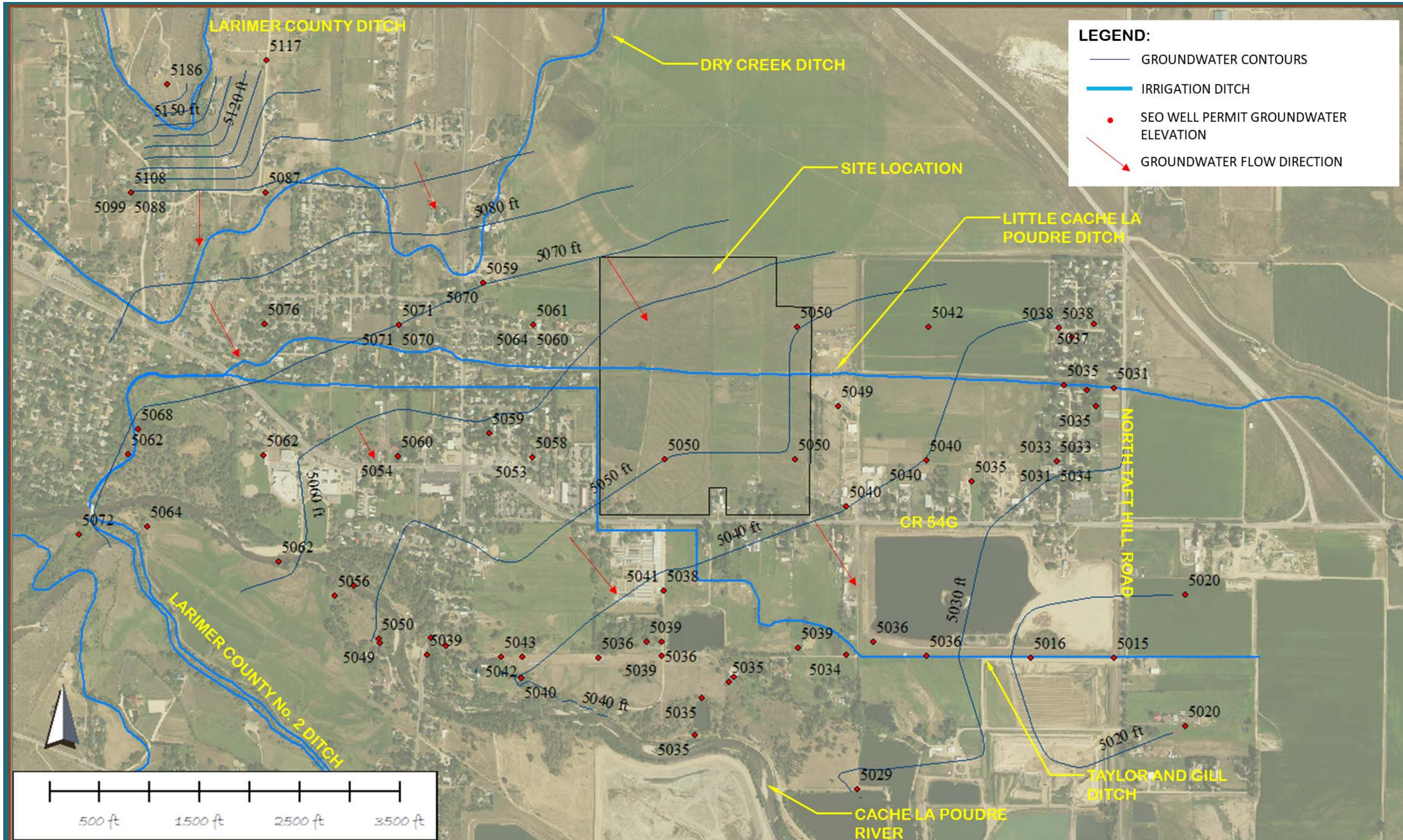

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FIGURE 7
GENERAL GROUNDWATER ELEVATIONS AND FLOW DIRECTIONS

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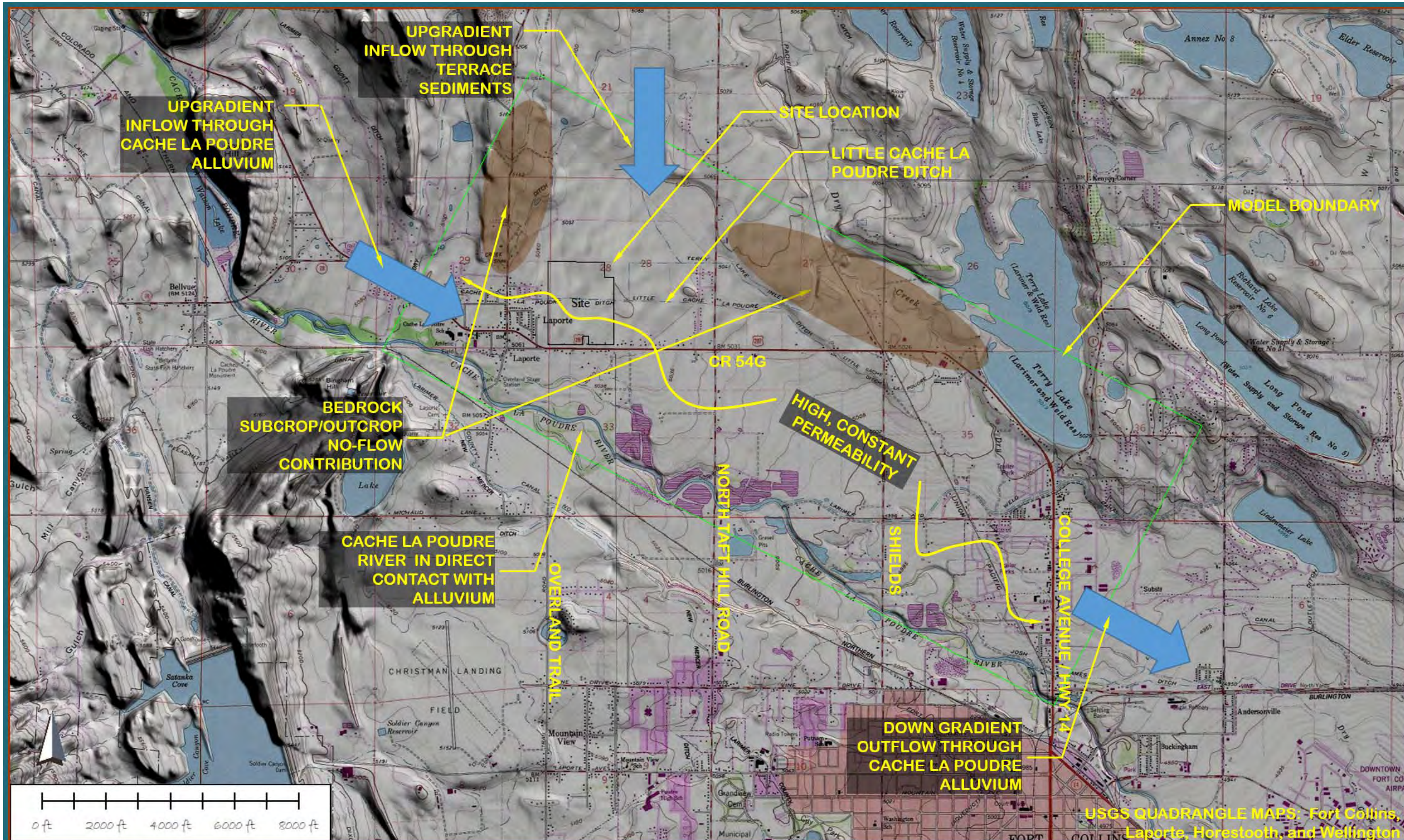

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FIGURE 8
CONCEPTUAL GROUNDWATER FLOW MODEL

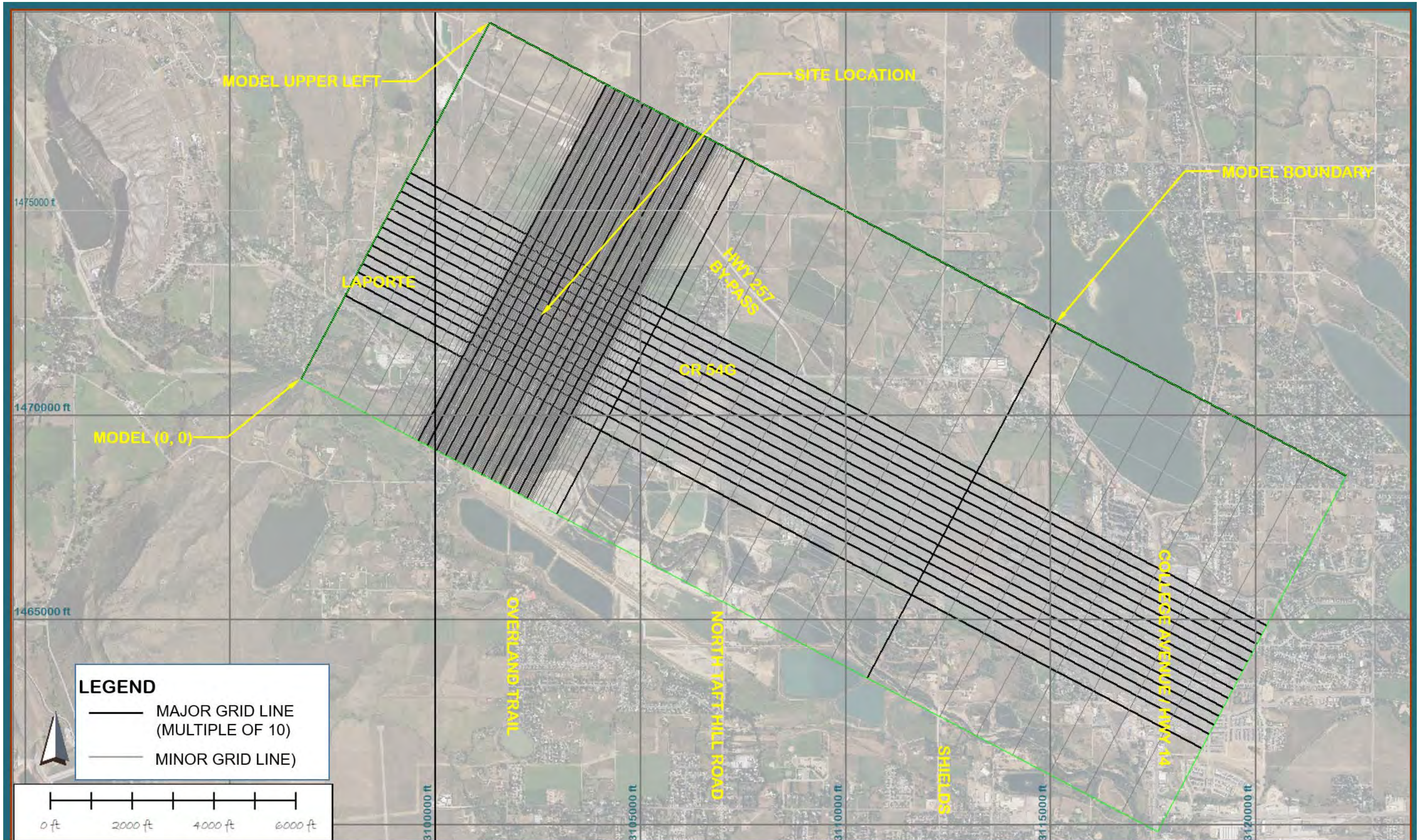

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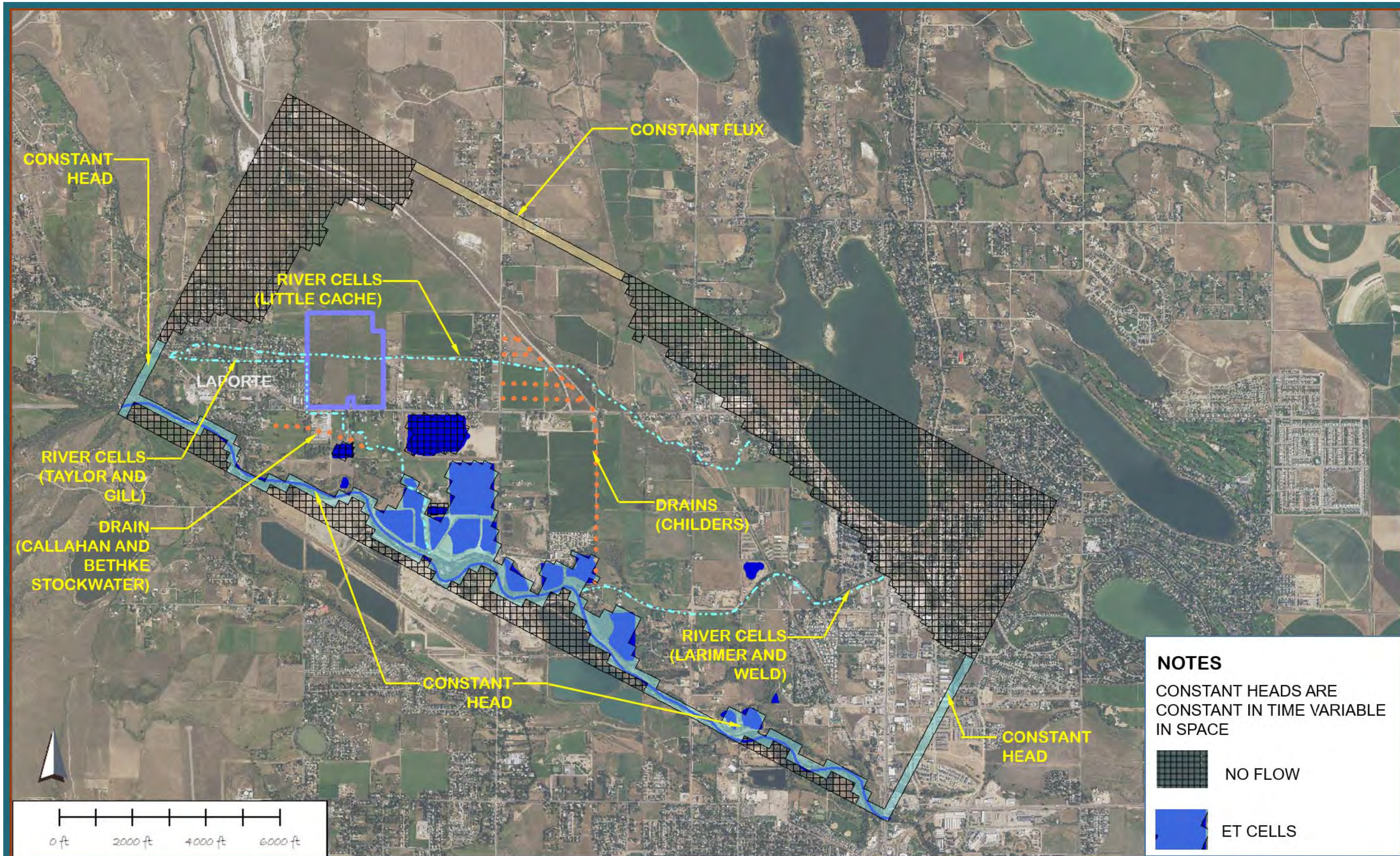
FIGURE 9
MODEL DOMAIN IN COLORADO STATE PLANE COORDINATES (FEET)



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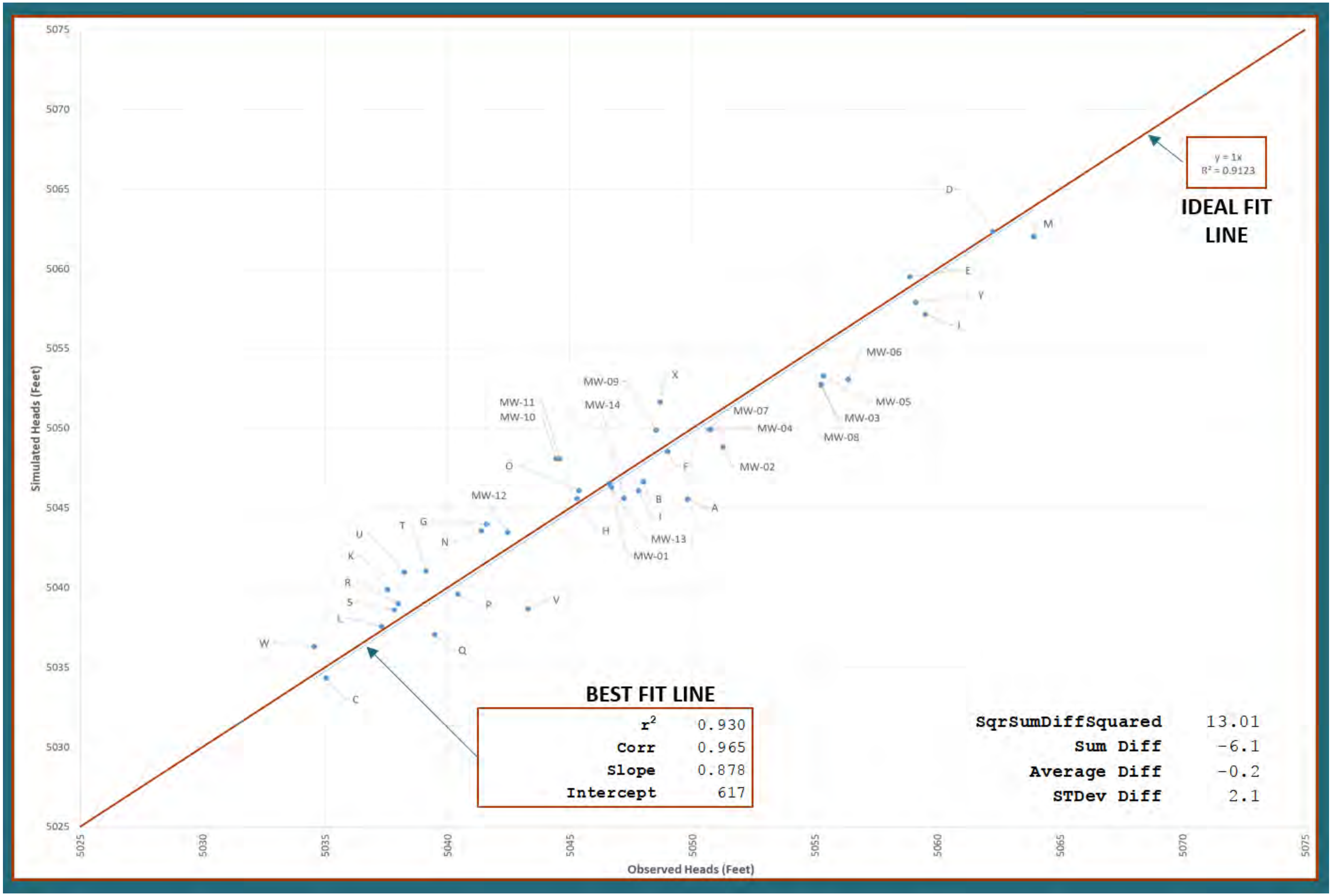

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FIGURE 11
SIMULATED vs. MEASURED GROUNDWATER ELEVATIONS

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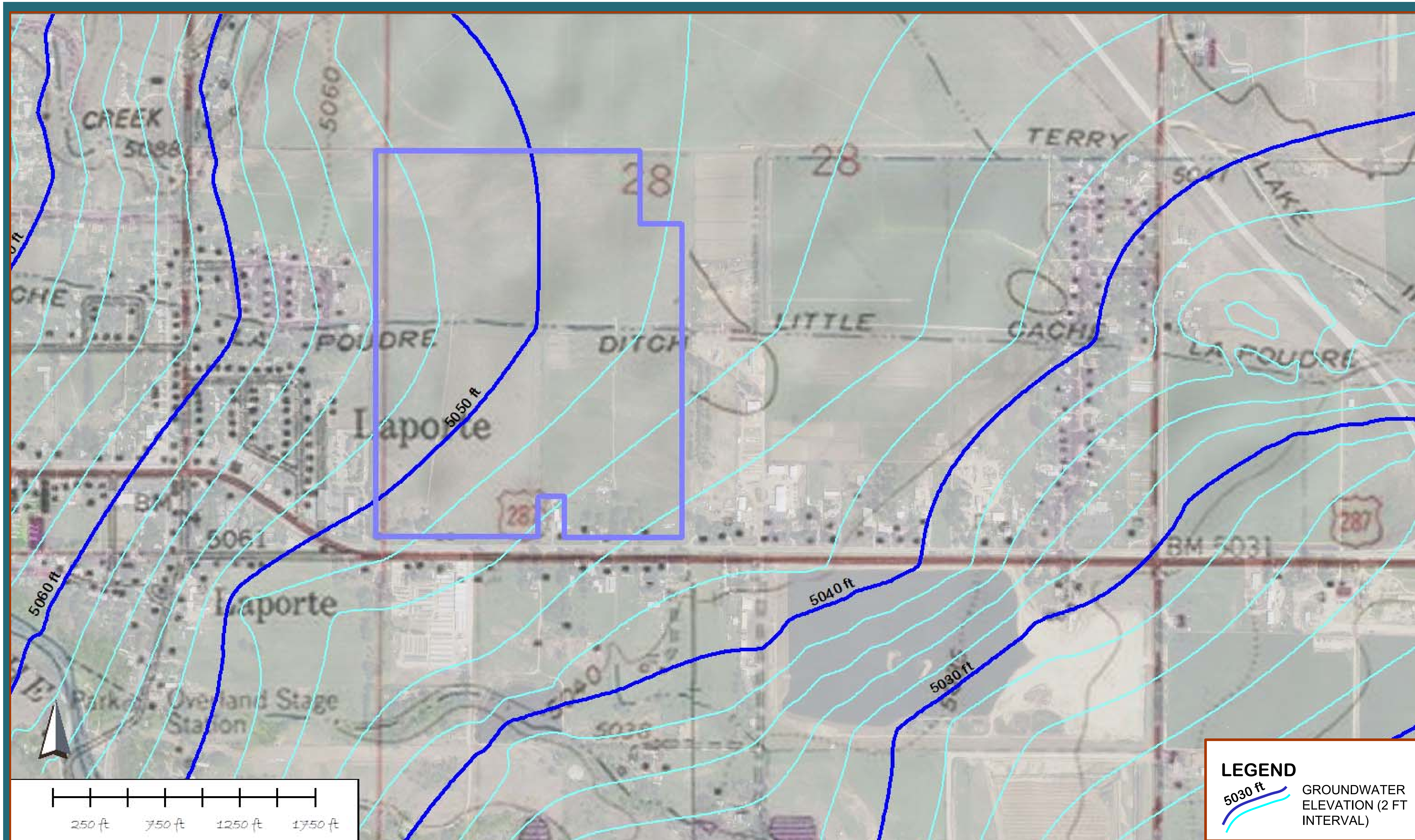

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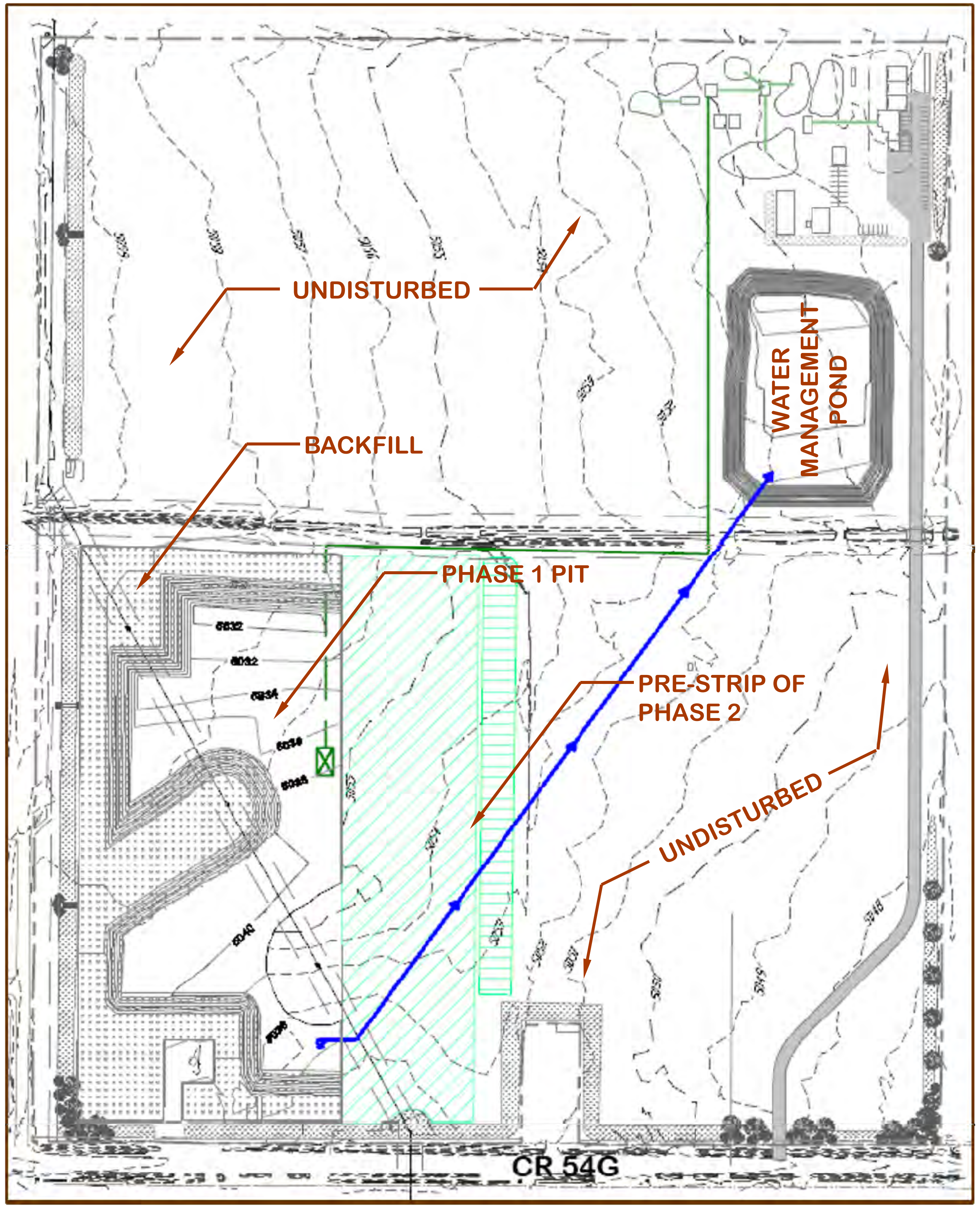
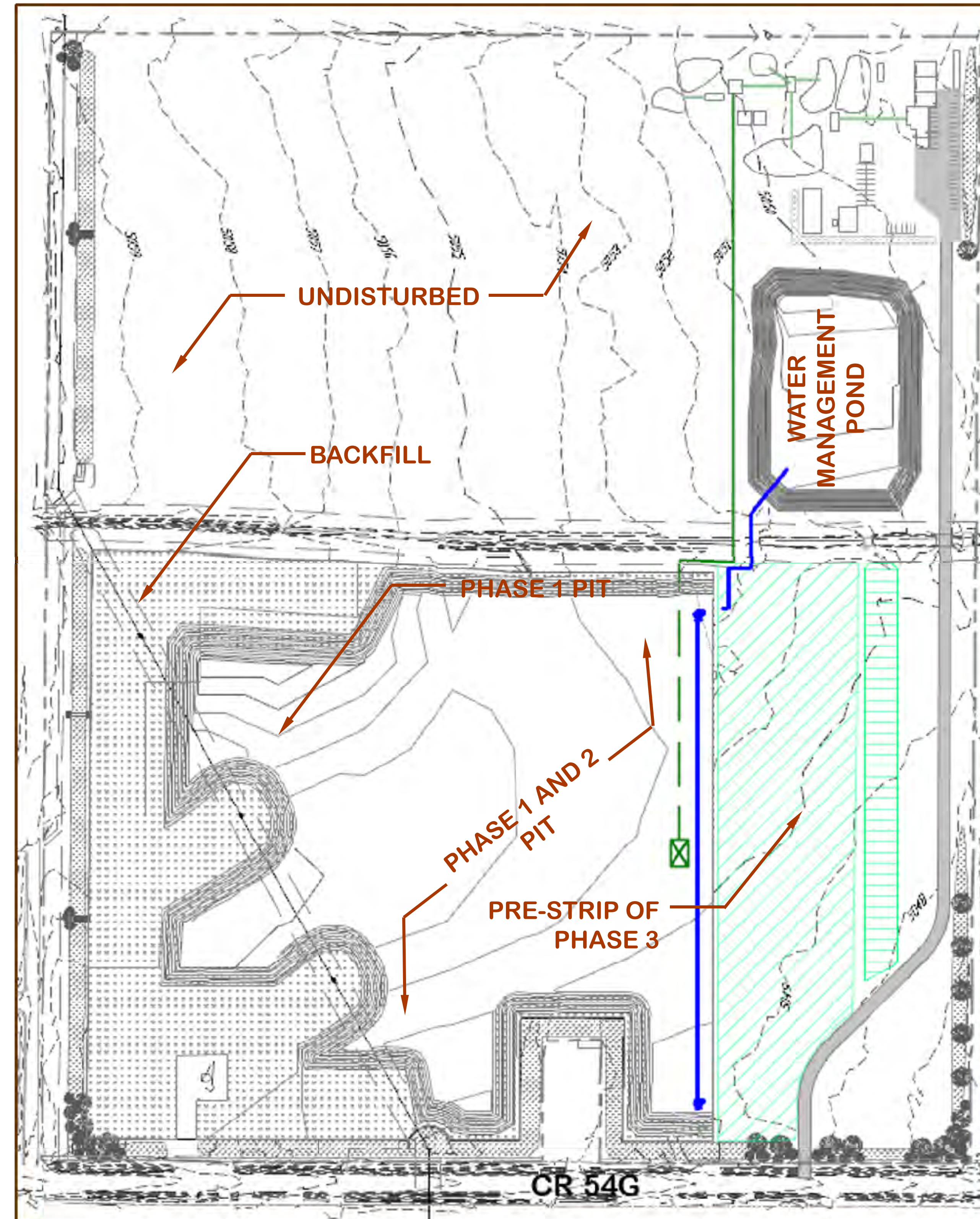
FIGURE 12
SIMULATED 2017 GROUNDWATER CONTOURS



PHASE 1



PHASE 2

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FIGURE 13
MINING PLAN
PHASES 1 AND 2

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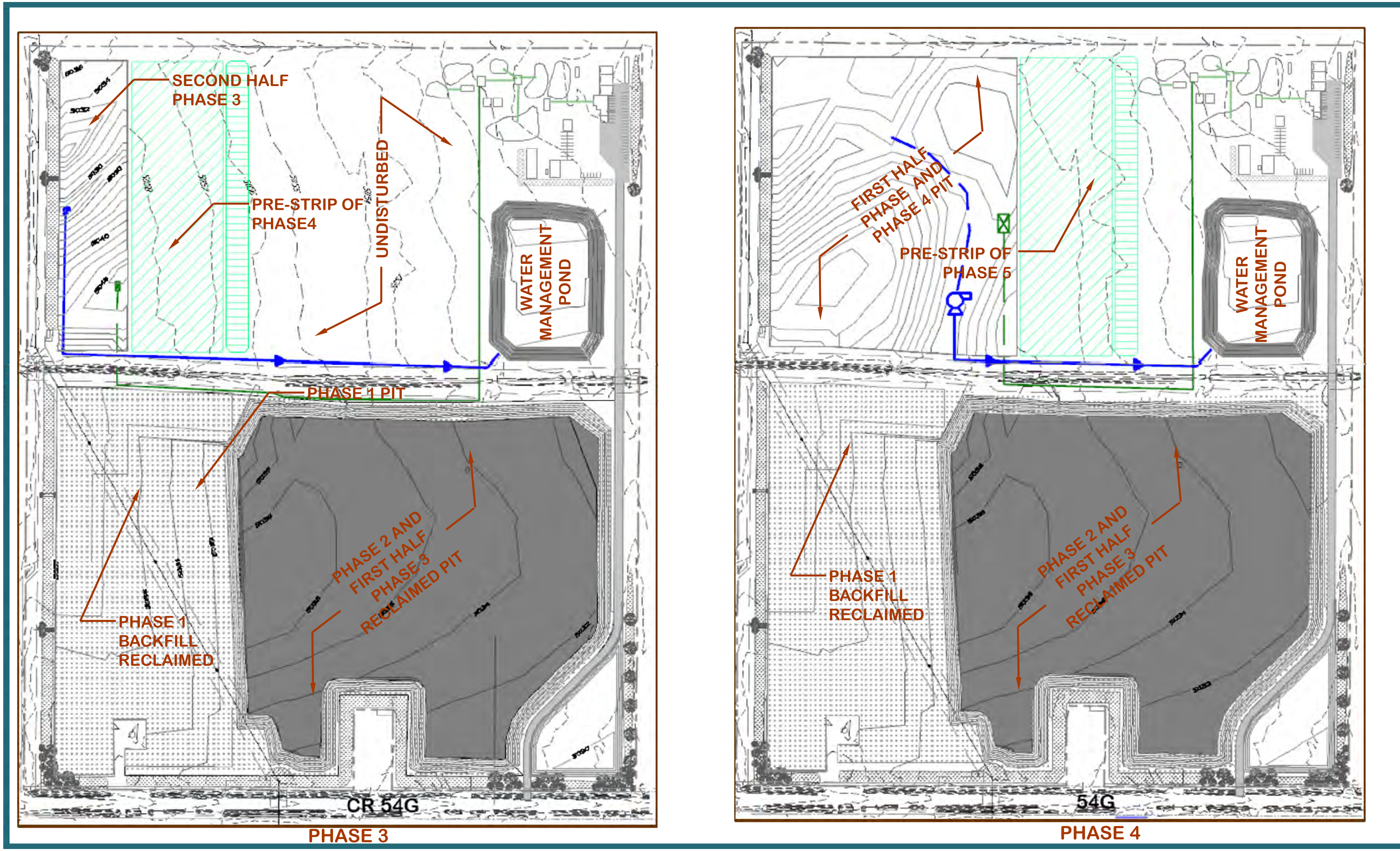

PROJECT: 360100	TASK: 08	PREPARED FOR: LOVELAND READY-MIX CONCRETE	FIGURE 14 MINING PLAN PHASES 3 AND 4
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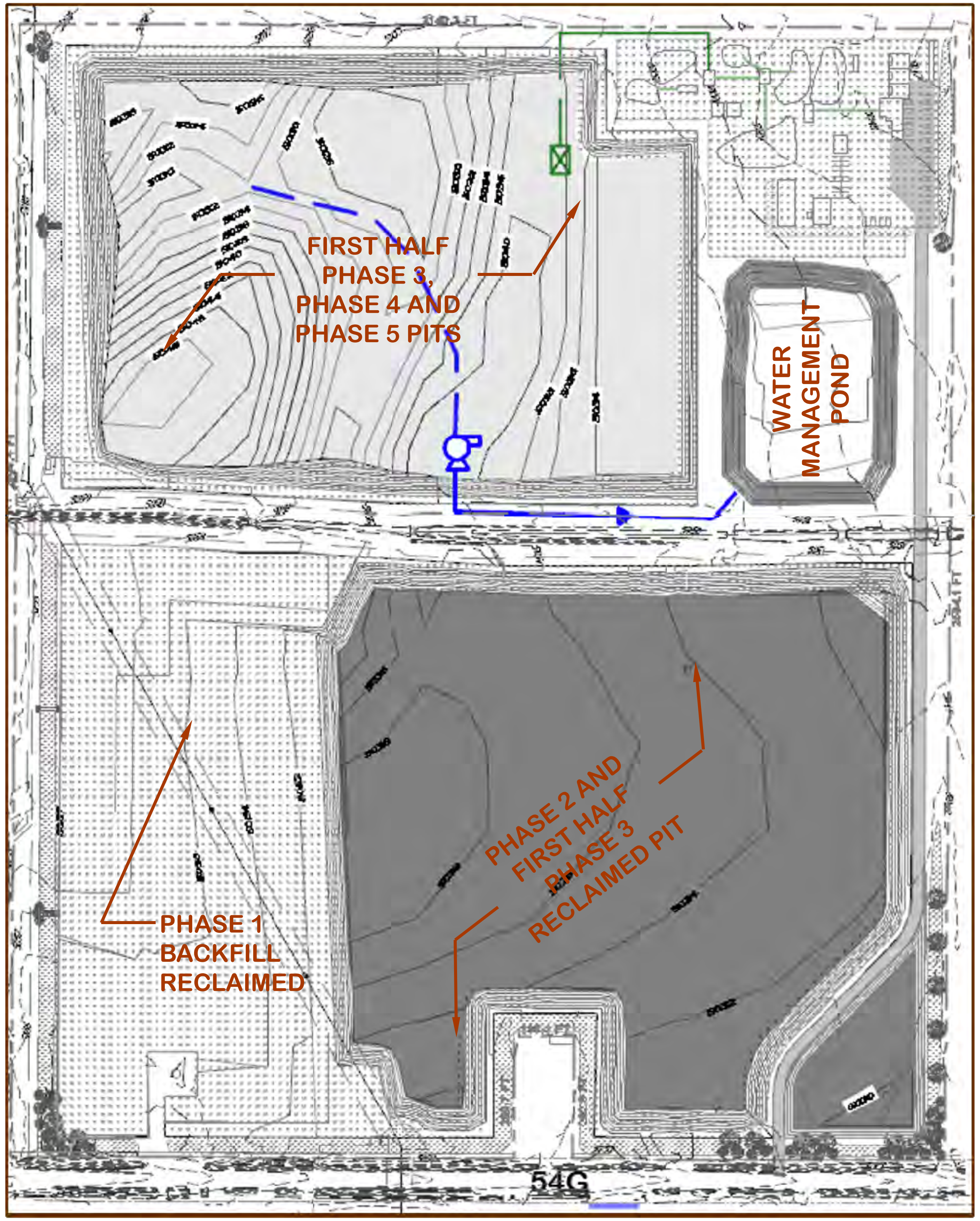
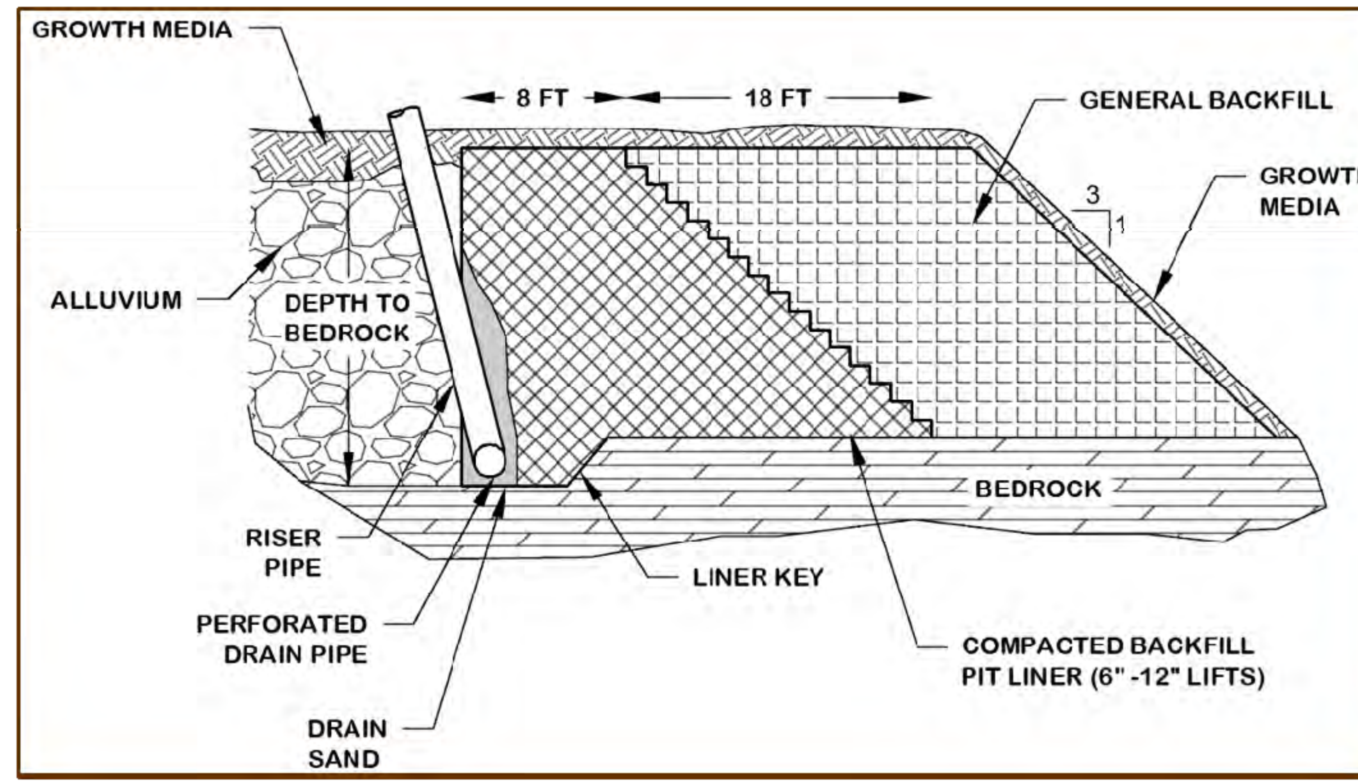


PHASE 5



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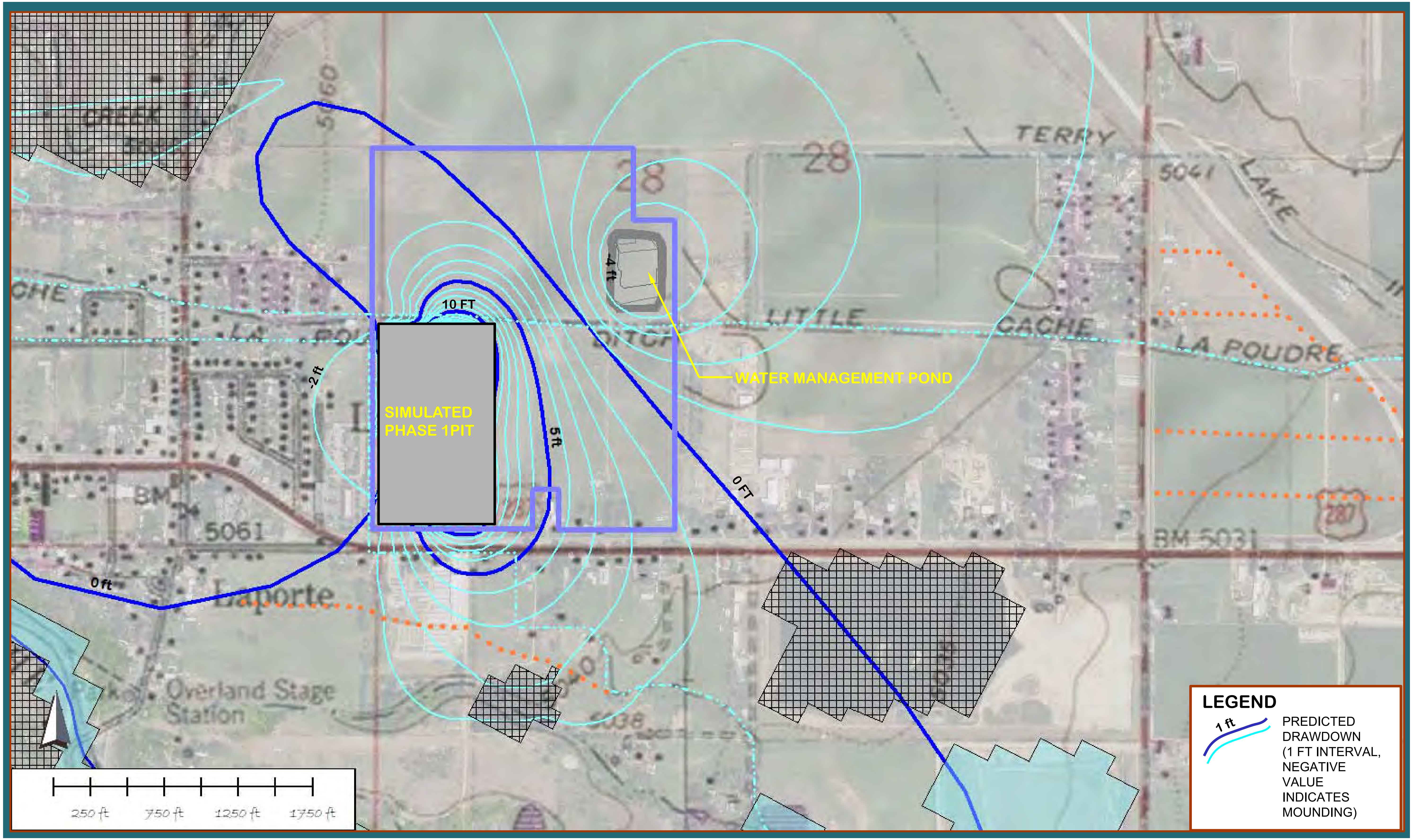
PREPARED FOR: LOVELAND READY-MIX CONCRETE

FIGURE 15
MINING PHASE 5 AND PERIMETER DRAIN
CROSS SECTION



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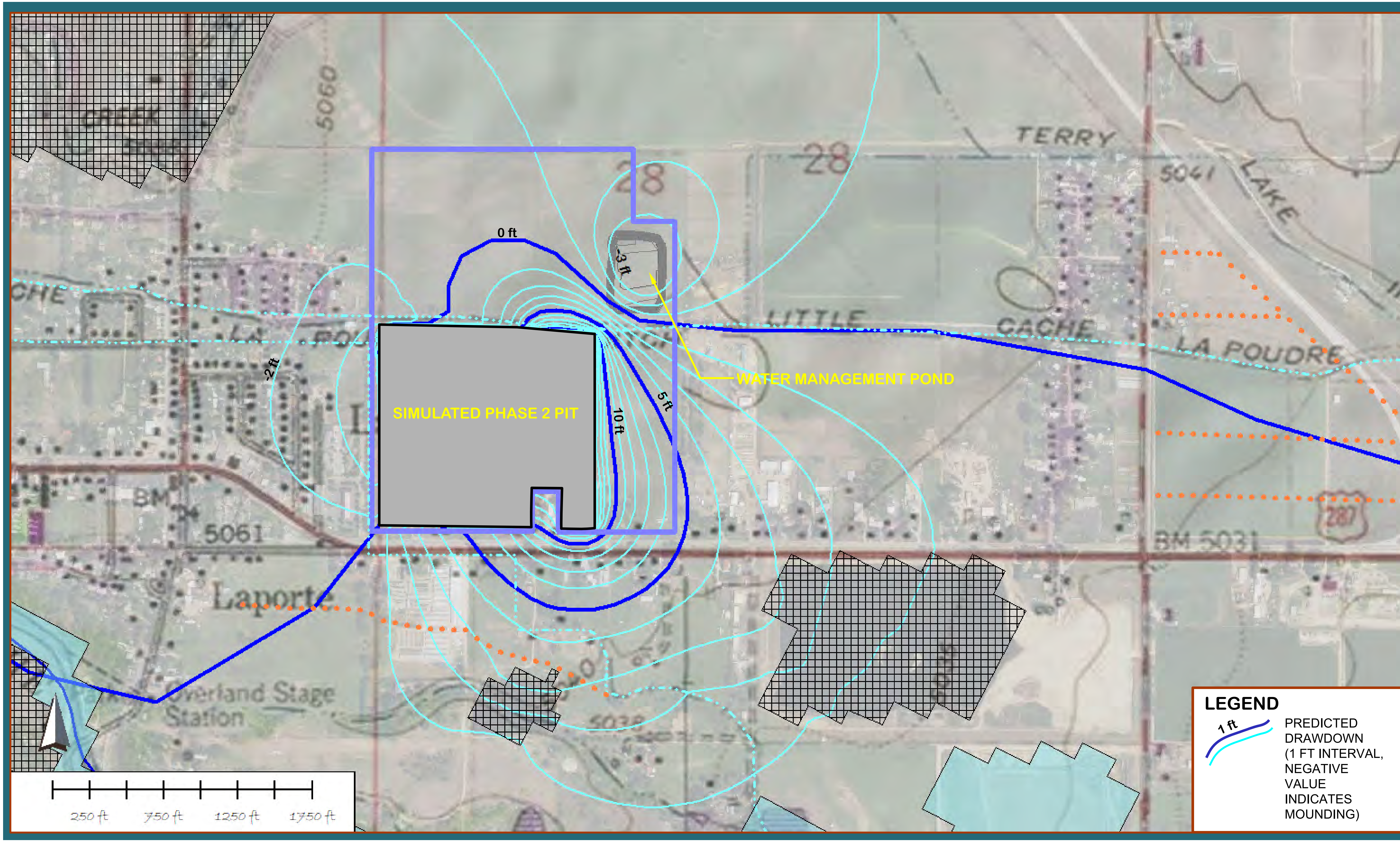

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TASK: 08
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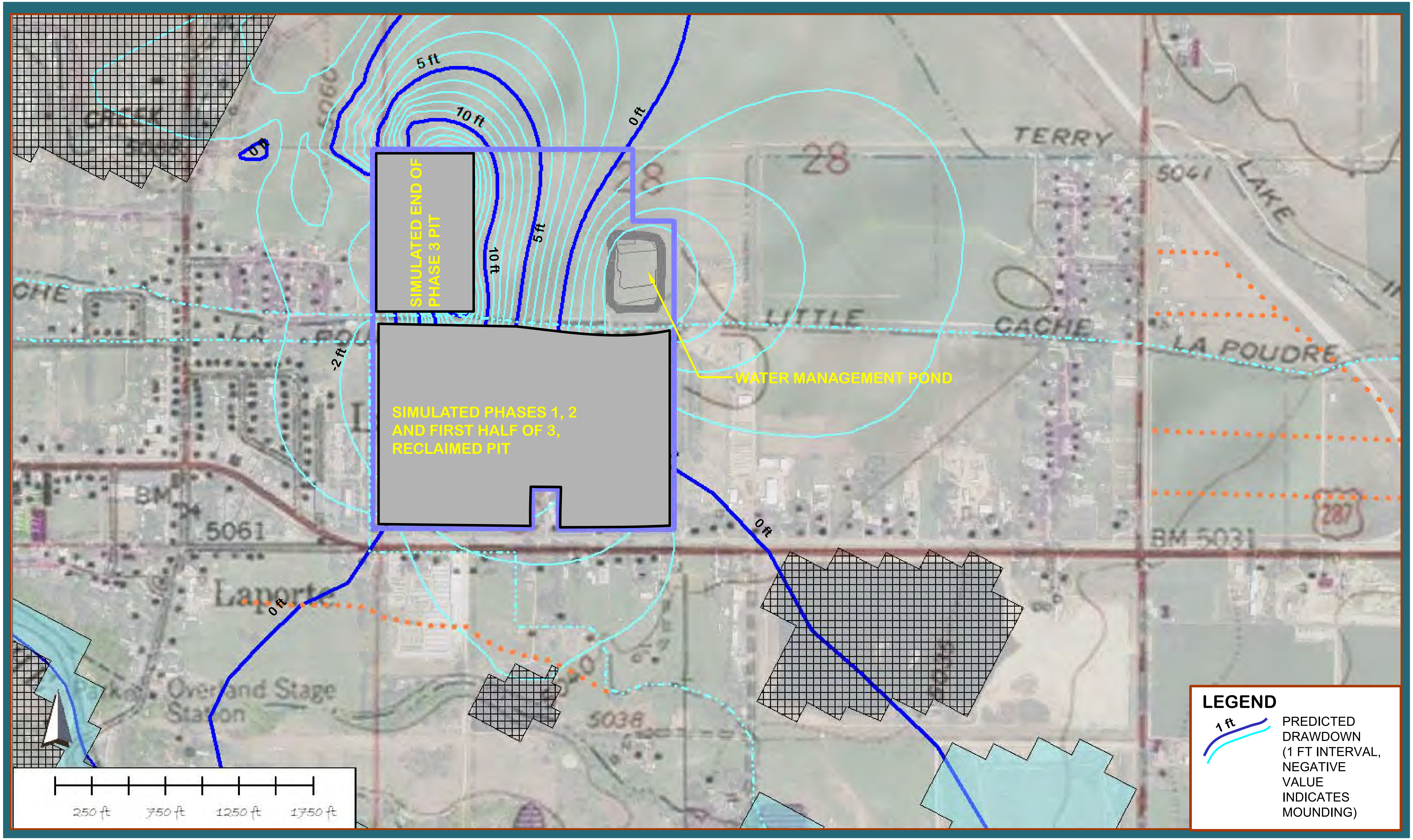
PREPARED FOR: LOVELAND READY-MIX CONCRETE

FIGURE 17
PREDICTED DRAWDOWN AT THE END OF PHASE 2



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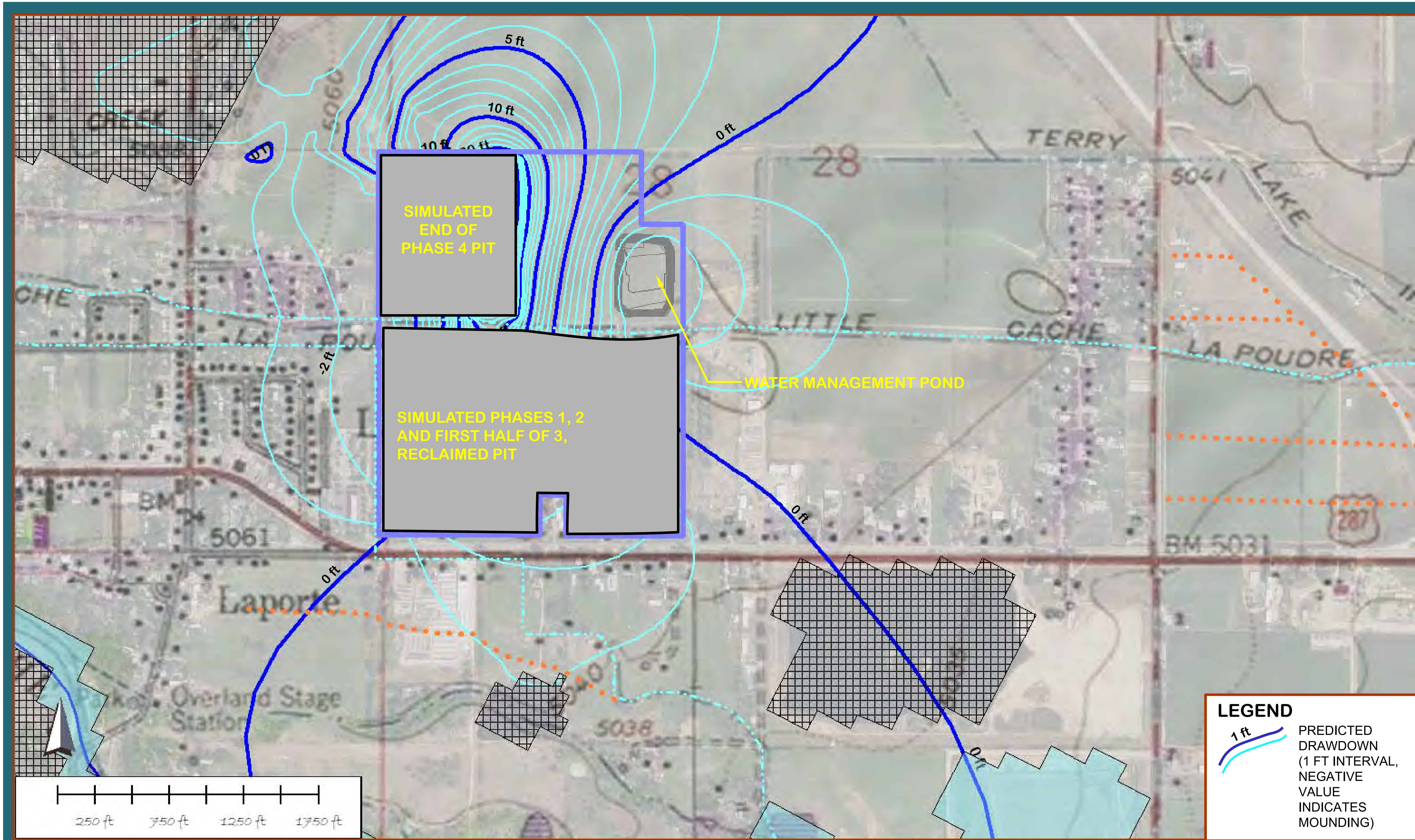
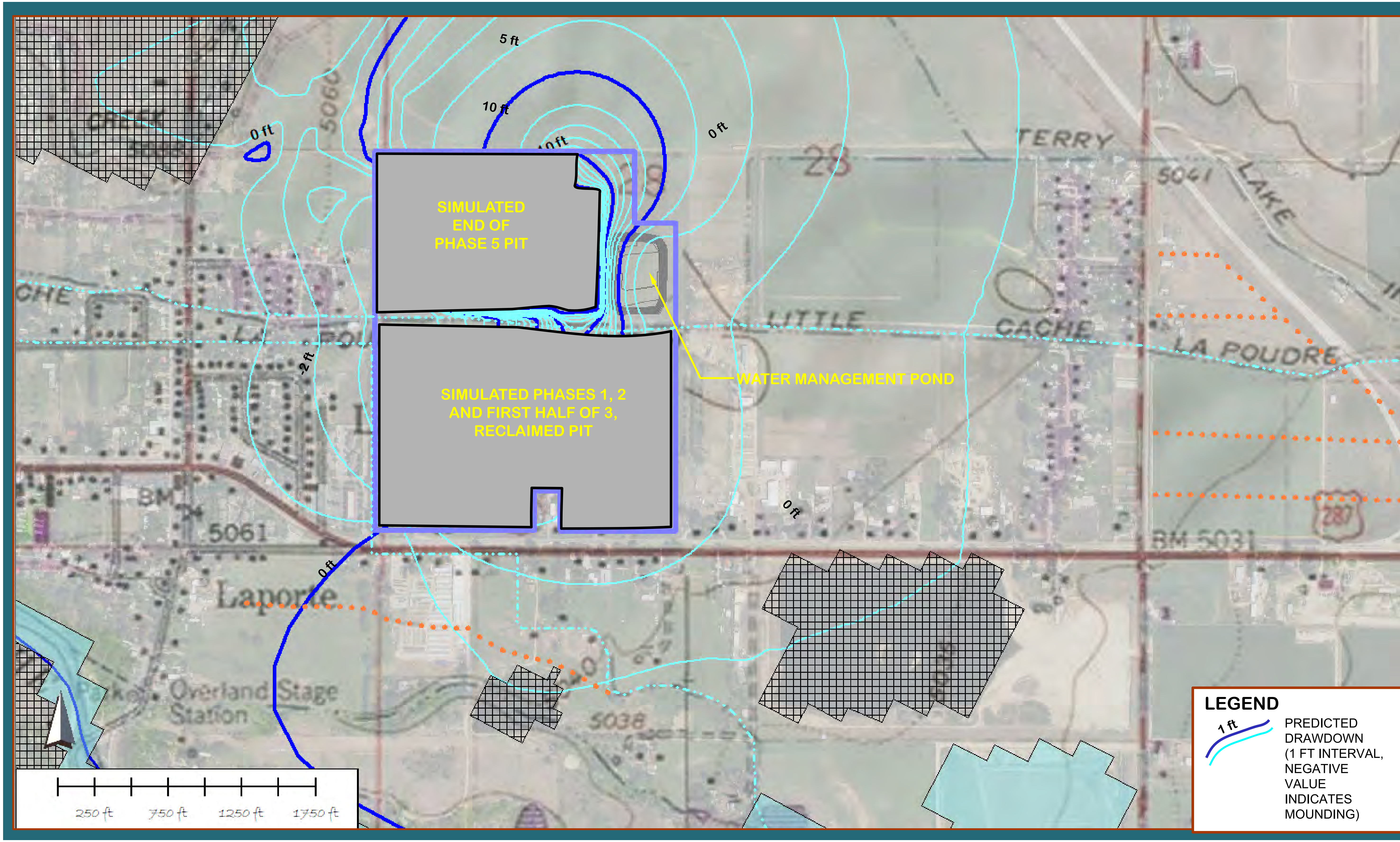
PROJECT: 360100	TASK: 08	PREPARED FOR: LOVELAND READY-MIX CONCRETE	FIGURE 18 PREDICTED DRAWDOWN AT THE END OF PHASE 3
PREPARED BY: TELESTO SOLUTIONS INCORPORATED			



PROJECT: 360100	TASK: 08
PREPARED BY: TELESTO SOLUTIONS INCORPORATED	

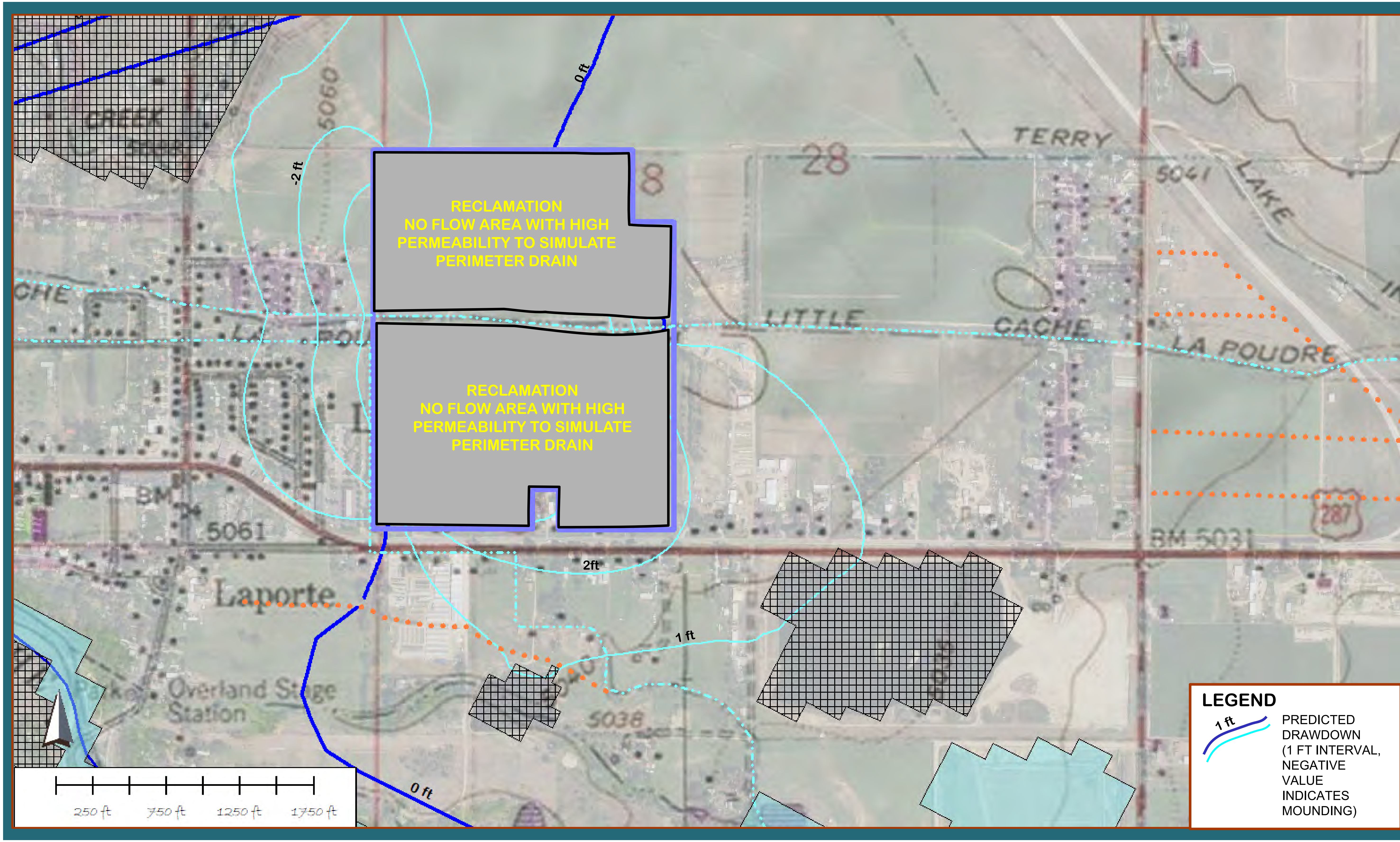
PREPARED FOR: LOVELAND READY-MIX CONCRETE

FIGURE 19
PREDICTED DRAWDOWN AT THE END OF PHASE 4



R:\LarimerCounty_CO\LovelandReadyMix\LaPorte\Products\Reports\GroundWaterStudy\Figures\20180111_Figures-TBLK_LAND_11x17.pptx

PROJECT: 360100	TASK: 08	PREPARED FOR: LOVELAND READY-MIX CONCRETE	FIGURE 20 PREDICTED DRAWDOWN AT THE END OF PHASE 5
PREPARED BY: TELESTO SOLUTIONS INCORPORATED			



R:\LarimerCounty_CO\LovelandReadyMix\LaPorte\Products\Reports\GroundWaterStudy\Figures\20180111_Figures-TBLK_LAND_11x17.pptx

PROJECT: 360100	TASK: 08
PREPARED BY: TELESTO SOLUTIONS INCORPORATED	

PREPARED FOR: LOVELAND READY-MIX CONCRETE

FIGURE 21
PREDICTED DRAWDOWN AFTER RECLAMATION

Appendix A
Neighborhood Well Questionnaire and Notes

TELESTO
SOLUTIONS • INCORPORATED

14 April 2017

Subject: Do You Have a Water Well?

To Whom it May Concern:

As you may know, Loveland Ready-Mix Concrete (LRM) is in the process of applying for a special use permit through Larimer County to open and operate an aggregate mine and ancillary concrete batch plant near LaPorte, Colorado. As part of the permitting process, a thorough understanding of the groundwater system is necessary to mitigate any potential impact to nearby well users.

Telesto Solutions, Inc. (Telesto), on behalf of LRM, will be performing a groundwater analysis to support the permitting process and help minimize any impacts to wells neighboring the proposed aggregate mine site. A key component of the analysis is knowing where wells are located and understanding the depth to the water in those wells. Because the State of Colorado's well permit information is not highly accurate, we are asking for your help in performing this study by filling out the attached questionnaire and mailing it back to us in the stamped envelope provided by the end of April 2017.

Additionally and with your permission, we would like to measure the depth to water in your well. The measurement results will be provided to you and used in the groundwater analysis. If you agree, we will contact you and make an appointment to take this measurement.

If you have any questions or would like more information, please call Parker Coit at (970) 484-7704 (Telesto) or Mrs. Stephanie Fancher-English (LRM) at (970) 667-2680.

Thank you in advance for your consideration

Sincerely,
Telesto Solutions, Inc.

Parker Coit
Geologist

PJC:wln
Enclosure
cc: File

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you:

   Name Victoria Magisano

   Mailing Address PO Box 276

   Street Address 2816 Tharp Dr

   City, State, Zip Code Laporte Co 80535

   Best Phone Number to Contact You (970) 484-3409

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address
   No Well AT my Address, That I know of

3. Is your well (please circle only one):
   a. Active (currently in use?)
   b. Inactive (not currently in use, but could be easily used)?
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well? (Circle yes or no).

   a. Yes b. No N/A

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

Strongly opposed to this Entire Project
I do not like the Noise, Dirt, Traffic
Decreased Property values or quality
of Life it will cause!

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you:

   Name MALCOLM BOYD

   Mailing Address P.O. BOX 81

   Street Address 3040 COATS

   City, State, Zip Code LAPORTE, CO 80535

   Best Phone Number to Contact You (970) 212 1463

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address
   NO WELL ON MY PROPERTY

3. Is your well (please circle only one):
   a. Active (currently in use?)
   b. Inactive (not currently in use, but could be easily used)?
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well? (Circle yes or no).

   a. Yes b. No

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

____

____

____

____

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you:

   Name JAMES BROOKMAN

   Mailing Address P.O. BOX 44 LAPORTE 80535

   Street Address 2721 Shady Grove LANE 80524

   City, State, Zip Code

   Best Phone Number to Contact You (970) 214-8709 cell

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address
   DRILLED 2001
   2721 shady grove - test well NORTH Side OF Property MARKED RED PAINT

3. Is your well (please circle only one):
   a. Active (currently in use?) — test well
   b. Inactive (not currently in use, but could be easily used)?
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well? (Circle yes or no).

   a. Yes b. No

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

   TEST well drilled by another developer
   MARTIN MARIETTA HAS THE KEY - LOCK IS LOOSE
   AT PRESENT.

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you:

   Name Patrick Rowe

   Mailing Address 220 N. Shields St, Fort Collins, CO 80521

   Street Address ______

   City, State, Zip Code ______

   Best Phone Number to Contact You (____)______

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address

   ______

   Unsure which property this is in regards to..

3. Is your well (please circle only one):
   a. Active (currently in use?)
   b. Inactive (not currently in use, but could be easily used)?
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well?
   (Circle yes or no).

   a. Yes b. No

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

______

______

______

______

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you:

   Name Barry Baken

   Mailing Address 720 Peterson St

   Street Address ~~2320 Cnty Rd 546~~

   City, State, Zip Code Fort Collins, CO 80524

   Best Phone Number to Contact You (970) 217-3068

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address
   2320 Cnty Rd 546, Fort Collins, CO 80521

3. Is your well (please circle only one):
   a. Active (currently in use?)
   b. Inactive (not currently in use, but could be easily used)?
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well? (Circle yes or no).

   a. Yes b. No N/A

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

Not sure a well was even Drilled

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you:

   Name Lahue Frederick

   Mailing Address P.O. Box 1376 Laporte

   Street Address 3252 Sunrise Drive

   City, State, Zip Code 80535

   Best Phone Number to Contact You (970) 484-9360

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address
   3252 Sunrise Drive

3. Is your well (please circle only one):
   a. Active (currently in use?)
   b. Inactive (not currently in use, but could be easily used)?
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well?
   (Circle yes or no).

   a. Yes b. No

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you:

   Name Mark A/Karen S. Morgan

   Mailing Address 2532 County Rd. 54G

   Street Address Same

   City, State, Zip Code Fort Collins, Co 80524

   Best Phone Number to Contact You (970) 484-4065

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address
   3 wells: 1 near office, 1 near sawmill + 1 North of horse barn

3. Is your well (please circle only one):
   a. Active (currently in use?)
   b. Inactive (not currently in use, but could be easily used)?
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well? (Circle yes or no).

   a. Yes b. No

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you:

   Name Don Brown

   Mailing Address 2400 W. Cnty Rd 54G

   Street Address " "

   City, State, Zip Code Fort Collins, CO. 80524

   Best Phone Number to Contact You 970 484.4184

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address
   2400 W. Cnty Rd 54G

3. Is your well (please circle only one):
   a. Active (currently in use?)
   b. Inactive (not currently in use, but could be easily used)?
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well? (Circle yes or no).

   a. Yes b. No

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

   Watering the yard. I have two (2) wells on the property.

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you:

   Name Steve Benoit and Paula Brobst

   Mailing Address PO BOX 509 LAPORTE, CO 80535

   Street Address 3010 N. Overland Trail, LaPorte CO 80535

   City, State, Zip Code See above :)

   Best Phone Number to Contact You (970) 231-0657 Paula's cell

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address
   About 1/2 way back (between Overland trail & Coals Drive) on the property by the fence on the north side.

3. Is your well (please circle only one):
   a. Active (currently in use?)
   b. Inactive (not currently in use, but could be easily used)?
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well? (Circle yes or no).

   a. Yes b. No

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

We would use it to irrigate our back yard.
We have the pump, but it is not installed.
We have rights to the ditch water the ~~pump is~~ well is one
The water table is at about 5' on our property - as we built a workshop and hit water 5' down.

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you:

   Name JASON MARKS

   Mailing Address PO BOX 1226

   Street Address 2812 GARDNER PL

   City, State, Zip Code LAPORTE CO 80535-1226

   Best Phone Number to Contact You (970) 227 3220

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address
   2812 GARDNER PL

3. Is your well (please circle only one):
   a. Active (currently in use?)
   b. Inactive (not currently in use, but could be easily used)?
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well? (Circle yes or no).

   a. Yes b. No

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you:

Name

[redacted] Jacqueline Resseguie
3617 N County Road 25 E
Bellvue, CO 80512

Mailing Address

Street Address ______________________

City, State, Zip Code______________________

Best Phone Number to Contact You (970) 482-2030

2. Please provide the physical location of your well near LaPorte:
Street or Rural Address
there is no well on (my) the LaPorte property

3. Is your well (please circle only one):
a. Active (currently in use?)
b. Inactive (not currently in use, but could be easily used)?
c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well?
(Circle yes or no). I doubt that is possible

a. Yes b. No

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

the well on my property at the above address is not being used, there is not a good flow of water in it.

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you:

   Name RALPH EUGENE WATT

   Mailing Address PO BOX 723

   Street Address 2626 N OVERLAND TRAIL

   City, State, Zip Code LAPORTE, CO 80535

   Best Phone Number to Contact You (970) 218-2040

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address
   2626 N OVERLAND TRAIL LAPORTE

3. Is your well (please circle only one):
   a. Active (currently in use?)
   b. Inactive (not currently in use, but could be easily used)?
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well? (Circle yes or no).

   a. Yes b. No

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

AN UNREGISTERED LIVESTOCK WELL USED AS A BACKUP IF CITY WATER SYSTEMS FAIL. WELL HAS BEEN IN PLACE SINCE 1920 (ESTIMATED)

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you:

   Name TOM & SUSAN BARBOUR

   Mailing Address 1000 LODGEPOLE PL

   Street Address

   City, State, Zip Code BELLVUE, CO 80512

   Best Phone Number to Contact You (970) 224-4828

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address
   2500 W CO Rd 54 G.

3. Is your well (please circle only one):
   a. Active (currently in use?)
   b. Inactive (not currently in use, but could be easily used)?
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well? (Circle yes or no).

   a. Yes b. No

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

   Currently used to irrigate lawns

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you:

   Name Duncan Yahn

   Mailing Address 2722 Farview Dr.

   Street Address Same

   City, State, Zip Code Fort Collins, CO 80524

   Best Phone Number to Contact You 970-218-1320

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address
   Same

3. Is your well (please circle only one):
   a. Active (currently in use?)
   b. Inactive (not currently in use, but could be easily used)?
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well? (Circle yes or no).

   a. Yes b. No

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

Irrigation well with no pump currently. Avg water level 5 ft. below grade. Well depth 8 ft. Hoping to get a pump for it this summer.

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you:

   Name Erin Crowgey

   Mailing Address PO Box 785

   Street Address 3300 Tharp Dr.

   City, State, Zip Code Laporte, CO 80535

   Best Phone Number to Contact You (434) 284-1479

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address
   We may have a well on our property - we are not sure whether the structure is a well or just a pump

3. Is your well (please circle only one):
   a. Active (currently in use?)
   b. Inactive (not currently in use, but could be easily used)?
   c. Abandoned (damaged or otherwise unusable)?
   d. unsure.

4. Would you allow someone to measure depth to water in your well? (Circle yes or no).

   a. Yes b. No

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

We strenuously object to LRM's proposed operations in Laporte and will actively oppose the application at every step.

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you:

   Name Ruth Wallick

   Mailing Address PO Box 380, LaPorte CO 80535

   Street Address 3000 N. Overland Trail & 2912 N. Overland Tr

   City, State, Zip Code La Porte, CO 80535

   Best Phone Number to Contact You (970) 482-7655

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address
   3000 N. Overland Tr. & 2912 N. Overland. One well at each address

3. Is your well (please circle only one):
   a. Active (currently in use?)
   b. Inactive (not currently in use, but could be easily used)?
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well? (Circle yes or no).

   a. Yes b. No

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

Used for watering in spring, summer & early fall,
Not dry in winter but not used when below freezing

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you:

   Name TERRY WATERS

   Mailing Address PO BOX 291

   Street Address 3200 THARP DRIVE

   City, State, Zip Code LAPORTE CO 80535

   Best Phone Number to Contact You (970) 482-4462

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address
   3200 THARP DRIVE - NORTH SIDE OF PROPERTY

3. Is your well (please circle only one):
   a. Active (currently in use?)
   b. Inactive (not currently in use, but could be easily used)?
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well? (Circle yes or no).

   a. Yes b. No

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you:

   Name HERB Still

   Mailing Address 2801 Co. Rd. 54G

   Street Address Same

   City, State, Zip Code Ft. Collins, Co 80524

   Best Phone Number to Contact You (970) 217 8771

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address
   2801 Co. Rd. 54 G

3. Is your well (please circle only one):
   a. Active (currently in use?)
   b. Inactive (not currently in use, but could be easily used)?
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well? (Circle yes or no).

   a. Yes b. No

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you:

   Name Rita Hildred

   Mailing Address PO 86 LAPORTE CO #80535 #

   Street Address 2403 Brookhill rd

   City, State, Zip Code LaPorte, CO 80524

   Best Phone Number to Contact You (970) 214 6174 (Don Hildred Contact Person)

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address
   2403 Brookhill Road

3. Is your well (please circle only one):
   a. Active (currently in use?)
   b. Inactive (not currently in use, ~~but could be easily used~~)? unknown 30 years since used
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well? (Circle yes or no).

   a. Yes b. No

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

   This is an old well that went out of use when West Fort Collins water came to the area.

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you:

   Name Donald J. Chavez

   Mailing Address 2919 Farview Dr, Fort Collins, CO 80524

   Street Address 2919 Farview Dr.

   City, State, Zip Code Fort Collins CO 80524

   Best Phone Number to Contact You (970) 388-2924

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address
   2919 Farview Dr., Fort Collins, CO 80524

3. Is your well (please circle only one):
   a. Active (currently in use?)
   b. Inactive (not currently in use, but could be easily used)?
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well? (Circle yes or no).

   a. Yes b. No

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

We use the well for irrigation. It does not dry up.
Not ~~su~~ sure of the pumping rate

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you:

   Name Joe Sincavage

   Mailing Address 2813 Farview Dr.

   Street Address Same

   City, State, Zip Code Fort Collins CO 80524

   Best Phone Number to Contact You (970) 631-2224

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address
   West sector of lot at 2813 Farview Dr.

3. Is your well (please circle only one):
   a. Active (currently in use?)
   b. Inactive (not currently in use, but could be easily used)?
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well?
   (Circle yes or no).

   a. Yes b. No

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

   I water my lawn with my well. I have an 1½" Line into my Pump. ¾" Line to 4 sprinkler heads at 3400 rpm. As of 4/29/17 I have 40' to depth of water. I've living here 17 yrs and well has always performed

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you:

   Name Martha Aney

   Mailing Address 2903 Farview Dr.

   Street Address 2903 Farview Dr

   City, State, Zip Code Fort Collins, CO 80524

   Best Phone Number to Contact You (970) 224-2950

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address
   2903 Farview Dr.

3. Is your well (please circle only one):
   a. Active (currently in use?) - Year around - water for land + Animals
   b. Inactive (not currently in use, but could be easily used)?
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well?
   (Circle yes or no).

   a. Yes b. No - we need true flow rate measured.

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

I do not know flow rates, though we can run two hoses for several hours to water the garden, grass + horses.
Why are we only given a little over week to respond?
I also got a letter to Wayne Hutchens at our address. I am not sure who he is. He will need to be able to respond. Also most of this neighborhood has a well. Not all were at the meeting. You need to go to every house

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you:

   Name Nicolas Koontz

   Mailing Address 2930 Farview Dr

   Street Address Same

   City, State, Zip Code Ft. Collins, CO 80524

   Best Phone Number to Contact You (970) 217 8964

2. Please provide the physical location of your well near LaPorte: Street or Rural Address
   2930 Farview Dr + 2100 CR54g our other well

3. Is your well (please circle only one):
   a. Active (currently in use?)
   b. Inactive (not currently in use, but could be easily used)?
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well? (Circle yes or no).

   a. Yes b. No

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

   ~10gpm Shallow 8-10ft deep
   landscape Irrigation use
   doesn't go dry but flow rate drops

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you:

   Name Jack L and Ladelle L West

   Mailing Address 2812 County Rd 54G

   Street Address Same

   City, State, Zip Code Fort Collins CO 80524

   Best Phone Number to Contact You (970) 219-1581

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address
   2812 County Rd 54G

3. Is your well (please circle only one):
   a. Active (currently in use?)
   b. Inactive (not currently in use, but could be easily used)?
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well? (Circle yes or no).

   a. Yes b. No

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

It is used for yard and gardening. It has never run dry. We pull the pump & drain it during the winter. During summer for yard & garden it will run 10 hrs/day without running dry

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you:

   Name CHARLES CHERRY

   Mailing Address 2816 COUNTY RD. 54G

   Street Address SAME

   City, State, Zip Code FORT COLLINS CO 80524

   Best Phone Number to Contact You (970) 443-8798

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address
   50 FEET NORTH OF N.W. CORNER OF GARAGE 3 FEET FROM WEST - N. SOUTH PROPERTY LINE - VISIBLE

3. Is your well (please circle only one):
   a. Active (currently in use?)
   b. Inactive (not currently in use, but could be easily used)?
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well? (Circle yes or no).

   a. Yes b. No

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help: FROM 1¼" PLASTIC PIPE
   WILL EASILY RUN 4-5 ROUND SPRINKLERS +
   AFTER RIVER COMES UP A LITTLE SPRING TIME
   USED FOR LAWN + GARDEN

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you:

   Name Ed Stover

   Mailing Address P.O. Box 206 Laporte, Co 80535

   Street Address 2301 EDDY Lane

   City, State, Zip Code Fort Collins, Co 80524

   Best Phone Number to Contact You (970) 227-3322

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address
   * ~~Since our~~ 2301 EDDY Lane

3. Is your well (please circle only one):
   a. Active (currently in use?)
   b. Inactive (not currently in use, but could be easily used)?
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well?
   (Circle yes or no).

   a. Yes b. No

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

Although we don't have an irrigation well, we are concerned about our fishing pond on the East side of our property. FYI - Greeley installed many ~~[illegible]~~ Monitoring wells on our property + the neighbors to the North when they were going to install a 5" water line along our north boundary - again, for the purpose of not interfering with the ground water which is what feeds the pond. My Neighbor - Gene Komor, is concerned about his pond also

A site visit would explain a lot + would be useful for you to use the existing monitoring wells

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you:

   Name James Maxwell

   Mailing Address P.O. Box 52

   Street Address 2816 Gardner Pl

   City, State, Zip Code LaPorte, CO 80535

   Best Phone Number to Contact You (970) 217-3170

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address
   2816 Gardner Pl

3. Is your well (please circle only one):
   a. Active (currently in use?)
   b. Inactive (not currently in use, but could be easily used)?
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well? (Circle yes or no).

   a. Yes b. No

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

I use the well to Water my property (Grass, Flowers, Plants
I only Pump Water from it in the Summer

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

3205 Wilson Court
Sandra Gomez.
(970)
493-9362
6029

LOVELAND READY-MIX CONCRETE and TE

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we ca

   Name Kitty Kent Tony Kent

   Mailing Address N/A

   Street Address N/A

   City, State, Zip Code N/A

   Best Phone Number to Contact You (N)/A

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address
   NO ~~N/A~~

3. Is your well (please circle only one):
   a. Active (currently in use?)
   b. Inactive (not currently in use, but could be easily used)?
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well? (Circle yes or no).

   a. Yes b. No

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

you may not Invade my Land or privacy Stay out! — you are not welcome in or around my home or Land —

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

TELESTO

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you:

   Name Cole Thompson

   Mailing Address 4780 TOTONKA TRL

   Street Address ______

   City, State, Zip Code LAPORTE, CO 80535

   Best Phone Number to Contact You (970) 218-9649

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address
   SAME

3. Is your well (please circle only one):
   a. Active (currently in use?)
   b. Inactive (not currently in use, but could be easily used)?
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well? (Circle yes or no).

   a. Yes b. No

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

2004 330 ft hole - static water level 70' - 13.5 gal/min

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you:

   Name Robert & Rosemary Dickson

   Mailing Address 2726 Farview

   Street Address

   City, State, Zip Code Fort Collins Co. 80524

   Best Phone Number to Contact You (970) 551 0925

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address
   2726 Farview Fort Collins

3. Is your well (please circle only one):
   a. Active (currently in use?)
   b. Inactive (not currently in use, but could be easily used)?
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well? (Circle yes or no).

   a. Yes b. No

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

   Use for grass & trees on property
   use spring & summer & Fall months

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you: Kuei Pao

   Name KINTZLEY, RAYMOND Kelly

   Mailing Address 2601 WCR54G

   Street Address ______

   City, State, Zip Code FT. COLLINS, CO 80524

   Best Phone Number to Contact You (303) 250 4720

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address SAME AS ABOVE

3. Is your well (please circle only one):
   a. Active (currently in use?)
   b. Inactive (not currently in use, but could be easily used)?
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well?
   (Circle yes or no).

   a. Yes b. No

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

   Never Goes dry
   USE ALL SPRING/SUMMER/FALL

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you:

   Name ______

   Mailing Address Stegner Dairy Farm 1817 U.S. Hwy 287 N. Fort Collins, CO 80524

   Street Address ______

   City, State, Zip Code ______

   Best Phone Number to Contact You (970) 493-5180

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address
   No wells

3. Is your well (please circle only one):
   a. Active (currently in use?)
   b. Inactive (not currently in use, but could be easily used)?
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well?
   (Circle yes or no).

   a. Yes b. No N/A

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

Don't have well — Location miss marked on County maps

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you:

   Name APLIN JEANNETTE

   Mailing Address Box 266

   Street Address LAPORTE

   City, State, Zip Code Co 80535

   Best Phone Number to Contact You (970) 493-0139

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address
   2821 GARDNER PLACE

3. Is your well (please circle only one):
   a. Active (currently in use?)
   b. Inactive (not currently in use, but could be easily used)?
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well? (Circle yes or no).

   a. Yes b. No

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you:

   Name Robert D. Boner

   Mailing Address 3121 Gold Charm Dr.

   Street Address Same

   City, State, Zip Code Fort Collins Co. 80524

   Best Phone Number to Contact You ( ) no fone

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address
   3121 Gold Charm Dr.

3. Is your well (please circle only one):
   a. Active (currently in use?)
   b. Inactive (not currently in use, but could be easily used)?
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well? (Circle yes or no).

   a. Yes b. No

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

   water cats & Dogs & Horses & lawn & garden

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you:

   Name REGINA BACHMANN

   Mailing Address 2820 THARP DR.

   Street Address SAME AS ABOVE

   City, State, Zip Code LA PORTE, CO. 80535

   Best Phone Number to Contact You (970) 493 1513

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address
   BACK YARD OF RESEDENCE

3. Is your well (please circle only one):
   a. Active (currently in use?)
   b. Inactive (not currently in use, but could be easily used)?
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well? (Circle yes or no).

   a. Yes b. No

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

   HAS NOT BEEN USED FOR VERY LONG TIME.

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you:

   Name Robin Rippee

   Mailing Address 3013 gold Charm Dr

   Street Address Same

   City, State, Zip Code Ft Collins Co 80524

   Best Phone Number to Contact You (970) 484-0413

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address
   above address

3. Is your well (please circle only one):
   a. Active (currently in use?)
   b. Inactive (not currently in use, but could be easily used)?
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well? (Circle yes or no).

   a. Yes b. No

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

   Hasn't been in use due to pump unorperating

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you:

   Name Bill Friehauf

   Mailing Address 2504 W. Cty Rd 54 G

   Street Address Same

   City, State, Zip Code Ft. Collins, Co 80524

   Best Phone Number to Contact You (970) 416-7785

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address
   Inside Garage

3. Is your well (please circle only one):
   a. Active (currently in use?)
   b. Inactive (not currently in use, but could be easily used)?
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well? (Circle yes or no).

   a. Yes b. No

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

   13.5 GPM
   Used for Sprinkler System

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you:

   Name Linda J. Doran

   Mailing Address 522 11th Street Ft Collins Co 80524

   Street Address 3303 W. County Rd. 52 ~~Laporte~~

   City, State, Zip Code LaPorte Co 80535

   Best Phone Number to Contact You (970) 402-8826 (Ask for mike Doran)

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address North side of the house

3. Is your well (please circle only one):
   a. Active (currently in use?)
   b. Inactive (not currently in use, but could be easily used)?
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well? (Circle yes or no).

   a. Yes b. No

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

   I don't actually live @ this residence
   my ex-husband does.
   If you have any problems call me
   @ (970) 779-4377

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you:

   Name RANDY WOOD

   Mailing Address 2412 W COUNTY RD 54G

   Street Address SAME

   City, State, Zip Code FT COLLINS CO 80524

   Best Phone Number to Contact You (970) 484-8226

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address
   SAME AS ABOVE

3. Is your well (please circle only one):
   a. Active (currently in use?)
   b. Inactive (not currently in use, but could be easily used)?
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well? (Circle yes or no).

   a. Yes b. No

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

DOES NOT GO DRY IN WINTER
GETS LOW IN AUGUST
MY WELL IS LOCATED INSIDE OF HOUSE SO IS NOT
EASY TO MEASURE DEPTH

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you:

   Name Cecil E Bowden

   Mailing Address 709 Eastdale Dr

   Street Address

   City, State, Zip Code Ft Collins Co 80524

   Best Phone Number to Contact You (970) 482-8604

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address
   67J cty Rd Cherokee Park Area

3. Is your well (please circle only one):
   a. Active (currently in use?)
   b. Inactive (not currently in use, but could be easily used)?
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well? (Circle yes or no).

   a. Yes b. No

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

LIMITED use WITH CABIN SITE

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you:

   Name BARbARA Schuldt

   Mailing Address P.O. Box 528 LAPorte, CO 80535

   Street Address 2819 FARview DR.

   City, State, Zip Code Ft. Collins, CO 80524

   Best Phone Number to Contact You (480) 277-0893

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address
   2819 FARview DR.

3. Is your well (please circle only one):
   a. Active (currently in use?)
   b. Inactive (not currently in use, but could be easily used)?
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well? (Circle yes or no).

   a. Yes b. No

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

I need this FOR lawn & GARden. it is GRANdFathered IN,
DO NOT WANT YOUR GRAVEL PIT NEAR MY house OR ANYONE elses DIG IN LoveLAND & leave US Alone. HAVE SIGNed Petition TO STOP YOU

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FO

Russell J Whitaker
2729 County Road 54G
Fort Collins CO 80524
AC24224

1. Please confirm the fo can contact you:

   Name ______

   Mailing Address ______

   Street Address ______

   City, State, Zip Code ______

   Best Phone Number to Contact You (970) 224-2315

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address
   West side of house

3. Is your well (please circle only one):
   a. Active (currently in use?)
   b. Inactive (not currently in use, but could be easily used)?
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well? (Circle yes or no).

   a. Yes b. No

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

______

______

______

______

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you:

   Name BOB GRESSLEY

   Mailing Address 5829 RIST CANYON ROAD

   Street Address SAME

   City, State, Zip Code BELLVUE, COLORADO, 80512

   Best Phone Number to Contact You (970) 402-1994

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address
   ABOVE

3. Is your well (please circle only one):
   a. Active (currently in use?)
   b. Inactive (not currently in use, but could be easily used)?
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well? → APP: 30 FEET
   (Circle yes or no).

   a. Yes b. No

   PUMPING FOR APP. 30 YEARS

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

UNKNOWN NO WASHING,
BATHING, IRRIGATION, CLEANING.

NOTE: I WANT TO GO ON RECORD, ON RECEIPT OF THIS FORM – SHOULD WE LOSE OUR WELL WATER, WE DEMAND WHATEVER COMPANY(S) (ABOVE) RESPONSIBLE, MUST RE-DRILL IT.

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you:

   Name Donald J. Chavez

   Mailing Address 2919 Farview Dr, Fort Collins, CO 80524

   Street Address 2919 Farview Dr

   City, State, Zip Code Fort Collins CO 80524

   Best Phone Number to Contact You (970) 388-2924

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address
   2919 Farview Dr., Fort Collins, CO 80524

3. Is your well (please circle only one):
   a. Active (currently in use?)
   b. Inactive (not currently in use, but could be easily used)?
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well? (Circle yes or no).

   a. Yes b. No

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

We use the well for irrigation. It does not dry up.
Not ~~so~~ sure of the pumping rate

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

LOVELAND READY-MIX CONCRETE and TELESTO SOLUTIONS

QUESTIONNAIRE FOR WELL WATER

1. Please confirm the following information so that we can contact you:

   Name Mike + Liz Sutherland

   Mailing Address 2725 Farview Dr

   Street Address ~~Fort Collins~~

   City, State, Zip Code Fort Collins, Colo 80524

   Best Phone Number to Contact You (970) 690-6896

2. Please provide the physical location of your well near LaPorte:
   Street or Rural Address 2725 Far View Dr

3. Is your well (please circle only one):
   a. Active (currently in use?)
   b. Inactive (not currently in use, but could be easily used)? B
   c. Abandoned (damaged or otherwise unusable)?

4. Would you allow someone to measure depth to water in your well? (Circle yes or no).

   a. Yes b. No

5. Any additional information that you can provide concerning your well (e.g. pumping rate, does it go dry during the winter, how do you use it) would help:

   does not go dry

You may return this form in the enclosed stamped envelope or email it to:

pcoit@telesto-inc.com

ID	Owner	Location	Water_Depth (ft)	Stickup (in)	Total_Depth (ft)	Northing	Easting	Elevation (ft)	Water Elevation	Field1
1	M. MORGAN	2532 W County Rd 54G	4.32	0		4497560	489522	5047.9	5043.6	
2	M. MORGAN	2532 W County Rd 54G	5.33	30	-	4497807	489527	5046.6	5043.8	
3	D. Hildred	2403 Brookhill Rd	3.35	0	-	4496687	489433	5038.4	5035.0	
4	R. WALLICK	3000 N Overland Trl	7.62	16.5	-	4497719	488378	5066.9	5060.7	
5	R. WALLICK	2912 N Overland Trl	5.65	0	-	4497626	488472	5064.6	5059.0	
6	T. WATERS	3200 Tharp DR	5.94	13.5	-	4497606	489194	5063.0	5058.2	
7	H. STILL	2801 W County Rd 54G	5.4	0	-	4497174	489193	5049.5	5044.1	
8	J. WEST	2812 W County Rd 54G	5.55	2	-	4497263	489125	5051.8	5046.5	
9	C. CHERRY	2816 W County Rd 54G	4.65	8.25	-	4497277	489086	5052.2	5048.2	
10	J. MAXWELL	2816 Gardner Pl	4.45	0	-	4497503	488485	5062.0	5057.6	
11	D. CHAVEZ	2919 Farview Dr	4.69	1.8	7.1	4497565	490134	5037.4	5032.9	
12	J. SINCAVAGE	2813 Farview Dr	3.33	7	8.45	4497426	490121	5037.1	5034.3	
13	P. BROBST	3010 N OVERLAND TRL	5.55	0	7.75	4497752	488388	5067.3	5061.7	
14	E. STONER	2301 Eddy Ln	4.02	25.2	-	4496806	488733	5049.5	-	
15	E. STONER	2301 Eddy Ln	7.82	17	-	4497277	489086	5047.9	5041.5	
16	E. STONER	2301 Eddy Ln	6.6	21	-	4496766	488948	5044.6	5039.8	
17	E. STONER	2301 Eddy Ln	5.81	24	-	4496704	489037	5044.9	5038.8	
18	M. AMEY	2903 Farview Dr	4.09	9	-	4497523	490140	5037.1	5033.7	
19	M. AMEY	2903 Farview Dr	3.42	3	6.04	4497505	490146	5036.4	5033.2	
20	D.BROWN	2400 W COUNTY ROAD 54G	4.35	10	15.7	4497327	489819	5042.0	5038.5	
21	D.BROWN	2400 W COUNTY ROAD 54G	4.3	0	7.2	4497328	489826	5041.7	5037.4	
22	G. KOMER	2817 W COUNTY ROAD 54G	-	-	-	4496843	489119	5046.6	-	LAKE
23	L. SUTHERLAND	2725 FARVIEW DR	3.9	1	16.1	4497330	490104	5037.1	5033.3	
24	E. WATT	2626 N Overland Trl	4.66	-	-	4497104	488413	5059.7	5055.1	
25	S. GOMEZ	3205 WILSON CT	3.4	-	-	4497626	488536	5064.0	5060.0	

Appendix B
Knox Pit Monitoring Well Logs and Report
And
Groundwater Sample Data

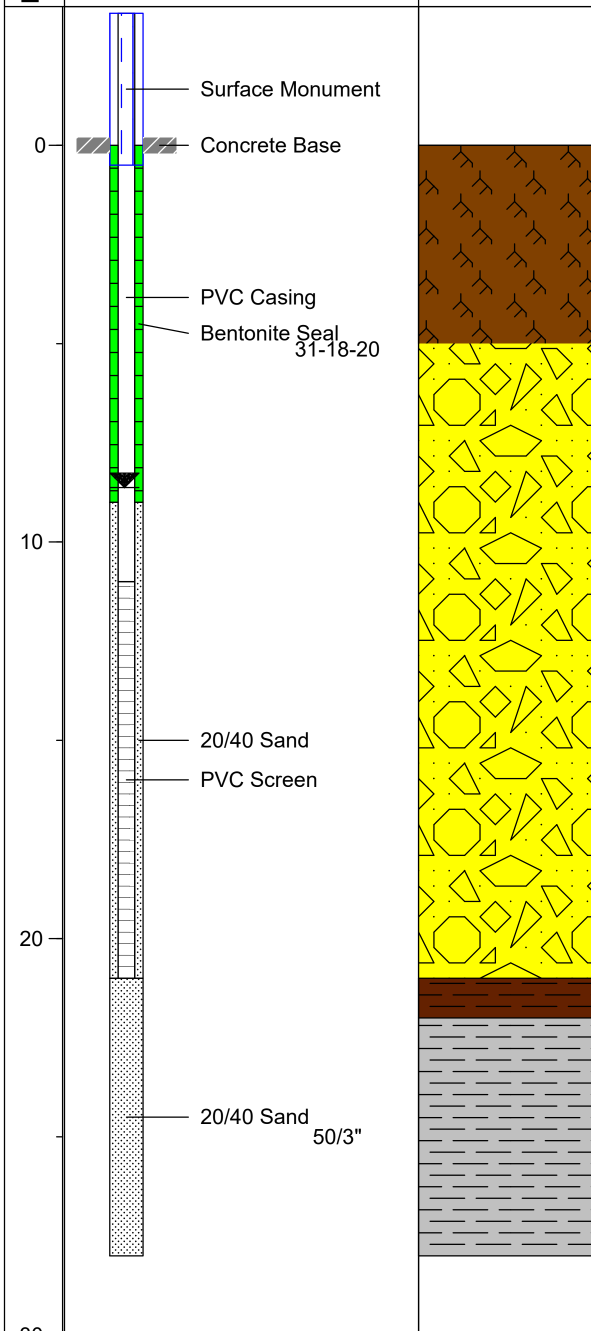
Loveland Ready Mix

WELL IDENTIFICATION: **MW-01**

TOTAL DEPTH: **28**
GROUND SURFACE ELEVATION: **5052.27**
WELL CASING ELEVATION: **5055.14**
CASING: **2" PVC Schedule 40**
SCREEN: **0.1 Slot**
DEPTH TO WATER (FT): **11.5 TOC**

LOCATION: **Knox Pit**
COORDINATE SYSTEM: **UTM NAD 83**
NORTHING: **4497284.407**
EASTING: **48907284.945**
DRILLING CO: **Authentic Drilling**
DRILLING METHOD: **Hollow Stem Auger**
OVERSIGHT CONTRACTOR: **Telesto Solutions Inc.**
GEOLOGIST: **PARKER COIT**
DATE BEGUN: **4/3/2017**
DATE COMPLETED: **4/4/2017**

DEPTH	WELL INSTALLATION	LITHOLOGY	DESCRIPTION



Ground Surface

Topsoil: Dark brown fine loam with high organics, very silty towards bottom.

Alluvium: 5ft- Cobbles 1-2in, well rounded, arkosic, 50% cobbles, 50% coarse sand.

Sand; coarse to very coarse, clear, white and pink grains, very hard

Quartz and feldspar sand grains, sub-angular

Well graded, poor sorted alluvium

15ft on large cobbles > 4in

Very coarse sand and gravel, poor sorting, little fines

Weathered Shale: Shale bedrock, very soft, clayey black to orange

Shale: Fissle very dry shale

Hard shale, dry

Very hard black shale, planer, fine laminate

TELESTO SOLUTIONS INCORPORATED

Loveland Ready Mix

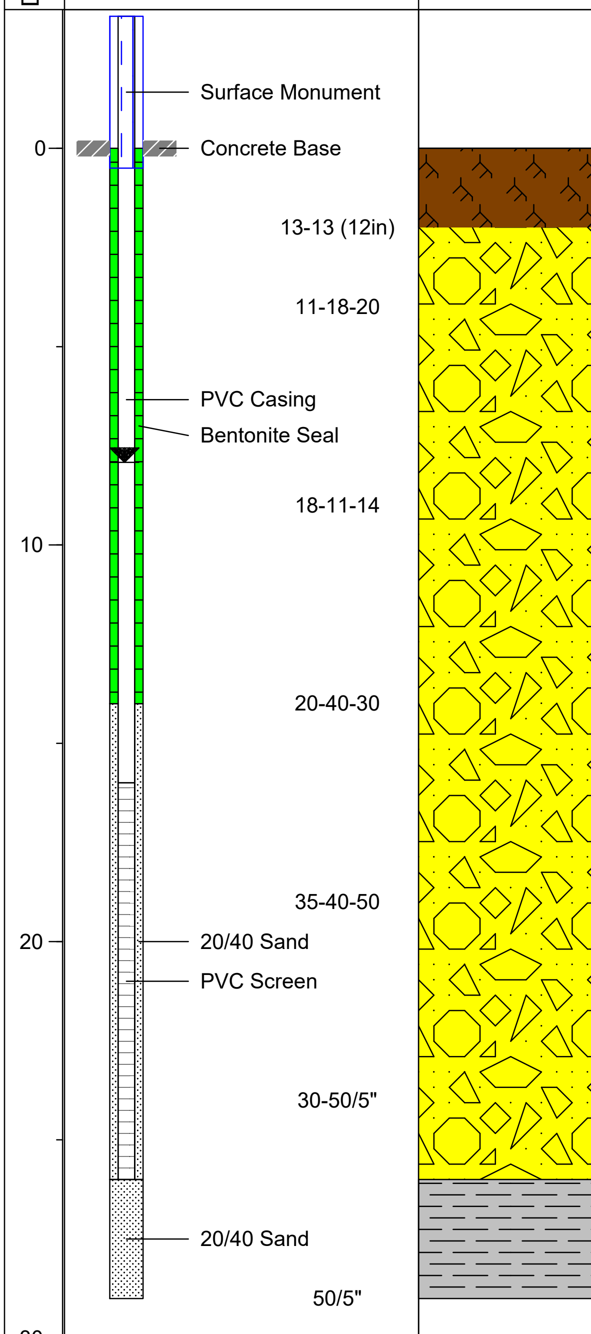
WELL IDENTIFICATION: **MW-02**

TOTAL DEPTH: **29**
GROUND SURFACE ELEVATION: **5055.63**
WELL CASING ELEVATION: **5058.63**
CASING: **2" PVC Schedule 40**
SCREEN: **0.1 Slot**
DEPTH TO WATER (FT): **11.1 TOC**

LOCATION: **Knox Pit** COORDINATE SYSTEM: **UTM NAD 83**
NORTHING: **4497238.85** EASTING: **488751.113**

DRILLING CO: **Authentic Drilling**
DRILLING METHOD: **ODEX**
OVERSIGHT CONTRACTOR: **Telesto Solutions Inc./ Terracon**
GEOLOGIST: **PARKER COIT**
DATE BEGUN: **4/4/2017** DATE COMPLETED: **4/4/2017**

DEPTH | WELL INSTALLATION | LITHOLOGY | DESCRIPTION



Ground Surface

Topsoil: Dark brown fine to sandy loam, hard and dense

Alluvium: 2ft- Coarse sand to gravel, 1/2 to 1in gravels, arkosic, 50% sand matrix

4ft- Coarse alluvium, cobbles >1in, fine sand and silt, well graded, sub-rounded

9ft- Gravels and coarse sand, moist, > 4in cobbles

14ft- Coarse sand, sub-round, arkosic, inteterbed with slight clay (red), quartz rich sand

19ft- Very coarse sand, slight sticky clay, sub-round to sub-angular, interbed gravels

24ft- Coarse gravels and cobbles

Shale: Bedrock, very hard and dry black shale

TELESTO SOLUTIONS INCORPORATED

Loveland Ready Mix

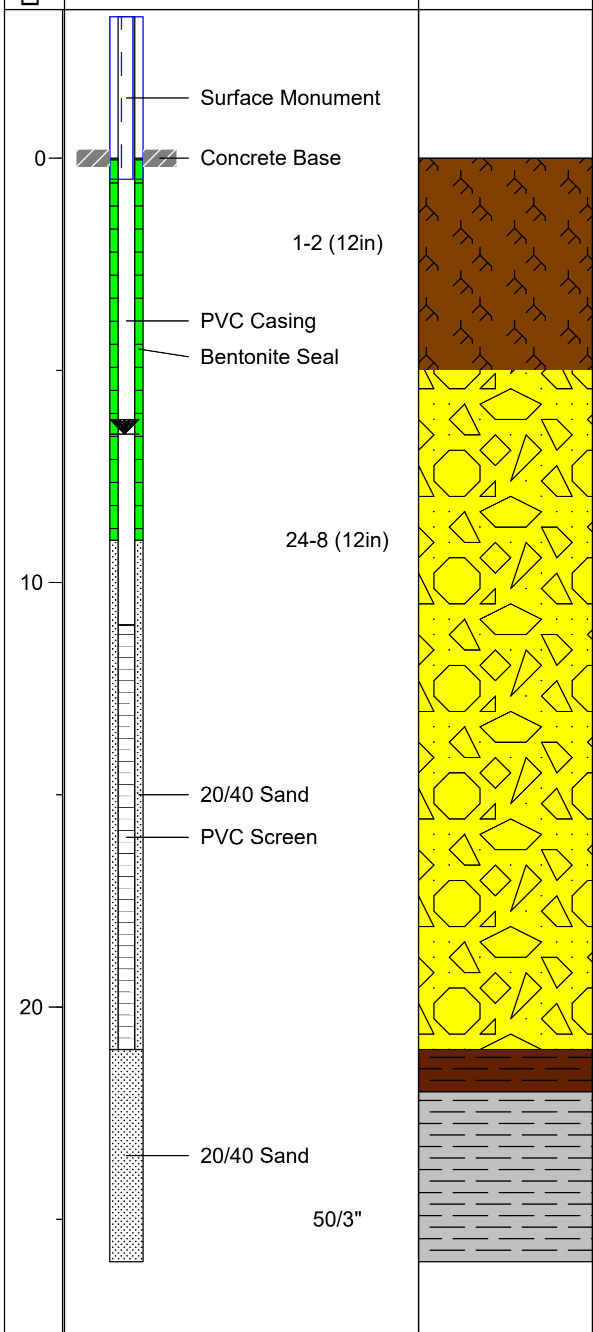
WELL IDENTIFICATION: **MW-03**

TOTAL DEPTH: **26**
GROUND SURFACE ELEVATION: **5059.07**
WELL CASING ELEVATION: **5062.07**
CASING: **2" PVC Schedule 40**
SCREEN: **0.1 Slot**
DEPTH TO WATER (FT): **9.5 TOC**

LOCATION: **Knox Pit** COORDINATE SYSTEM: **UTM NAD 83**
NORTHING: **4497527.971** EASTING: **488758.694**

DRILLING CO: **Authentic Drilling**
DRILLING METHOD: **ODEX**
OVERSIGHT CONTRACTOR: **Telesto Solutions Inc.**
GEOLOGIST: **PARKER COIT**
DATE BEGUN: **4/4/2017** DATE COMPLETED: **4/4/2017**

DEPTH	WELL INSTALLATION	LITHOLOGY	DESCRIPTION



Ground Surface

Topsoil: Dark brown silty clay soil, wet, very dense, high organics, sticky

Alluvium: 5ft- Wet coarse sands at base of topsoil, grade to cobbles and gravel, sub-round

Sandy, very loose, arkosic

9ft- Very coarse gravels, cobbles > 1in; slight black clay

Loose cobbles 1/2in to > 4in, very sandy

14ft- Coarse gravles, sub-round, ~70% gravel

20ft- 1/2in to 1 in gravles; 75% gravel, 25% sand

Weathered Shale: Weathered bedrock, wet, red to black, soft

Shale: Black to grey bedrock shale, very hard, dry an dusty

TELESTO SOLUTIONS INCORPORATED

Loveland Ready Mix

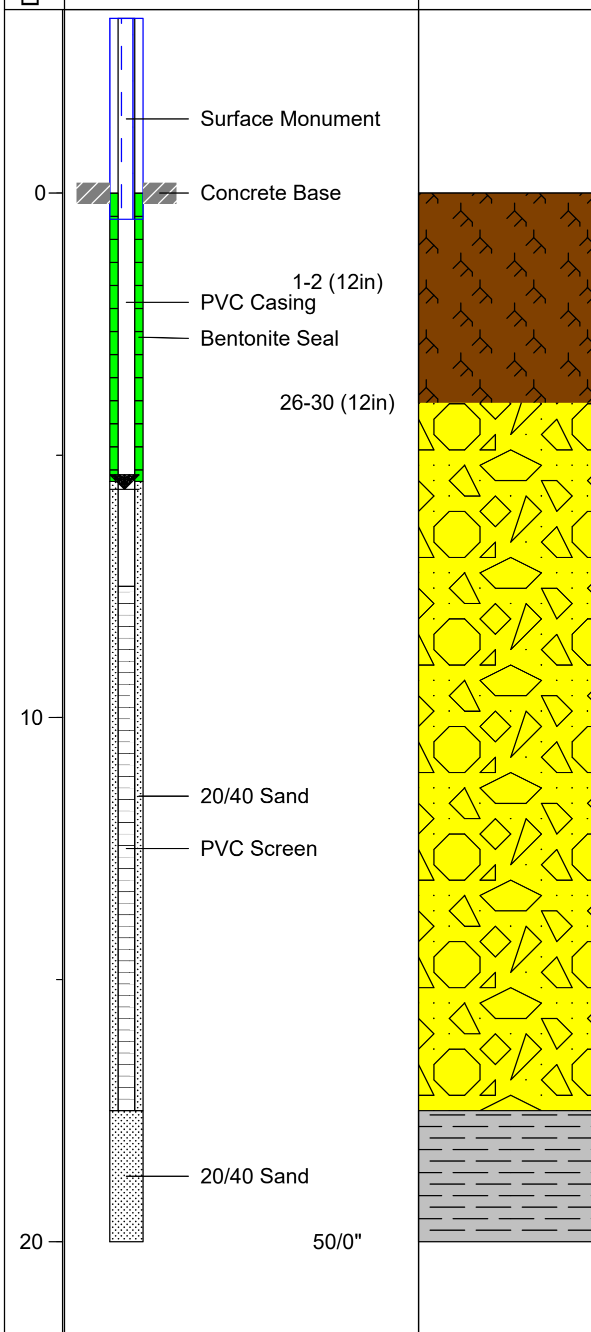
WELL IDENTIFICATION: **MW-04**

TOTAL DEPTH: **20**
GROUND SURFACE ELEVATION: **5055.03**
WELL CASING ELEVATION: **5058.03**
CASING: **2" PVC Schedule 40**
SCREEN: **0.1 Slot**
DEPTH TO WATER (FT): **8.6 TOC**

LOCATION: **Knox Pit** COORDINATE SYSTEM: **UTM NAD 83**
NORTHING: **4497627.416** EASTING: **489065.838**

DRILLING CO: **Authentic Drilling**
DRILLING METHOD: **ODEX**
OVERSIGHT CONTRACTOR: **Telesto Solutions Inc.**
GEOLOGIST: **PARKER COIT**
DATE BEGUN: **4/4/2017** DATE COMPLETED: **4/4/2017**

DEPTH	WELL INSTALLATION	LITHOLOGY	DESCRIPTION



Ground Surface

Topsoil: Dark brown top soil, fine grain loam, organic rich, hard

Alluvium: 4ft- Coarse gravels, slight sand, gravel (red), sub-rounded

Granitic cobbles with interbedded coarse feldspar sands.

9ft- Loose sands and gravels, red, pink, clear and white

Large cobbles, rig bouncing

14ft- Coarse gravels, sub-rounded

Shale: Black to grey bedrock shale, very hard, no weathered zone observed

TELESTO SOLUTIONS INCORPORATED

Loveland Ready Mix

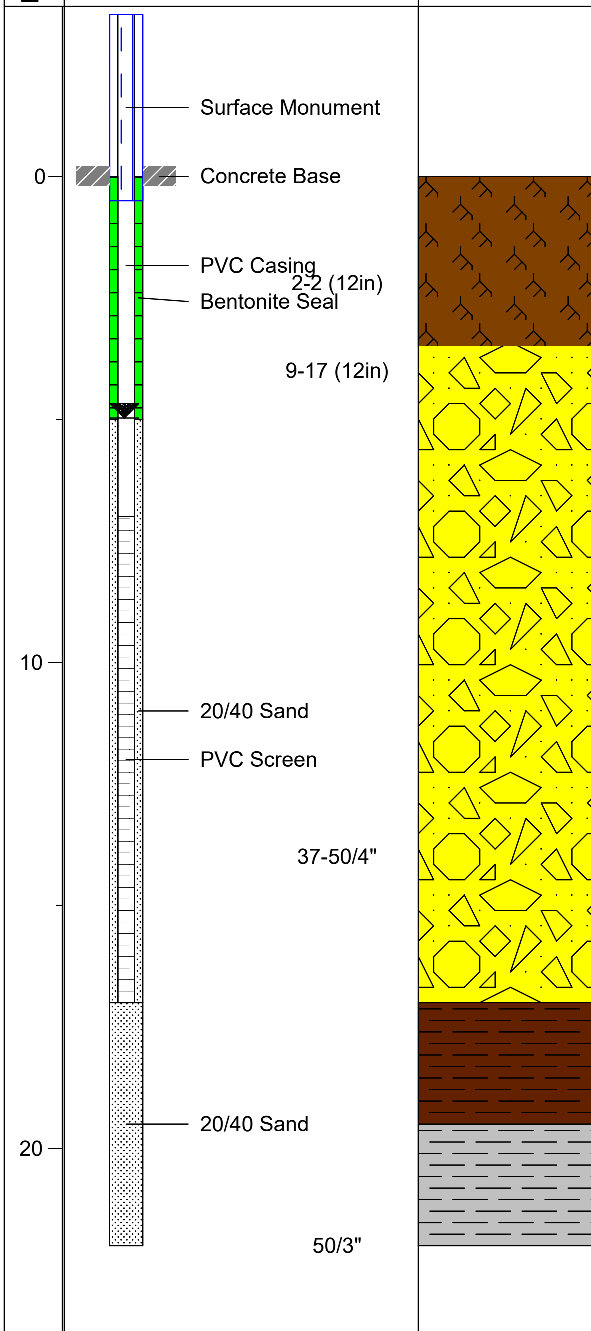
WELL IDENTIFICATION: **MW-05**

TOTAL DEPTH: **22**
GROUND SURFACE ELEVATION: **5059.76**
WELL CASING ELEVATION: **5062.79**
CASING: **2" PVC Schedule 40**
SCREEN: **0.1 Slot**
DEPTH TO WATER (FT): **8.0 TOC**

LOCATION: **Knox Pit** COORDINATE SYSTEM: **UTM NAD 83**
NORTHING: **4497715.521** EASTING: **488787.732**

DRILLING CO: **Authentic Drilling**
DRILLING METHOD: **ODEX**
OVERSIGHT CONTRACTOR: **Telesto Solutions Inc.**
GEOLOGIST: **PARKER COIT**
DATE BEGUN: **4/4/2017** DATE COMPLETED: **4/4/2017**

DEPTH | WELL INSTALLATION | LITHOLOGY | DESCRIPTION



Ground Surface

Topsoil: Dark brown clay loam, organics

Alluvium: 4ft- Coarse sand and gravels, poor sort, well rounded

Very coarse sand to gravel, ~60% sand, arkosic

Medium to fine grain sand to gravels; 50% sand 50 % gravel

9ft- Thick gravel and large cobbles >2in, sub round, granitic origin, quartz, feldspar

Large cobbels >4in

14ft- Coarse cobbles and gravels

Weathered Shale: Pasty claystone, orange to black, slight silt

Shale: Competent bedrock, black hard shale

TELESTO SOLUTIONS INCORPORATED

Loveland Ready Mix

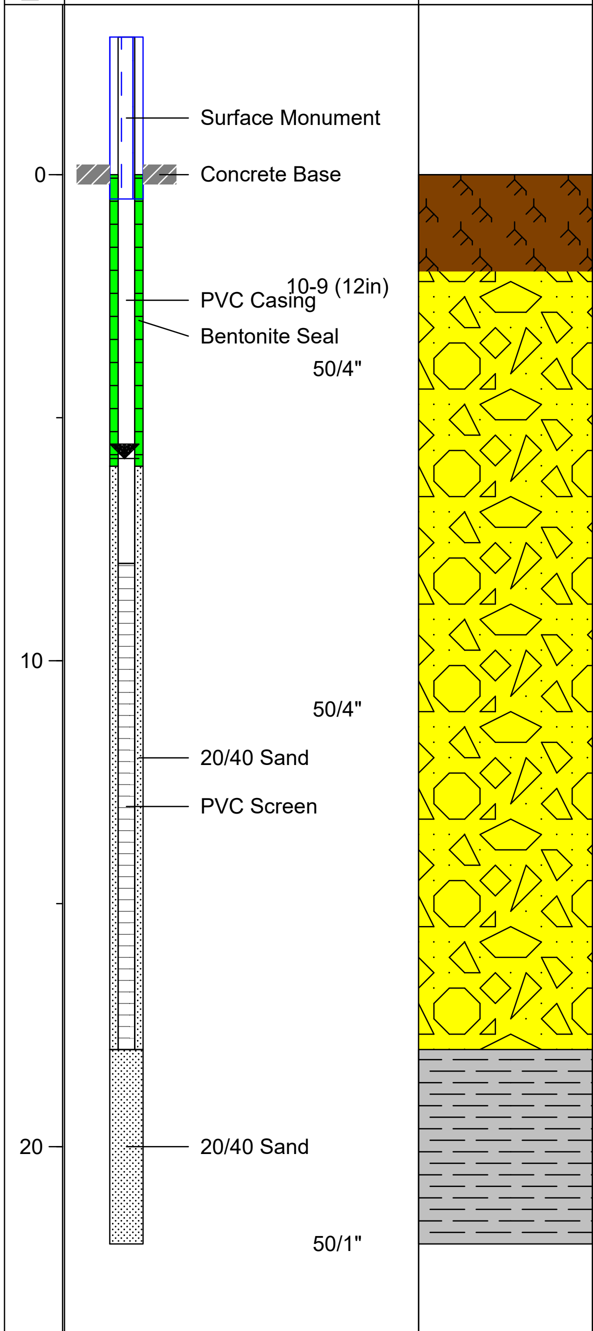
WELL IDENTIFICATION: **MW-06**

TOTAL DEPTH: **22**
GROUND SURFACE ELEVATION: **5059.15**
WELL CASING ELEVATION: **5061.83**
CASING: **2" PVC Schedule 40**
SCREEN: **0.1 Slot**
DEPTH TO WATER (FT): **8.52 TOC**

LOCATION: **Knox Pit** COORDINATE SYSTEM: **UTM NAD 83**
NORTHING: **4498009.682** EASTING: **488785.638**

DRILLING CO: **Authentic Drilling**
DRILLING METHOD: **ODEX**
OVERSIGHT CONTRACTOR: **Telesto Solutions Inc./ Terracon**
GEOLOGIST: **PARKER COIT**
DATE BEGUN: **4/5/2017** DATE COMPLETED: **4/5/2017**

DEPTH	WELL INSTALLATION	LITHOLOGY	DESCRIPTION



Ground Surface

Topsoil: Organic rich, dark brown, dense clay loam

Alluvium: 2ft- ~ 1in cobbles, well rounded, 20% silts
Loose sand, coarse

4ft- Large cobbles > 4in, broken rock fragments

9ft- Cobbles and loose sand, silght fines

14ft- Well graded alluvium, unconsolidated

Shale: Dark grey to black shale bedrock

TELESTO SOLUTIONS INCORPORATED

Loveland Ready Mix

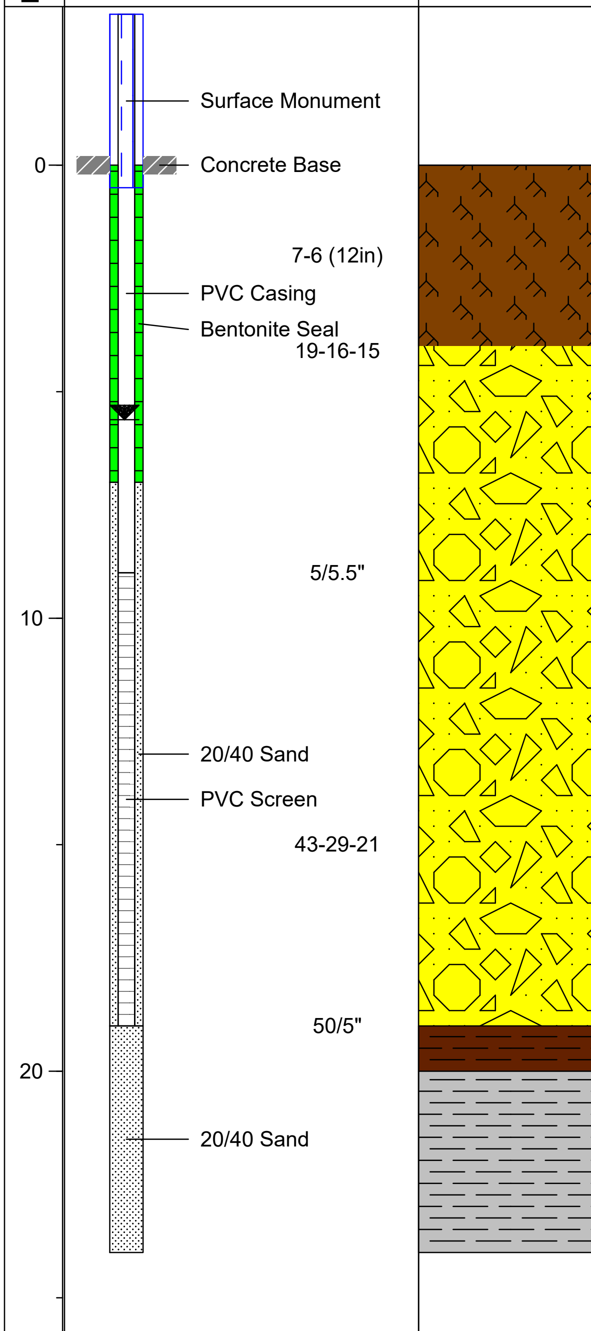
WELL IDENTIFICATION: **MW-07**

TOTAL DEPTH: **24**
GROUND SURFACE ELEVATION: **5054.91**
WELL CASING ELEVATION: **5057.94**
CASING: **2" PVC Schedule 40**
SCREEN: **0.1 Slot**
DEPTH TO WATER (FT): **8.65 TOC**

LOCATION: **Knox Pit** COORDINATE SYSTEM: **UTM NAD 83**
NORTHING: **4497680.669** EASTING: **489084.521**

DRILLING CO: **Authentic Drilling**
DRILLING METHOD: **ODEX**
OVERSIGHT CONTRACTOR: **Telesto Solutions Inc./ Terracon**
GEOLOGIST: **PARKER COIT**
DATE BEGUN: **4/5/2017** DATE COMPLETED: **4/5/2017**

DEPTH	WELL INSTALLATION	LITHOLOGY	DESCRIPTION



Ground Surface

Topsoil: Dark brown dense clayey loam, organics

Alluvium: 4ft- Coarse gravels, cobbles, coarse sand, well rounded, loose

Thick arkosic alluvium

Sandy (coarse), cobbles ~60%

9ft- Cobble cuttings, cobbles > 4in

Alluvium, round pea gravels, coarse sands, slight fines

14ft- Coarse sands with silts, ~20% cobbles

Weathered Shale: Weathered bedrock, red/orange to light grey claystone. Pastey and sticky.

Shale: Very hard dark black shale, fine lamiante

TELESTO SOLUTIONS• INCORPORATED

Loveland Ready Mix

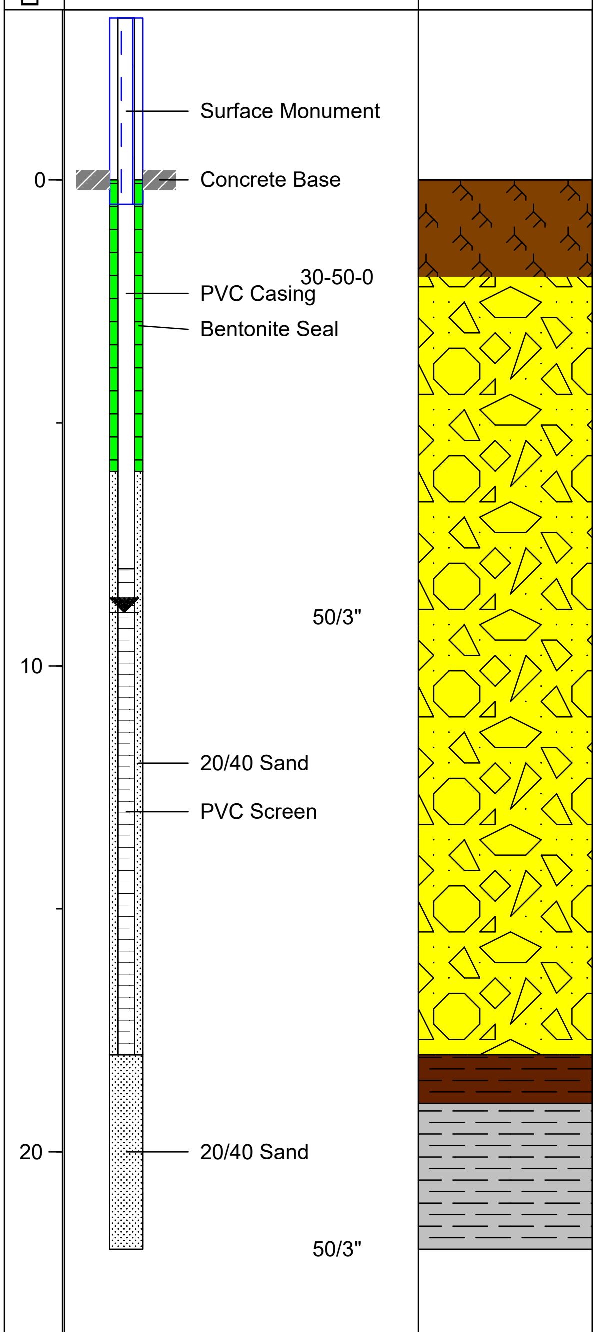
WELL IDENTIFICATION: **MW-08**

TOTAL DEPTH: **22**
GROUND SURFACE ELEVATION: **5059.58**
WELL CASING ELEVATION: **5062.67**
CASING: **2" PVC Schedule 40**
SCREEN: **0.1 Slot**
DEPTH TO WATER (FT): **11.99 TOC**

LOCATION: **Knox Pit** COORDINATE SYSTEM: **UTM NAD 83**
NORTHING: **4497887.601** EASTING: **488771.077**

DRILLING CO: **Authentic Drilling**
DRILLING METHOD: **ODEX**
OVERSIGHT CONTRACTOR: **Telesto Solutions Inc.**
GEOLOGIST: **PARKER COIT**
DATE BEGUN: **4/5/2017** DATE COMPLETED: **4/5/2017**

DEPTH	WELL INSTALLATION	LITHOLOGY	DESCRIPTION



Ground Surface

Topsoil: Very dense clay, dark brown, high organics

Alluvium: 2ft- Cobbles and gravels, slight sand, slight interbed clay loam

4ft- Good cobbles > 2in, coarse sand

9ft- Very coarse gavels ~1/4in, sub-round, cobbles, coarse sand, very hard

12 ft- Medium to fine grain sand, well round

Large cobbles > 4in

14ft- Coarse sand, poor sorting, gravelly, arkosic

Weathered Shale: Weathered bedrock, red to orange soft clay

Shale: Black shale, competent bedrock

TELESTO SOLUTIONS INCORPORATED

Loveland Ready Mix

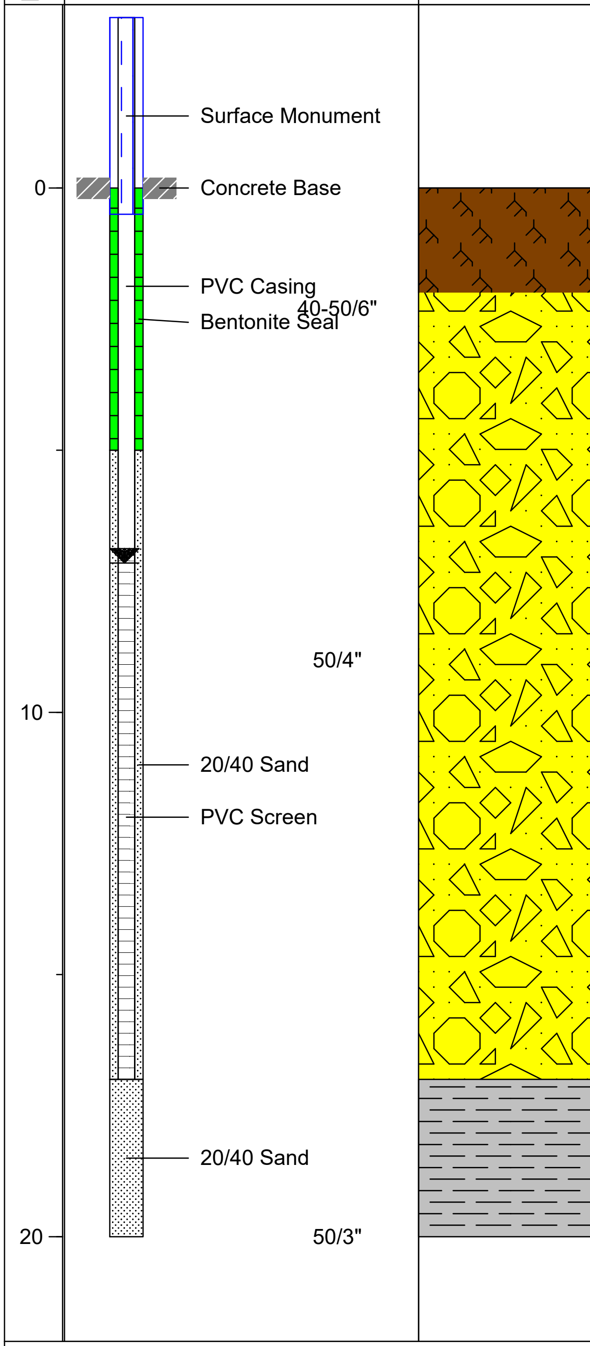
WELL IDENTIFICATION: **MW-09**

TOTAL DEPTH: **20**
GROUND SURFACE ELEVATION: **5053.66**
WELL CASING ELEVATION: **5056.61**
CASING: **2" PVC Schedule 40**
SCREEN: **0.1 Slot**
DEPTH TO WATER (FT): **10.1 TOC**

LOCATION: **Knox Pit** COORDINATE SYSTEM: **UTM NAD 83**
NORTHING: **4498001.461** EASTING: **489008.375**

DRILLING CO: **Authentic Drilling**
DRILLING METHOD: **ODEX**
OVERSIGHT CONTRACTOR: **Telesto Solutions Inc.**
GEOLOGIST: **PARKER COIT**
DATE BEGUN: **4/5/2017** DATE COMPLETED: **4/5/2017**

DEPTH	WELL INSTALLATION	LITHOLOGY	DESCRIPTION



Ground Surface

Topsoil: Clay loam, very dense, organics, clay rich, hard and dry

Alluvium: 2ft- Interbedded sands and gravels, Large cobbles (10%)
Cobbles > 4in, pink to red cuttings, sub-angular

4ft- Gravels and coarse sands (wet)

9ft- Large cobbles > 4in

14ft- Very loose coarse to medium/fine sand, well rounded

Shale: Bedrock, all competent, hard black shale

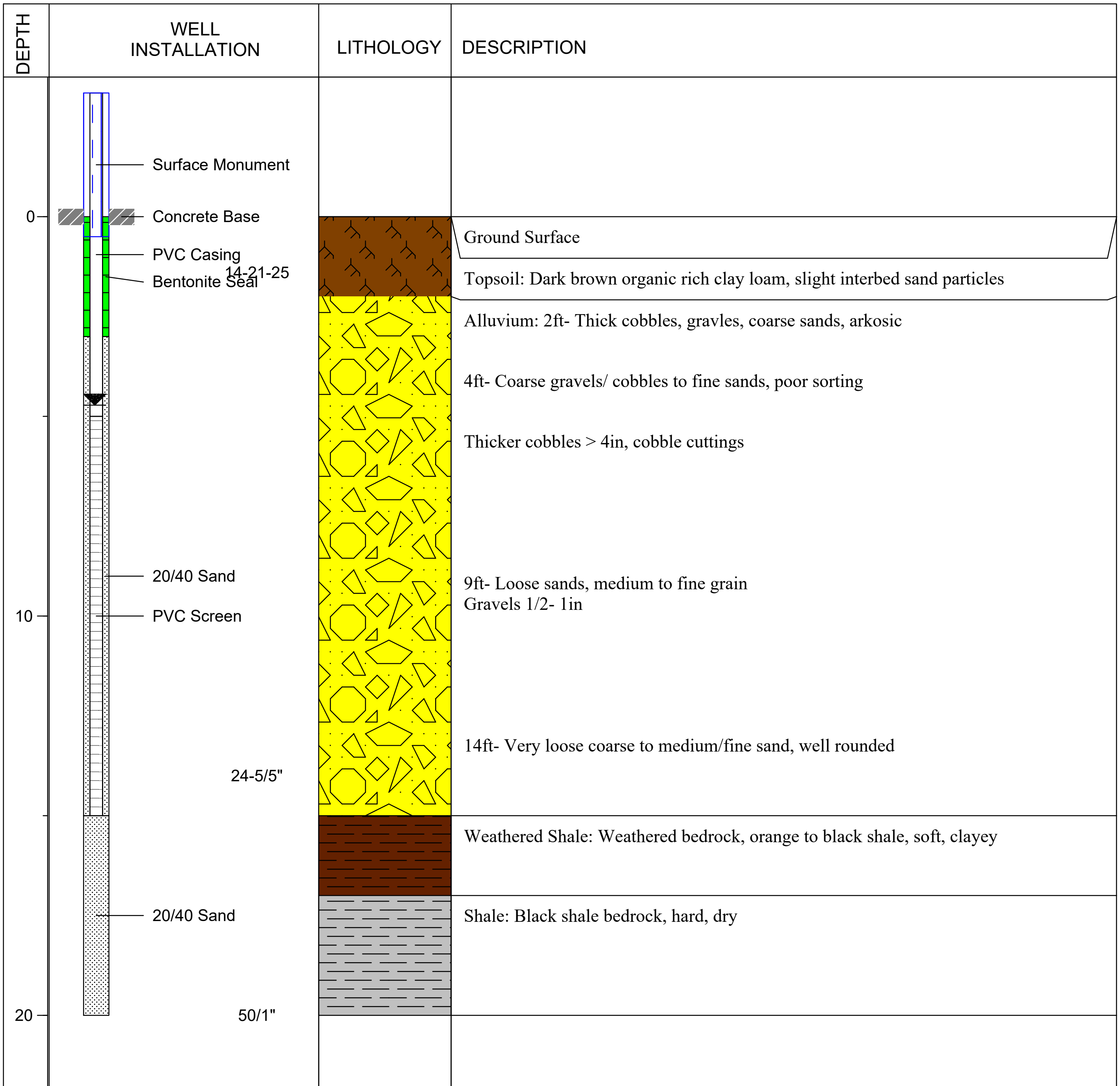
TELESTO SOLUTIONS INCORPORATED

Loveland Ready Mix

WELL IDENTIFICATION: **MW-10**

TOTAL DEPTH: **20**
GROUND SURFACE ELEVATION: **5048.27**
WELL CASING ELEVATION: **5051.40**
CASING: **2" PVC Schedule 40**
SCREEN: **0.1 Slot**
DEPTH TO WATER (FT): **7.85 TOC**

LOCATION: **Knox Pit**
COORDINATE SYSTEM: **UTM NAD 83**
NORTHING: **4497999.974**
EASTING: **489348.838**
DRILLING CO: **Authentic Drilling**
DRILLING METHOD: **ODEX**
OVERSIGHT CONTRACTOR: **Telesto Solutions Inc.**
GEOLOGIST: **PARKER COIT**
DATE BEGUN: **4/5/2017**
DATE COMPLETED: **4/5/2017**



TELESTO SOLUTIONS INCORPORATED

Loveland Ready Mix

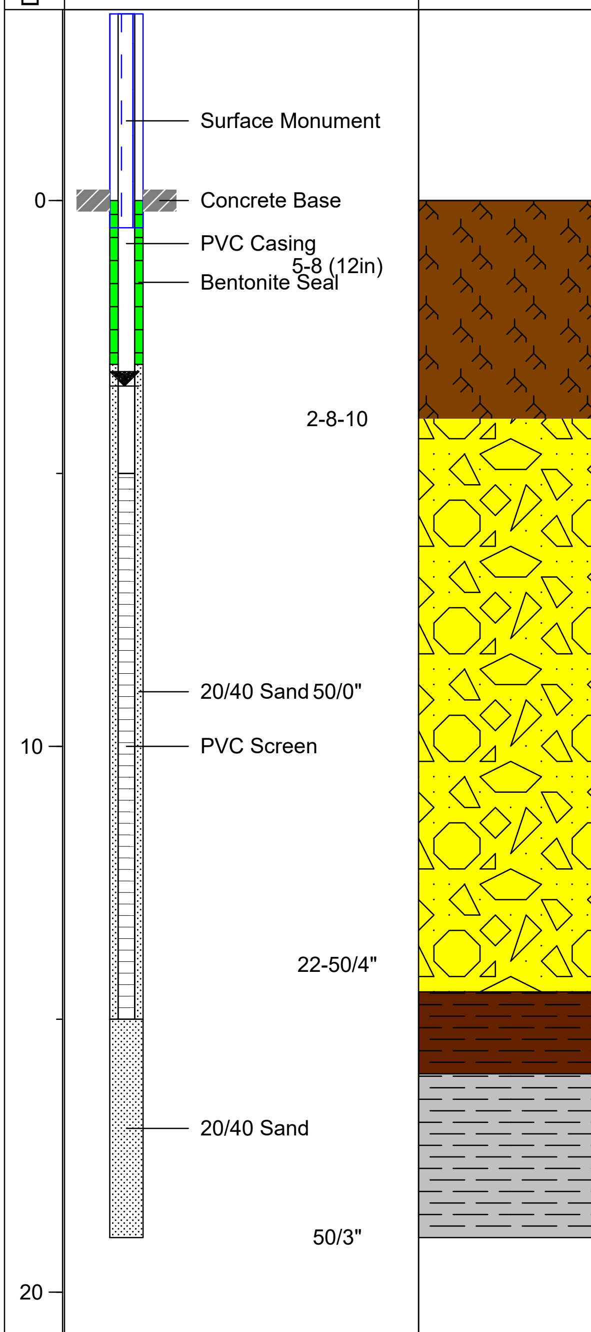
WELL IDENTIFICATION: **MW-11**

TOTAL DEPTH: **19**
GROUND SURFACE ELEVATION: **5048.08**
WELL CASING ELEVATION: **5051.18**
CASING: **2" PVC Schedule 40**
SCREEN: **0.1 Slot**
DEPTH TO WATER (FT): **6.5 TOC**

LOCATION: **Knox Pit** COORDINATE SYSTEM: **UTM NAD 83**
NORTHING: **4497933.417** EASTING: **489346.603**

DRILLING CO: **Authentic Drilling**
DRILLING METHOD: **ODEX**
OVERSIGHT CONTRACTOR: **Telesto Solutions Inc./ Terracon**
GEOLOGIST: **PARKER COIT**
DATE BEGUN: **4/6/2017** DATE COMPLETED: **4/6/2017**

DEPTH	WELL INSTALLATION	LITHOLOGY	DESCRIPTION



Ground Surface

Topsoil: Very dense dark clay with organics

Alluvium: 4ft- Soil to alluvium transition, clayey soil interbed with weathered cobbles
Wet stickey clay, transition to coarse sands at 4.5ft

9ft- Coarse loose sand to gravel, moderately sorted, arkosic

Well rounded cobbles ~ 1in

14ft- Base of alluvium

Weathered Shale: Weathered interface, orange to black claystone, competent at 16ft

Shale: Very hard black shale

Loveland Ready Mix

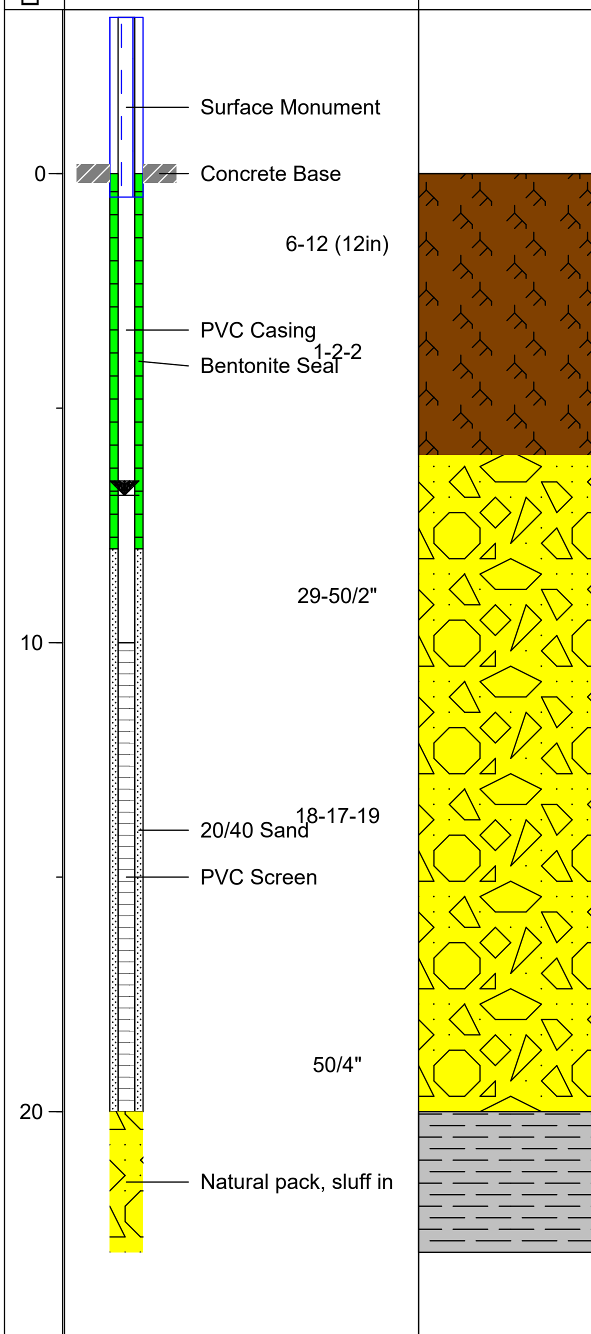
WELL IDENTIFICATION: **MW-12**

TOTAL DEPTH: **23**
GROUND SURFACE ELEVATION: **5047.23**
WELL CASING ELEVATION: **5050.37**
CASING: **2" PVC Schedule 40**
SCREEN: **0.1 Slot**
DEPTH TO WATER (FT): **10.0 TOC**

LOCATION: **Knox Pit** COORDINATE SYSTEM: **UTM NAD 83**
NORTHING: **4497239.596** EASTING: **489356.207**

DRILLING CO: **Authentic Drilling**
DRILLING METHOD: **ODEX**
OVERSIGHT CONTRACTOR: **Telesto Solutions Inc./ Terracon**
GEOLOGIST: **PARKER COIT**
DATE BEGUN: **4/6/2017** DATE COMPLETED: **4/6/2017**

DEPTH	WELL INSTALLATION	LITHOLOGY	DESCRIPTION



Ground Surface

Topsoil: Dark brown clay loam, organics, dense

4ft- Transition to sandy clay loam, dark brown to black, soft, very loose

Alluvium: 6ft- Coarse sands and cobbles (wet)

9ft- Gravels and coarse sands, few cobbles, 1/2-1in gravels

Loose cobbles, gravels and arkosic sand

14ft- Large cobbles, cobble cuttings > 4in

Shale: Black to dark grey bedrock shale, very hard, dry

TELESTO SOLUTIONS INCORPORATED

Loveland Ready Mix

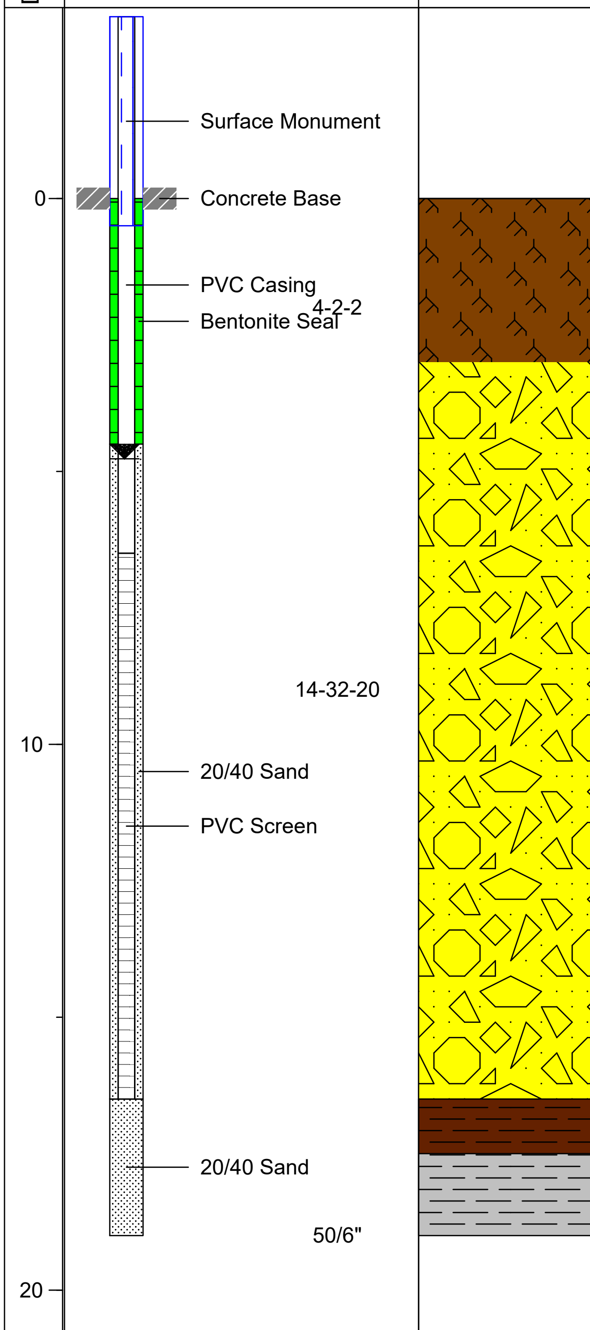
WELL IDENTIFICATION: **MW-13**

TOTAL DEPTH: **19**
GROUND SURFACE ELEVATION: **5049.58**
WELL CASING ELEVATION: **5052.41**
CASING: **2" PVC Schedule 40**
SCREEN: **0.1 Slot**
DEPTH TO WATER (FT): **7.6 TOC**

LOCATION: **Knox Pit** COORDINATE SYSTEM: **UTM NAD 83**
NORTHING: **4497559.239** EASTING: **489387.11**

DRILLING CO: **Authentic Drilling**
DRILLING METHOD: **ODEX**
OVERSIGHT CONTRACTOR: **Telesto Solutions Inc.**
GEOLOGIST: **PARKER COIT**
DATE BEGUN: **4/6/2017** DATE COMPLETED: **4/6/2017**

DEPTH	WELL INSTALLATION	LITHOLOGY	DESCRIPTION



Ground Surface

Topsoil: Overburden, dark brown clay,hard
Transition to sandy loam, slight gravel

Alluvium: 3ft-Cobbles >1/3in

Thick cobbles > 4in, returning cobble cuttings

9ft- Pea gravel and cobbles, slight sand ~25%

On large cobbles

14ft- Loose sand, gravel and cobbles

Weathered Shale: Weathered bedrock, orange to light grey claystone, pastey

Shale: Very hard black shale, dry

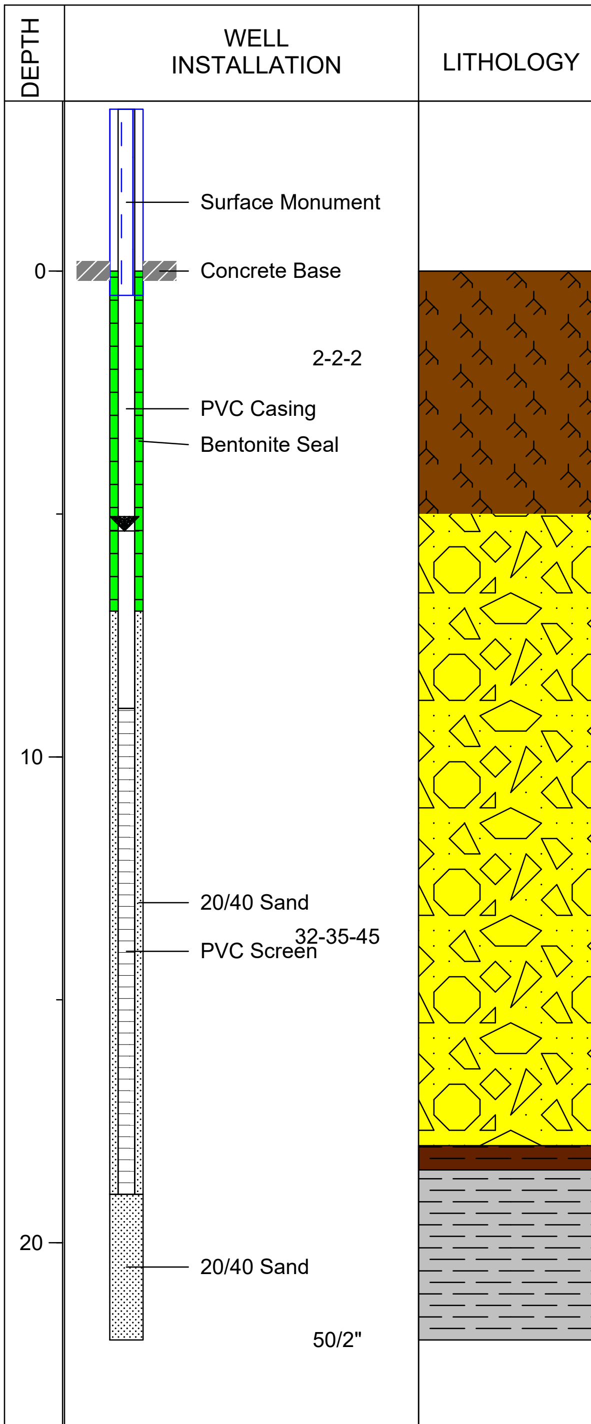
TELESTO SOLUTIONS INCORPORATED

Loveland Ready Mix

WELL IDENTIFICATION: **MW-14**

TOTAL DEPTH: **22**
GROUND SURFACE ELEVATION: **5050.94**
WELL CASING ELEVATION: **5054.09**
CASING: **2" PVC Schedule 40**
SCREEN: **0.1 Slot**
DEPTH TO WATER (FT): **8.5 TOC**

LOCATION: **Knox Pit**
COORDINATE SYSTEM: **UTM NAD 83**
NORTHING: **4497277.399**
EASTING: **489149.108**
DRILLING CO: **Authentic Drilling**
DRILLING METHOD: **ODEX**
OVERSIGHT CONTRACTOR: **Telesto Solutions Inc.**
GEOLOGIST: **PARKER COIT**
DATE BEGUN: **4/6/2017**
DATE COMPLETED: **4/6/2017**



DESCRIPTION

Ground Surface

Topsoil: Overburden, dark brown top soil, organics, cakey

4ft- Dark brown soil, soft, ~50% sand, wet, sticky

Alluvium: 5ft- Cobbles and gravels, very sandy, coarse, loose, ~70% sand

Good cobbles > 4in

9ft- Coarse gravels, pea size to 2in

Coarse cobbles, cobble cuttings > 4in

14ft- Loose sand, very coarse, well round

Weathered Shale: Weathered bedrock, orange to light grey claystone, pastey

Shale: Competent very hard black shale

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Appendix C
Northern Boundary – Flux Estimate

Problem Statement: *Calculation Documentation*

To assess potential impacts of the Loveland Ready-Mix Concrete, Inc. (LRM) Knox Pit Mine development on groundwater, the hydraulic properties of the aggregate resource (alluvium) should be estimated to develop the boundary groundwater flow conditions for the numerical groundwater model (MODFLOW) for the site.

Objectives:

1. Calculate the boundary condition groundwater flow through the alluvium at the model boundary.
2. Analyze multiple methods to calculate groundwater flow.

Approach:

1. Calculate flux recharge of groundwater into the aggregate resource
2. Using Darcy's Law Calculate the flow through the aggregate resource at the model boundary and compare to the Flux

Data and Assumptions:

1. Hydraulic gradient mimics surface topography
2. Precipitation = 16.05 in/year

Monthly Totals

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
2007	0.54	0.22	1.59	0.97	1.22	0.33	0.84	3.6	1.04	1.74	0.37	1.2	13.66
2007 100-yr dry year	0.12	0.6	0.01	1.39	0.27	1.6	0.62	0.63	1.16	0.43	0.45	0.06	7.34
2008	0.03	0.26	0.78	0.85	1.61	2.06	1.11	3.94	1.28	0.81	0.01	0.53	13.27
2009	0.28	0.16	0.93	4.44	2.23	5.03	3.95	0.22	0.67	2.16	0.7	1.11	21.88
2009 100-yr wet year	0.19	1.39	2.74	2.18	4.46	6.23	4.5	0.62	1.36	3.55	0.1	0.25	27.57
2010	0.15	0.65	1.55	3.15	2.13	1.96	1.26	1.23	0.06	0.87	0.7	0.22	13.93
2011	0.29	0.66	0.29	2.05	4.5	2.78	1.7	0.12	1.97	1.77	0.87	0.79	17.79
2012	0.07	0.72	0	0.4	1.69	0.61	3.11	0.03	2.72	0.66	0.14	0.4	10.55
2013	0.11	0.55	0.98	2.84	2.83	0.59	1.9	0.57	6.09	1.68	0.22	0.45	18.81
2014	1.43	0.3	1.37	0.62	4.76	0.99	3.04	0.58	1.28	0.8	0.88	0.64	16.69
2015	0.11	1.09	0.21	3.32	6.34	1.55	1.69	0.69	0.2	1.81	1.56	0.94	19.51
2016	0.58	1.01	2.28	2.75	1.84	0.05	0.91	0.76					11.63

Average Precip (IN)= 16.0525

3. Hydraulic properties of alluvium are consistent throughout geologic unit. Average Hydraulic Conductivity = 140.56 FT/Day

Aquifer Hydraulic Property Estimates from the Cooper Jacob Method

Monitoring Well	Q (gpm)	T (FT^2/day)	Aquifer Thickness (FT)	K (FT/day)	K (cm/s)
MW-02	5.54	1189.2	20.3	58.6	2.07E-02
MW-04	8	2378.8	12.4	191.9	6.77E-02
MW-06	6.85	365.0	8.8	41.4	1.46E-02
MW-10	9.2	1014.5	11.7	86.6	3.06E-02
MW-12	6.08		14.7		

Aquifer Hydraulic Properties Estimated from the Theis Recovery Method

Monitoring Well	T (FT^2/day)	Thickness (FT)	K (FT/day)	K (cm/s)
MW-02	4227.718	20.280	208.467	7.35E-02
MW-04	1746.469	12.398	140.873	4.97E-02
MW-06	2294.270	8.806	260.550	9.19E-02
MW-10	1592.378	11.715	135.926	4.80E-02
MW-12		14.7		

Average K (FT/Day) = 140.56

Data and Assumptions:

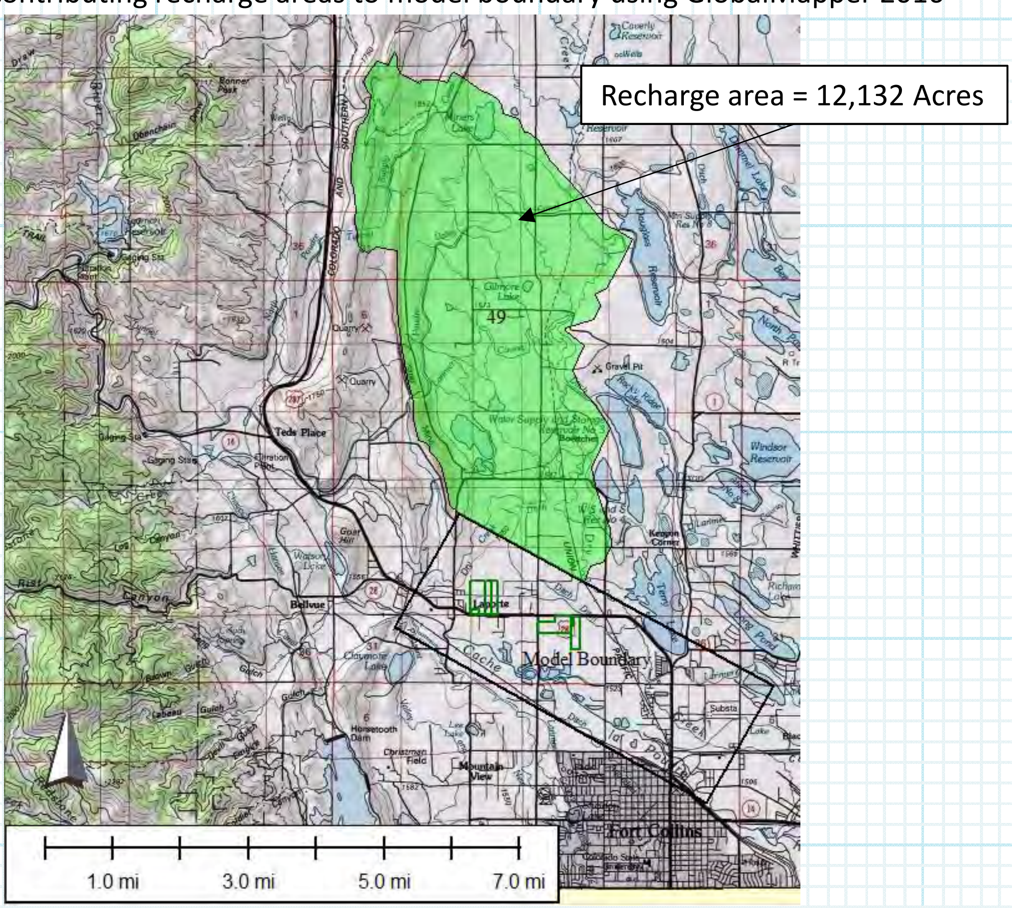
4. Average alluvium thickness equals observed thickness of wells drilling on the north side of Knox Mine site = 13.625 FT

Monitoring Well	Alluvim Thickness (FT)
MW-06	16
MW-09	15
MW-10	13
MW-11	10.5

5. 5% is the average percentage of precipitation that becomes groundwater recharge on Colorado Front Range under natural vegetative conditions (USGS, 2011). 10% of precipitation will be used to calculate a conservative maximum flow.
6. Recharge area flows to model boundary
7. USGS Preliminary integrated geologic map databases for the United States Colorado (USGS, 2005)

Calculations:

1. Calculate contributing recharge areas to model boundary using GlobalMapper 2016®



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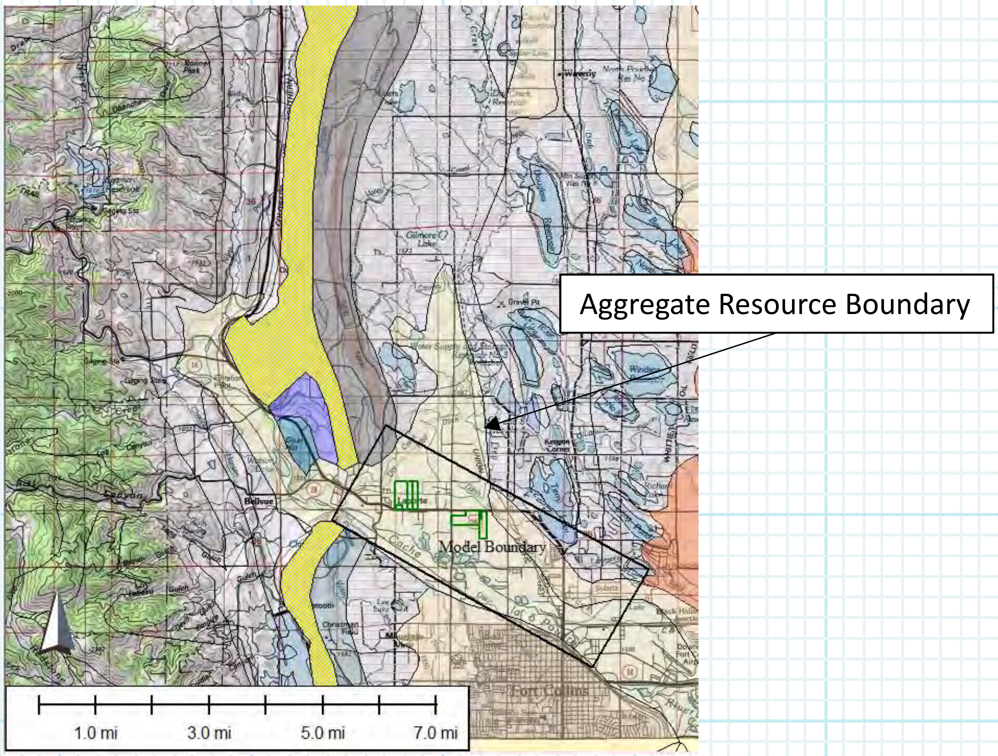
Job No: 360100-003-08 Client: LRM Page 3 of 5

Task: MODFLOW Boundary Flow Condition Estimates Computed By: P. Coit Date: 7/28/17

Checked By: W. Niccoli Date: 7/29/17

Calculations:

2. Define aggregate resource boundary using USGS Geologic Map



3. Calculate flux/recharge into alluvium using recharge equation

$$R = A * P * \frac{0.1}{365.25}$$

R=Recharge= ACFT/Day
A= Surface Drainage Area = 12,132 AC
P= Precipitation= 16.05 IN =1.34 FT
0.05 = Percent of Precipitation Recharged
365.25= Days/Year

R = 12,132 AC*1.34FT *0.1 / 365.25 Days
R= 1625.69 ACFT/ 365.25 Days
= 4.45 ACFT/Day

Calculations:

4. Using Darcy's Law estimate groundwater flow at boundary

$$Q = KA(h_1\text{-}h_2)/L$$

Q= Flow Rate ACFT/Day

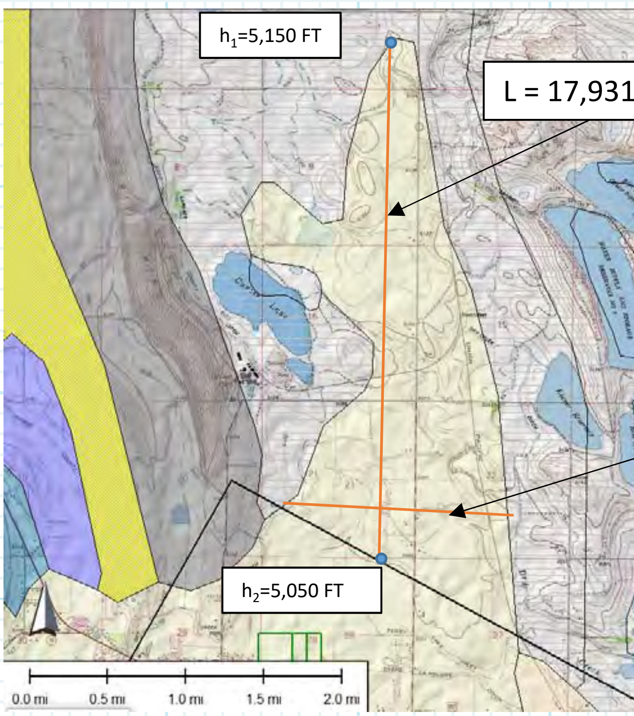
K= Hydraulic Conductivity= 140.56 FT/Day

A= Cross-Sectional Area of Aggregate at model boundary = 13.625 FT 7,788 FT = 106,11.5 FT^2*

h_1= Hydraulic Head Point 1 = 5,150 FT

h_2= Hydraulic Head Point 2 = 5,050 FT

L = Gradient Length = 3.396 Miles = 17,931 FT



*Q= 140.56 FT/Day * 106,111.5 FT^2 *((5150 FT-5050 FT)/ 17930.9 FT)*

Q= 83076.73 FT^3/Day

Q=1.91 ACFT/Day

Results:

Recharge Method = 4.45 ACFT/Day
Darcy Method = 1.91 ACFT/Day

Discussion and Recommendations:

The estimated values were within range and the results can be considered accurately calculated. The estimates present the upper and lower boundary conditions of groundwater flow along the model boundary. An over estimation of percent of precipitation that becomes groundwater flow of 10% was used to calculate the upper boundary of flow at 4.45 ACFT/Day. If the USGS recommended value of 5% was used the estimated flow 2.2 ACFT/Day which is within 14% of the Darcy Method calculated value of 1.91 ACFT/Day.

There are a lot of uncertainties that go into estimating groundwater flow passing through materials. Thus, the estimates of flow calculated within are only good as the assumptions used in the calculations.

Conclusions:

The calculation set achieved the objectives set forth through robust use of the available data and design information. The hydraulic flow properties can be used as boundary conditions in the numeric groundwater model for the Knox Pit.

References:

USGS, 2005. USGS Open-File Report 2005-1351, Preliminary integrated geologic map databases for the United States: Central States: Montana, Wyoming, Colorado, New Mexico, North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, Texas, Iowa, Missouri, Arkansas, and Louisiana. Denver, Colorado.: United States Geological Survey. 2005.

USGS, 2011. *Groundwater Availability of the Denver Basin Aquifer System, Colorado; Professional Paper 1770. Suzanne Pashke, Ed.,* Denver, Colorado.: United States Geological Survey. February 2, 2011.

Appendix D
Specific Capacity Analyses

Job No:	360100-003-08	Client:	LRM	Page	1 of 2
Task:	Specific Capacity Analyses	Computed By:	P. Coit	Date:	8/11/17
		Checked By:	W. Niccoli	Date:	8/11/17

Problem Statement: *Calculation Documentation*

Using specific capacity and pumping data from alluvial wells located in the vicinity of the Proposed Loveland Ready-Mix Concrete, Inc. (LRM) Knox Pit Mine, estimate the transmissivity of the alluvial aquifer at the site.

Assumptions and Approach :

Specific capacity is defined as the discharge per unit drawdown in an aquifer. Using specific capacity to estimate aquifer transmissivity is most applicable in an aquifers test where drawdowns have approximately stabilized. For horizontal, steady state flow, the discharge rate from a well is given by

$$Q = \frac{2\pi T s_w}{F} \qquad (1)$$

where:

T= Transmissivity
s_w = drawdown at the well face
F = shape factor (typical values range between 5.5 and 6.5

Assuming $F \cong 2\pi$, then:

$$T \cong \frac{Q}{s_w} \qquad (2)$$

Analysis/Results:
Based on the assumptions above, the results of specific capacity analyses for alluvial wells in the vicinity of Proposed Knox Pit are shown in Figure 1. Corresponding results are located :

R:\LarimerCounty_CO\LovelandReadyMix\LaPorte\Calculations\Spreadsheets\

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Job No: 360100-003-08 Client: LRM Page 2 of 2

Task: Specific Capacity Analyses Computed By: P. Coit Date: 8/11/17

Checked By: W. Niccoli Date: 8/11/17

Results:

Figure 1: Specific Capacity Wells Near LaPorte

geometry	objectid	moreinfo	receipt	permit	wdid	welldepth	topperfcas	botperfcas	yield	staticwl		Drawdown	T (gpm/ft)	K (ft/day)
X: -11703621.1	382284	http://www	9040212	45723-		15			15	5		10	0.900	17.32
X: -11701367.0	391194	http://www	3616454	274062--A		21	12	21	8	4		17		
X: -11701527.4	393933	http://www	9038951	13962-		14			7	6		8	0.525	12.63
X: -11702040.1	42944	http://www	9038331	5453-		23			30	6		17	1.059	11.99
X: -11702050.5	43167	http://www	9038946	13844-		15	6	15	7	6		9	0.467	9.98
X: -11701527.4	43189	http://www	9039008	14699-		17			50	8		9	3.333	71.29
X: -11702564.6	43194	http://www	9039019	14966-		10			10	2		8	0.750	18.05
X: -11702573.4	43207	http://www	9039048	15579-		22	10	22	15	3		19	0.474	4.80
X: -11701527.4	43234	http://www	9039142	17456-		16			12	5		11	0.655	11.45
X: -11701515.8	43249	http://www	9039193	18817-		13			10	6		7	0.857	23.57
X: -11701527.4	43364	http://www	9039566	26230-		15			10	6		9	0.667	14.26
X: -11703621.1	264762	http://www	9040020	39146-		20			15	6		14	0.643	8.84
X: -11701869.5	270308	http://www	316868	158089--A		20	10	20	15	7		13	0.692	10.25
X: -11701527.4	275024	http://www	9038164	2345-		24			25	8		16	0.938	11.28
X: -11701515.8	275025	http://www	9038231	3528-		22			15	6		16	0.563	6.77
X: -11703096.5	280044	http://www	9038950	13954-		16	7	16	7	6		10	0.420	8.08
X: -11703011.7	219003	http://www	9040091	41368-		10			30	2		8	2.250	54.14
X: -11701306.7	285084	http://www	9040550	58653-		9	5	9	8	5		4	1.200	57.75
X: -11701527.4	43475	http://www	9039886	33719-		7			6	4		3	1.200	77.00
X: -11702369.4	43514	http://www	9040018	39016-		18	14	18	28	6		12	1.400	22.46
X: -11701495.8	43576	http://www	9040268	47642-		10			10	7		3	2.000	128.33
X: -11703798.0	43960	http://www	9041505	86321-		25			10	7		18	0.333	3.56
X: -11703621.1	160070	http://www	9038725	11081-R	305372	10			1200	2		8		
X: -11701297.0	218996	http://www	9039976	37621-		9			33	7		2	9.900	952.81
X: -11701373.4	219002	http://www	9040089	41291-		7			7	4		3	1.400	89.83
X: -11701403.6	233954	http://www	9039969	37303-		9			6	7		2	1.800	173.24
X: -11703621.1	240313	http://www	9039795	30825-		17			15	5		12	0.750	12.03
X: -11701464.6	293747	http://www	9040126	42402-		8			5	2		6	0.500	16.04
X: -11703627.7	334862	http://www	9038674	10558-F		15	6	15	10	9		6	1.000	32.08
X: -11702400.2	334865	http://www	9040017	39015-		17	13	17	17	5		12	0.850	13.63
X: -11702050.5	349674	http://www	9039376	21497-		13	7	13	10	6		7	0.857	23.57
X: -11701527.4	370544	http://www	9038261	4043-		25			30	4		21	0.857	7.86
X: -11701515.8	474430	http://www	9038533	8278-		23			15	6		17	0.529	5.99
X: -11703627.7	460157	http://www	9040177	44427-	307414	10	9	10	21	4		6	2.100	67.37
													Min	3.56
													Geomean	21.9
													Average	61.82
													Max	952.81

Conclusion:

The calculation set achieved the objective to use available pumping data estimate the alluvial aquifer transmissivity and specific capacity.

Appendix E
Site-Specific Aquifer Tests

TELESTO SOLUTIONS • INCORPORATED	Job No: 360100-003-08	Client: LRM	Page 1 of 9
	Task: Short Term Aquifer Tests	Computed By: P. Coit	Date: 8/1/17
		Checked By: W. Niccoli	Date: 8/7/17

Problem Statement: Calculation Documentation

To assess potential impacts of the Loveland Ready-Mix Concrete, Inc. (LRM) Knox Pit Mine development on groundwater, a series of short-term aquifer tests were performed on 4 wells at the Proposed Knox Pix. The tests were performed on 4 monitoring wells (MW-02, MW-04, MW-06, MW-10) installed by LRM in April of 2017 to provide robust hydraulic conductivity data for the aggregate resource (alluvium) for the site.

Objective :
The main objective of the short-term aquifer testing program was to obtain reasonable estimates of the hydraulic conductivity of the alluvium at the Proposed Knox Pit. Given this objective, several simplifying assumptions were used in analyzing the aquifer test data:

Assumptions and Approach :

1. Groundwater flow to the wells is horizontal and vertical components of flow are negligible
2. The bottom of the well screen represents the bottom of the aquifer
3. Flow to the well is radial and the aquifer is of “seemingly” infinite lateral extent
4. The aquifer is homogeneous and isotropic
5. The drainable porosity of the well sandpack material is 0.25
6. Due to water table drawdown near the well, the appropriate aquifer thickness is given by:

$$b = hw + hi_{/2}$$

where:
b = The representative aquifer thickness
h_w = The height of water in the well at the end of the test
h_i = The initial height of water in the well.

Analysis:
Based on the assumptions above, Telesto used methods to analyze aquifer tests that were based, on the Theis solution of radial flow to a well in an infinite aquifer:

$$s = Q/4\pi T * W(u) \qquad \textbf{(1)}$$

where:
s = drawdown at an observation point (L)
Q = pumping rate of the well (L^3/T)
T = aquifer transmissivity (L^2/T)
W(u) = Theis well function
u = variable defined by:

$$u = r^2S/4\mathrm{Tt} \qquad \textbf{(2)}$$

where:
r = radius of interest (L)
S = storage coefficient of the aquifer
t = time (T)

Pumping Drawdown Analysis :

For small values of u (from a practical standpoint $u \leq 0.1$), the well function can be approximated by:

$$W(u) = \ln\left(\frac{2.246Tt}{Sr^2}\right) \qquad \textbf{(3)}$$

Thus, for $t > \frac{Sr^2}{0.4T}$ the Theis Solution can be written as :

$$s = \frac{2.303Q}{4\pi T}\log\left(\frac{2.246Tt}{Sr^2}\right) \qquad \textbf{(4)}$$

This late-time approximation of the Theis equation plots as a straight line on a semi-log plot of log (t) versus s.

Thus, if drawdown (s) data are plotted against log time (t) on semi-log paper, and the pumping test has been performed for an adequate amount of time, the data should approximate a straight line. Through either a linear regression analysis or visual fitting of a straight line to this data, the aquifer transmissivity can then be calculated from the following equation:

$$T = \frac{2.303\ Q}{4\pi\ \Delta s} \qquad \textbf{(5)}$$

where:

Δs is the change in drawdown over 1 log cycle of time.

By definition, the transmissivity is a product of the aquifer thickness (b) and the hydraulic conductivity (K). Thus, the hydraulic conductivity can be estimated by:

$$K = \frac{T}{b} \qquad \textbf{(6)}$$

McWhorter and Sunada (1977) describe this procedure, called the Jacob method, in more detail. This type of analysis was applicable to the 4 tests performed at Knox Pit . Figures 1 through 4 and Table 1 display the semi-log plots and results of this method used on the Knox Pit wells.

Drawdown Recovery Analysis :

Using superposition and the semi-log approximation, the Theis solution may also be used to analyze the residual drawdown during the recovery portion of a pumping-drawdown test. The late-time approximation for a well recovering from pumping can be written as (McWhorter and Sunada, 1977):

$$s_r = \frac{2.303}{4\pi T} \log\left(\frac{t}{t'}\right) \quad \textbf{(7)}$$

where:

t is the time since pumping began and t' is the time after pumping stopped.

Similar to the Jacob Method, a plot of later time residual drawdown (s_r) data versus log (t/t') on semi-log paper should produce a straight line. This procedure is commonly referred to as the Theis Recovery Method. Transmissivity can be computed using Equation 5, where Δs is the change in residual drawdown per log cycle of (t/t') on semi-log recovery plot. Table 2 and Figures 5-8 summarize the results of the Theis analysis.

Data and Results:

Data and Results are located:

R:\LarimerCounty_CO\LovelandReadyMix\LaPorte\Calculations\Modeling\GWModel\Pumping Tests\20170523 MW-02.xlsx

R:\LarimerCounty_CO\LovelandReadyMix\LaPorte\Calculations\Modeling\GWModel\Pumping Tests\20170523 MW-04.xlsx

R:\LarimerCounty_CO\LovelandReadyMix\LaPorte\Calculations\Modeling\GWModel\Pumping Tests\20170523 MW-06.xlsx

R:\LarimerCounty_CO\LovelandReadyMix\LaPorte\Calculations\Modeling\GWModel\Pumping Tests\20170523 MW-10.xlsx

TELESTO SOLUTIONS INCORPORATED

Job No: 360100-003-08 Client: LRM

Task: Short Term Aquifer Tests Computed By: P. Coit Date: 8/1/17

Checked By: W. Niccoli Date: 8/7/17

Data and Results:

Table 1: Aquifer Hydraulic Property Estimates from the Cooper Jacob Method

Monitoring Well	Q (gpm)	T (FT^2/day)	Aquifer Thickness (FT)	K (FT/day)	K (cm/s)
MW-02	5.54	1189.2	20.3	58.6	2.07E-02
MW-04	8	2378.8	12.4	191.9	6.77E-02
MW-06	6.85	365.0	8.8	41.4	1.46E-02
MW-10	9.2	1014.5	11.7	86.6	3.06E-02

Table 2: Aquifer Hydraulic Properties Estimated from the Theis Recovery Method

Monitoring Well	T (FT^2/day)	Thickness (FT)	K (FT/day)	K (cm/s)
MW-02	4227.718	20.280	208.467	7.35E-02
MW-04	1746.469	12.398	140.873	4.97E-02
MW-06	2294.270	8.806	260.550	9.19E-02
MW-10	1592.378	11.715	135.926	4.80E-02

Job No:	360100-003-08	Client:	LRM	Page	5 of 9
Task:	Short Term Aquifer Tests	Computed By:	P. Coit	Date:	8/1/17
		Checked By:	W. Niccoli	Date:	8/7/17

Figures:

Figure 1 PUMPING-DRAWDOWN TEST
MW-02

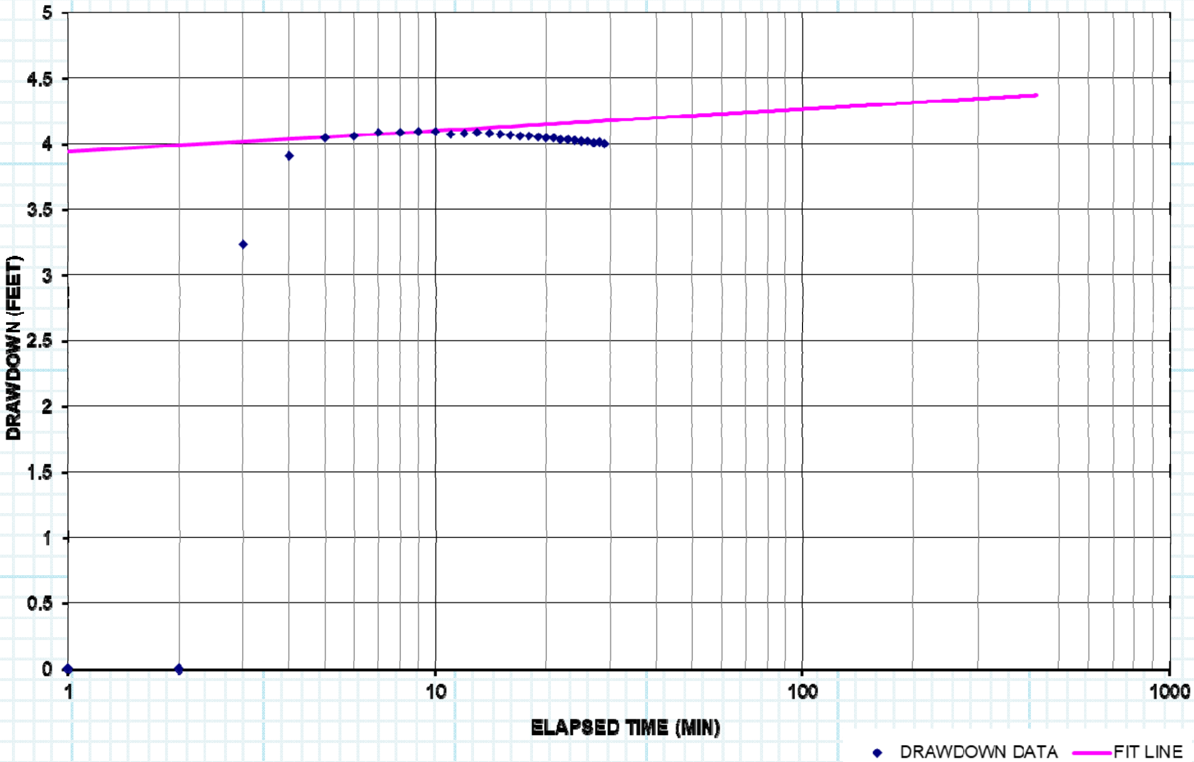
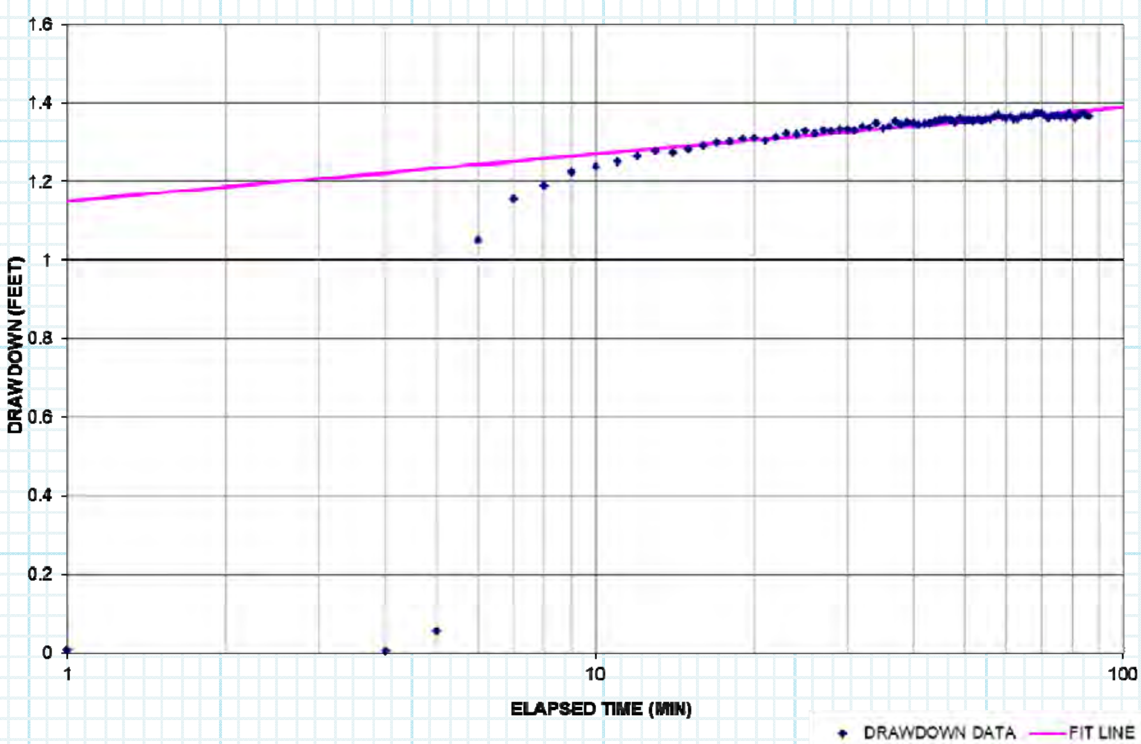


Figure 2 PUMPING-DRAWDOWN TEST
MW-04



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Job No: 360100-003-08 Client: LRM Page 6 of 9

Task: Short Term Aquifer Tests Computed By: P. Coit Date: 8/1/17

Checked By: W. Niccoli Date: 8/7/17

Figures:

Figure 3

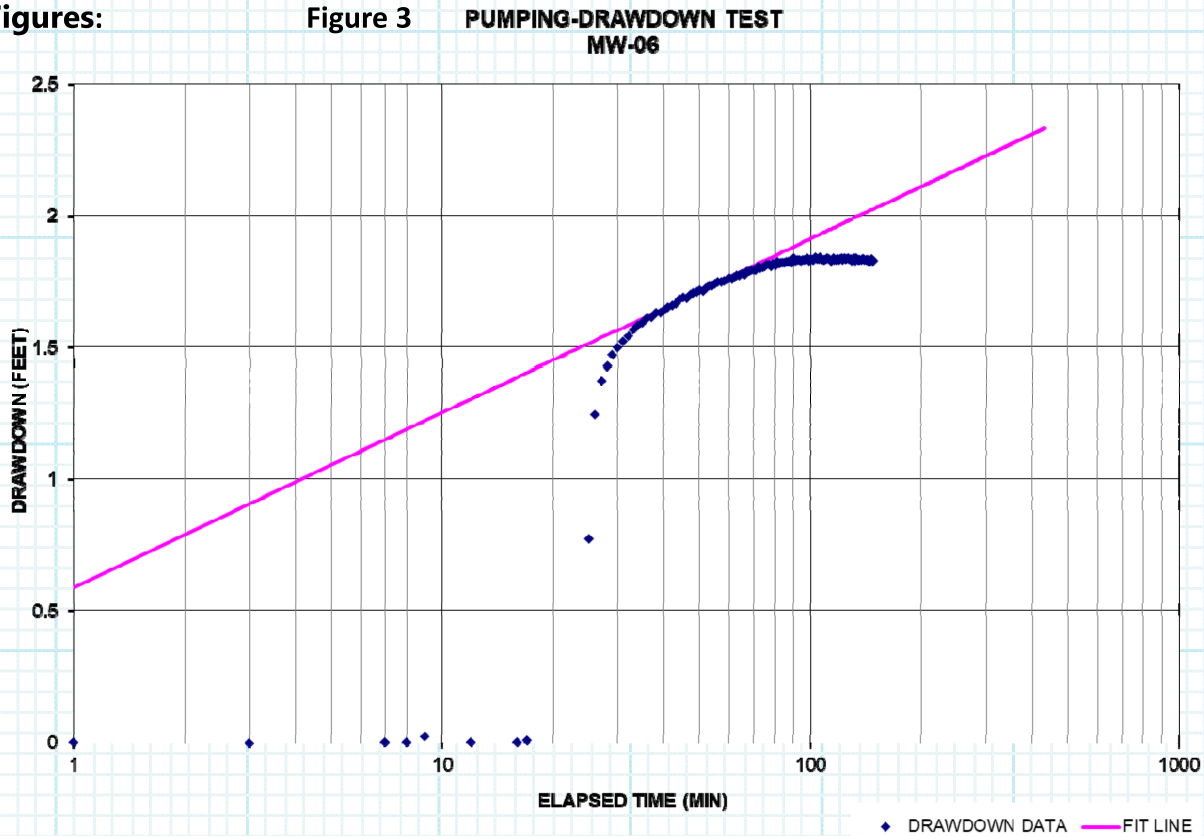
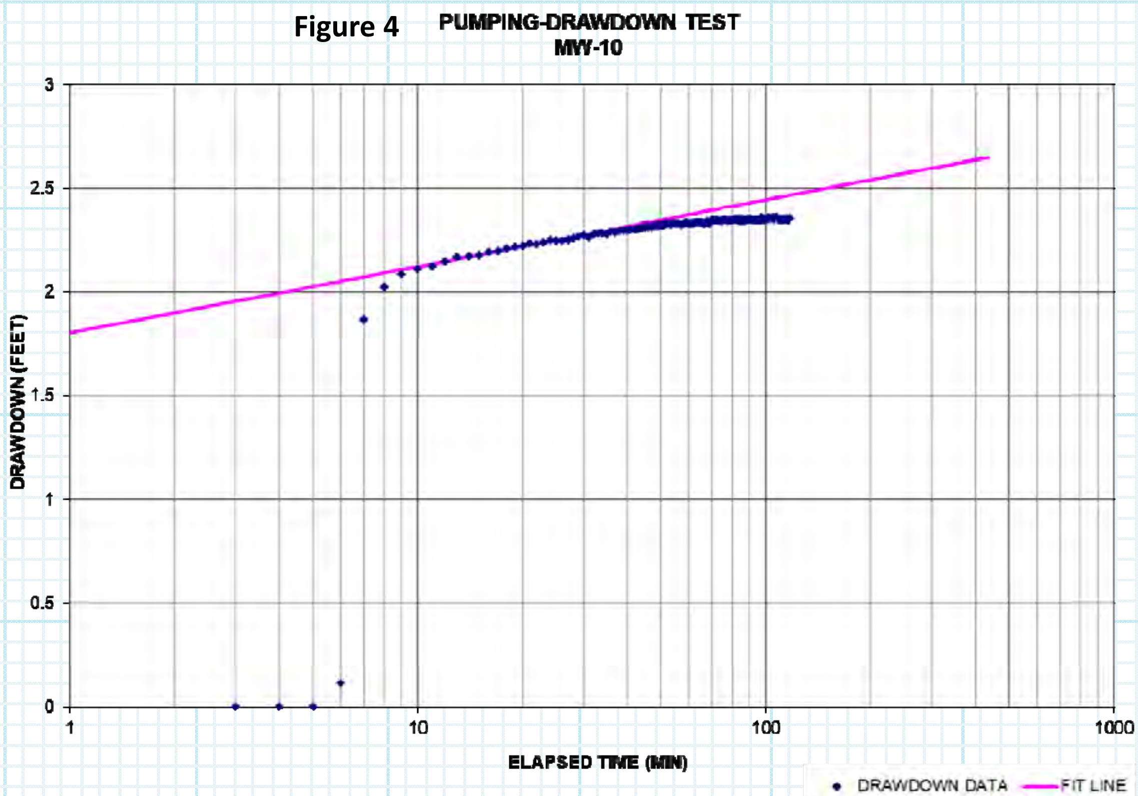


Figure 4



Figures:

Figure 5

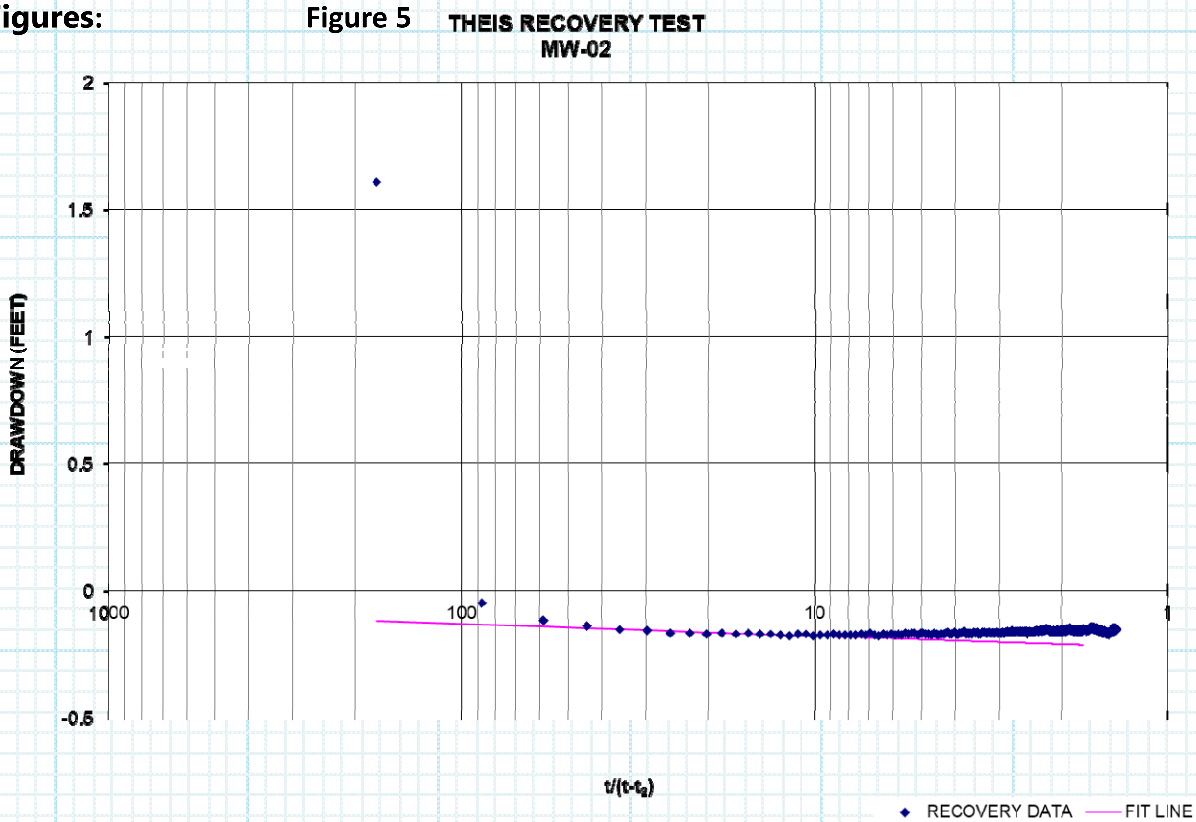
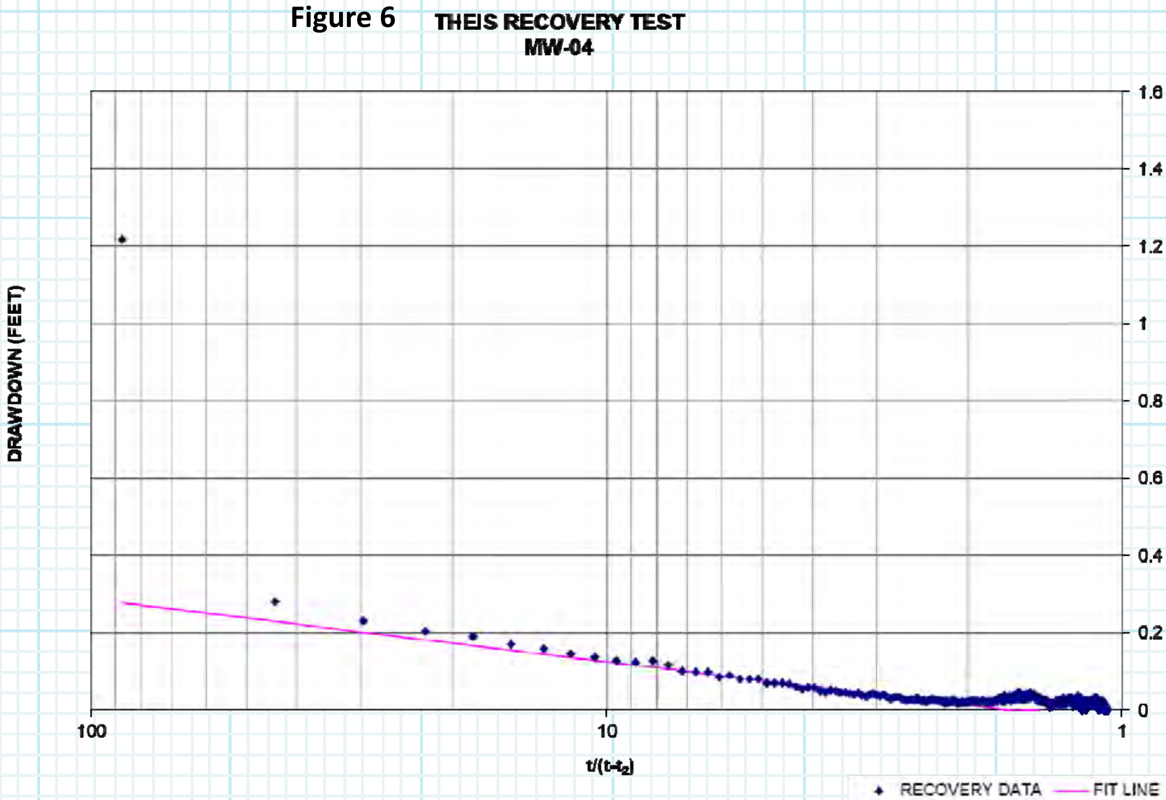


Figure 6



Figures:

Figure 7 THEIS RECOVERY TEST MW-06

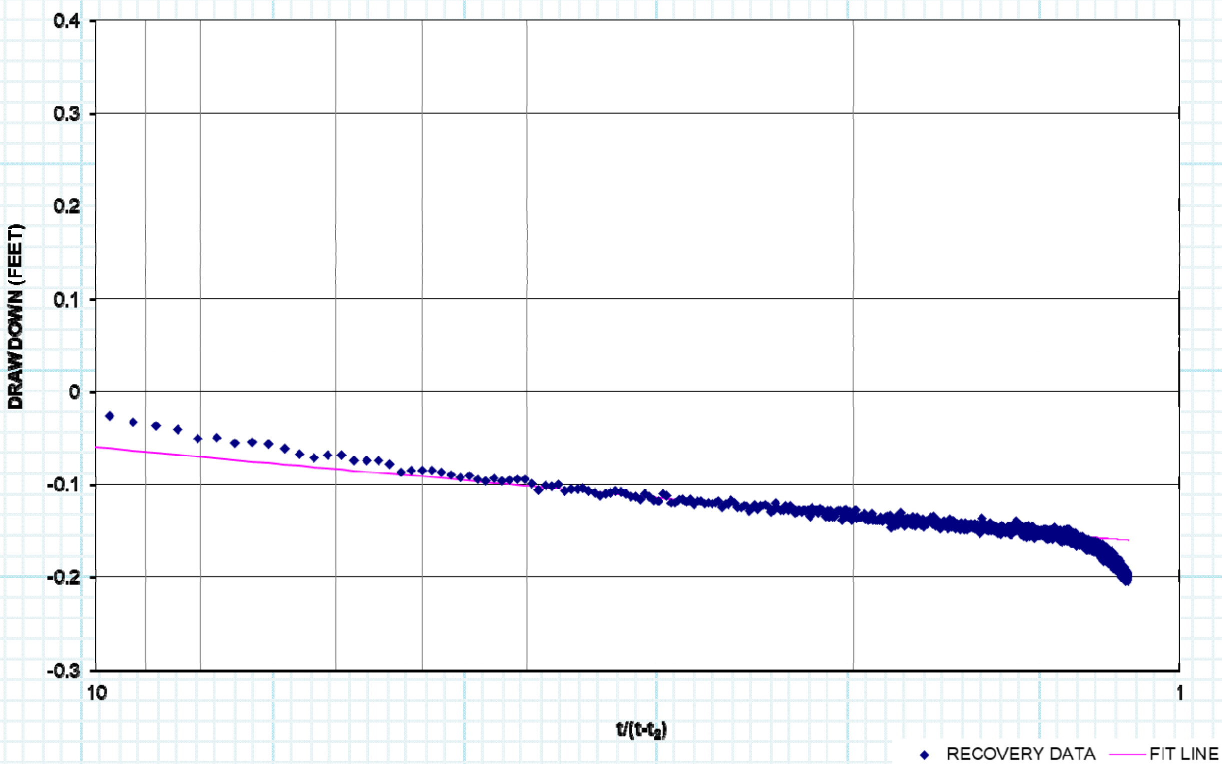
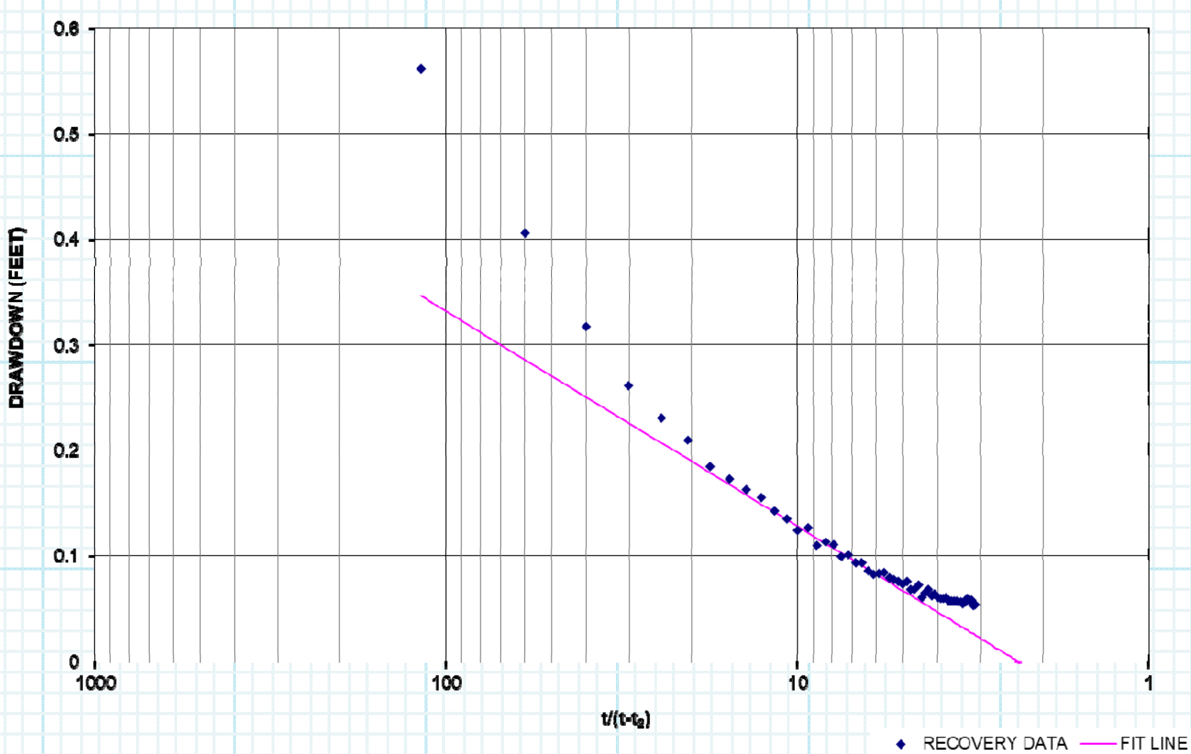


Figure 8 THEIS RECOVERY TEST MW-10



Discussion :

Assumptions 1 and 2 are valid because the screen length is very large compared to the well diameter. Assumptions 2 and 3 are appropriate due to the short-term nature of the aquifer tests performed at the Proposed Knox Site. Assumption 5 is based on porosity values cited in the literature for a clean sand (McWhorter and Sunada [1977], Freeze and Cherry [1979], and Spitz and Moreno [1996]). Assumption 6 is based on the Dupuit-Forcheimer assumption and is explained in McWhorter and Sunada (1977).

Conclusions:

The calculation set achieved the objectives set forth through robust use of the available data and design information. The short-term aquifer tests provided a quick and acceptably accurate method to gain insight into hydraulic properties of the alluvium at the Knox Pit. These properties can be used to estimate groundwater flow in the groundwater model for the Proposed Knox Pit.

References:

Freeze, R. Allan and John A. Cherry. 1979. *Groundwater*. Prentice Hall, Inc. Englewood Cliffs, New Jersey.

McWhorter, David B and Daniel K. Sunada. 1977. *Ground-Water Hydrology and Hydraulics.* Water Resources Publications. Littleton, Colorado.

Spitz, Karlheinz and Joanna Moreno. 1996. *A Practical Guide to Groundwater Modeling*. John Wiley & Sons. New York, New York.

Appendix F
Miscellaneous Calculations and Model Documentation

VARIOUS MODEL INPUT PARAMETERS

Item	Description	Units	Low	High	Modeled Value
Kx	Hydraulic Conductivity in the x model direction	ft/day	3.56	1070	334
Ky	Hydraulic Conductivity in the y model direction	ft/day			Kx
Kz=Kx/10	Hydraulic Conductivity in the z model direction	ft/day			Kx/10
n	Porosity	unitless	0.1	0.3	0.2
Constant head	West Boundary	feet	bedrock	flood	5079.5
Constant head	East Boundary	feet	bedrock	flood	4960 to 4978
Constant head	Southern Boundary (Poudre River)	feet	bedrock	flood	5079.5 to 4960
Flux boundary	Flux (see calculations Appendix C)	ft3/day			87017.75
Internal drains	Drain Elevations	feet	bedrock	DEM	5' below DEM
	Drain factor (multiple)	ft/day			10 x Kx
	Drain material thickness	feet			1
Internal ditches	River cells. Elevation	feet			2 to 3' above DEM
	Ksat of silt	ft/day			0.06
	Thickness of silt	feet			1
Site perimeter drains	Drain Elevations	feet	bedrock	DEM	1'above bedrock
	Drain factor (multiple)	ft/day			10 x Kx
	Drain material thickness	feet			1

EQUIVALENT MATERIAL PROPERTIES
OF THE PERIMETER DRAINS

TELESTO SOLUTIONS • INCORPORATED

Job No: 360100-004-04	Client: LRM	Page 1 of 4
Task: Equivalent drain size	Computed By: W. Niccoli	Date: 1/12/18
	Checked By: W. Katz	Date: 01/12/18

Calculation Documentation

Problem Statement:

LRM's proposed closure plan for the Knox Pit involves backfilling the pits with excess fines and overburden material. Around the perimeter of the pit, compacted backfill is proposed in order to seal the groundwater system from the pits. In order to limit the amount of groundwater level impacts up and downgradient of the sealed pits, LRM proposes to install a perimeter drain to convey naturally flowing groundwater. The size of the drains is unknown.

Objectives:

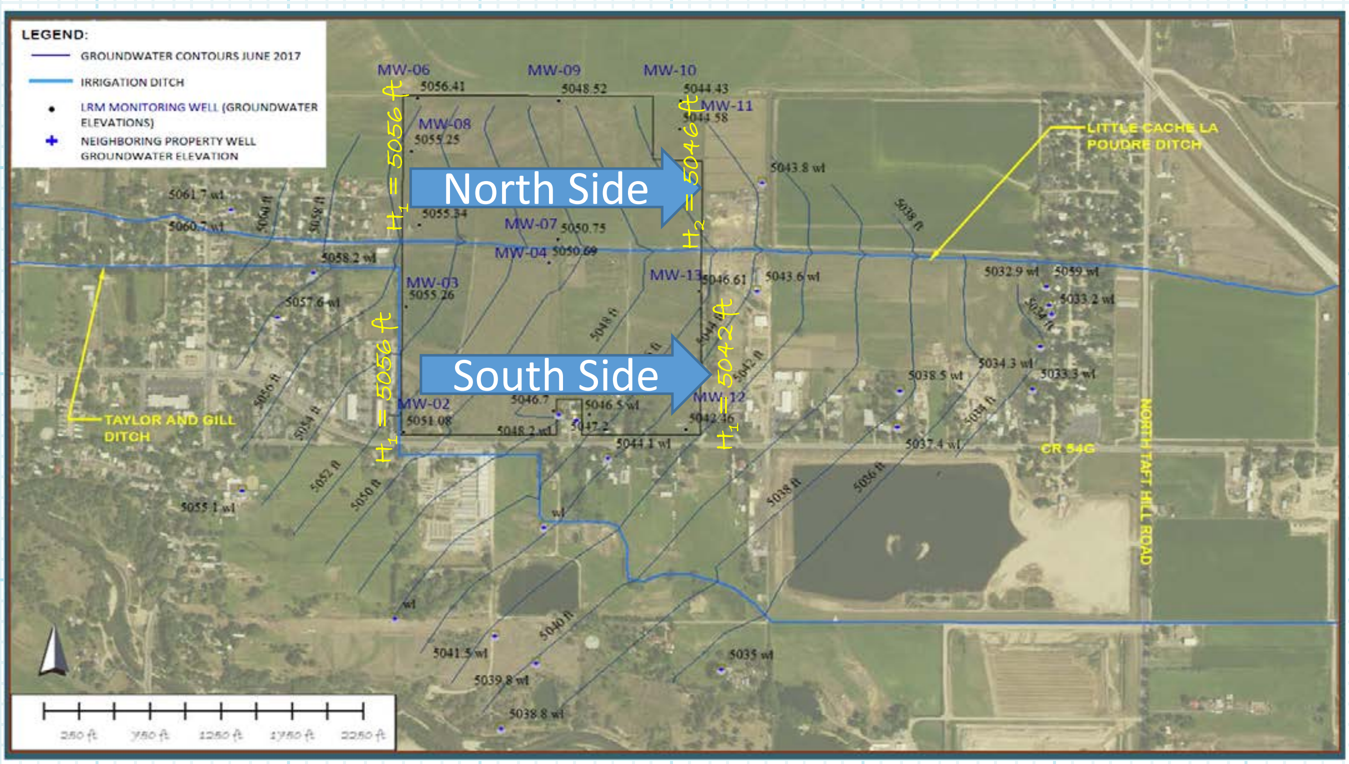
1. Determine the layout and size of drains required to move groundwater around the sealed pits

Approach:

1. Estimate the natural groundwater flow through the north and south sides of the site utilizing Darcy's law and site dimensions
2. Utilize the Hazen-William's formula to calculate the minimum pipe diameter required to convey the calculated groundwater flow
3. Check the calculated pipe diameters in an equivalent porous medium

Data and Assumptions:

1. Transmissivity of aquifer = 50,000 gal/ft-day, average thickness = 20 ft
2. Summer groundwater elevations and gradients:



TELESTO SOLUTIONS • INCORPORATED	Job No: 360100-004-04	Client: LRM	Page 2 of 4
	Task: Equivalent drain size	Computed By: W. Niccoli	Date: 1/12/18
		Checked By: W. Katz	Date: 01/12/18

Data and Assumptions Con'd:

3. Hazen Williams' Coefficient for plastic pipe
4. Assume drain pipes have zero slope

https://www.engineeringtoolbox.com/hazen-williams-coefficients-d_798.html

Arizona | Colorado | Colorado Water | Mapping/GIS | Misc | Music

Material	Coefficient - c -
ABS - Acrylonite Butadiene Styrene	130
Aluminum	130 - 150
Asbestos Cement	140
Asphalt Lining	130 - 140
Brass	130 - 140
Brick sewer	90 - 100
Cast-Iron - new unlined (CIP)	130
Cast-Iron 10 years old	107 - 113
Cast-Iron 20 years old	89 - 100
Cast-Iron 30 years old	75 - 90
Cast-Iron 40 years old	64-83
Cast-Iron, asphalt coated	100
Cast-Iron, cement lined	140
Cast-Iron, bituminous lined	140
Cast-Iron, sea-coated	120
Cast-Iron, wrought plain	100
Cement lining	130 - 140
Concrete	100 - 140
Concrete lined, steel forms	140
Concrete lined, wooden forms	120
Concrete, old	100 - 110
Copper	130 - 140
Corrugated Metal	60
Ductile Iron Pipe (DIP)	140
Ductile Iron, cement lined	120
Fiber	140
Fiber Glass Pipe - FRP	150
Galvanized iron	120
Glass	130
Lead	130 - 140
Metal Pipes - Very to extremely smooth	130 - 140
Plastic	130 - 150
Polyethylene, PE, PEH	140
Polyvinyl chloride, PVC, CPVC	150

Calculations:

1. Calculate the natural groundwater flow through the north and south sides of the property:

$$b_{avg} := 20 \cdot ft \qquad T_{aq} := 50000 \cdot \frac{gal}{ft \cdot day} \qquad K_{aq} := \frac{T_{aq}}{b_{avg}} \qquad K_{aq} = 334.201 \frac{ft}{day}$$

$$w_{north} := 1125 \cdot ft \qquad b_{north} := 18 \cdot ft \qquad H_{1north} := 5056 \cdot ft \qquad H_{2north} := 5046 \cdot ft \qquad L_{north} := 2250 \cdot ft$$

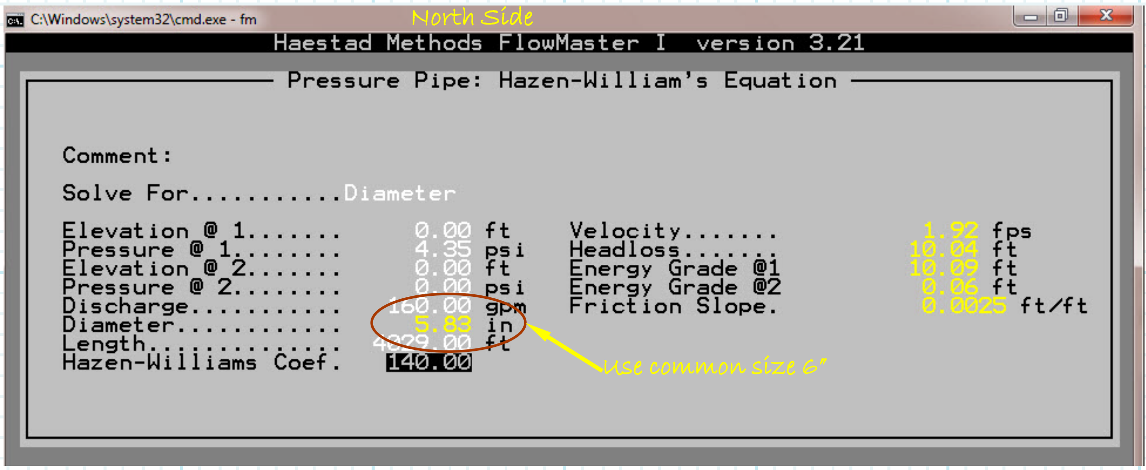
$$Q_{north} := w_{north} \cdot b_{north} \cdot K_{aq} \cdot \frac{\left(H_{1north} - H_{2north}\right)}{L_{north}} \qquad Q_{north} = 156.25\ gpm$$

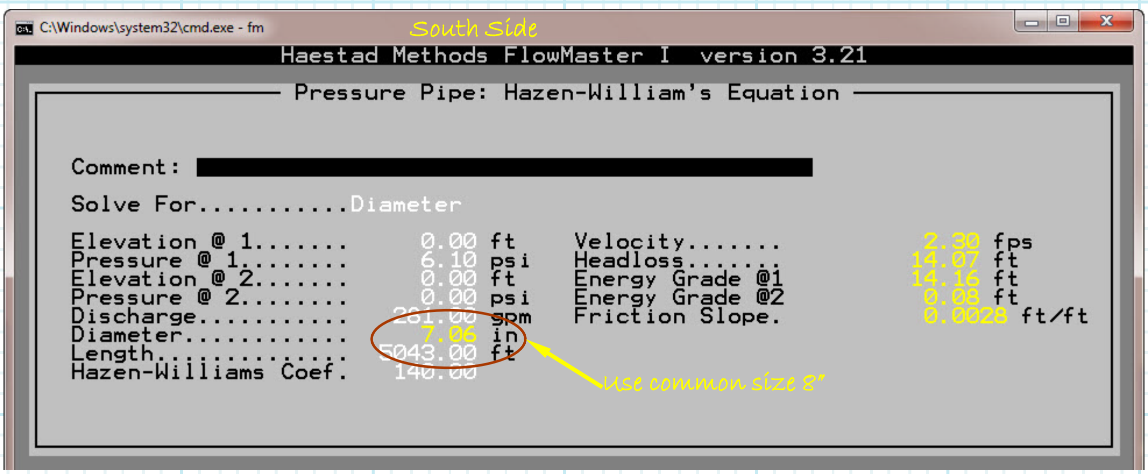
$$w_{south} := 1472 \cdot ft \qquad b_{south} := 18 \cdot ft \qquad H_{1south} := 5056 \cdot ft \qquad H_{2south} := 5042 \cdot ft \qquad L_{south} := 2352 \cdot ft$$

$$Q_{south} := w_{south} \cdot b_{south} \cdot K_{aq} \cdot \frac{\left(H_{1south} - H_{2south}\right)}{L_{south}} \qquad Q_{south} = 273.81\ gpm$$

Calculations Con'd:

2. Calculate the required drain pipe size to carry the north and south groundwater flow assuming zero slope on the drain pipe utilizing the Hazen Williams option in Flow Master:





3. Check actual flow rate with full pipe

North Side

$Q := 172 \cdot \frac{gal}{min}$ $D := 6 \cdot in$

$v := \frac{Q}{\left(\frac{\pi}{4} \cdot D^2\right)}$ $v = 1.952 \cdot \frac{ft}{sec}$

$C_{HW} := 140$ $L := 4029 \cdot ft$

$$h_f := \frac{3.022 \cdot \left(\frac{v}{\frac{ft}{sec}}\right)^{1.85}}{C_{HW}^{1.85} \cdot \left(\frac{D}{ft}\right)^{1.165}} \cdot L$$

$h_f = 10 \cdot ft$

South Side

$Q := 388 \cdot \frac{gal}{min}$ $D := 8 \cdot in$

$v := \frac{Q}{\left(\frac{\pi}{4} \cdot D^2\right)}$ $v = 2.477 \cdot \frac{ft}{sec}$

$C_{HW} := 140$ $L := 5043 \cdot ft$

$$h_f := \frac{3.022 \cdot \left(\frac{v}{\frac{ft}{sec}}\right)^{1.85}}{C_{HW}^{1.85} \cdot \left(\frac{D}{ft}\right)^{1.165}} \cdot L$$

$h_f = 14 \cdot ft$

Calculations Con'd:

4. Calculate the equivalent transmissivity and hydraulic conductivity of the drain (assume 2' wide)

North Side

$$T_{eff} := \frac{L \cdot Q}{6 \cdot ft \cdot h_f} \qquad T_{eff} = 1.651 \times 10^{7} \frac{gal}{day \cdot ft}$$

$$K_{eff} := \frac{T_{eff}}{b_{avg}} \qquad K_{eff} = 1.104 \times 10^{5} \frac{ft}{day}$$

South Side

$$T_{eff} := \frac{L \cdot Q}{6 \cdot ft \cdot h_f} \qquad T_{eff} = 3.352 \times 10^{7} \frac{gal}{day \cdot ft}$$

$$K_{eff} := \frac{T_{eff}}{b_{avg}} \qquad K_{eff} = 2.241 \times 10^{5} \frac{ft}{day}$$

Results:

The required drain size for the north side is 5.83 inches in diameter. Use 6 inch drain pipe
The required drain size for the south side is 7.06 inches in diameter. Use 8 inch drain pipe

Conclusion:

The calculation objectives were met. The drain sizes are more than sufficient to carry amount of existing groundwater flow around the sealed pits after closure.

SELENIUM TRANSPORT ESTIMATE

Calculation Documentation

Problem Statement:

Selenium has been found in the Pierre shale underlying the proposed Knox gravel pit. Concerns have been expressed over selenium leaking into the groundwater and into the drains from the property once mining begins. This calculation seeks to determine how much selenium may be expected in the water.

Objectives:

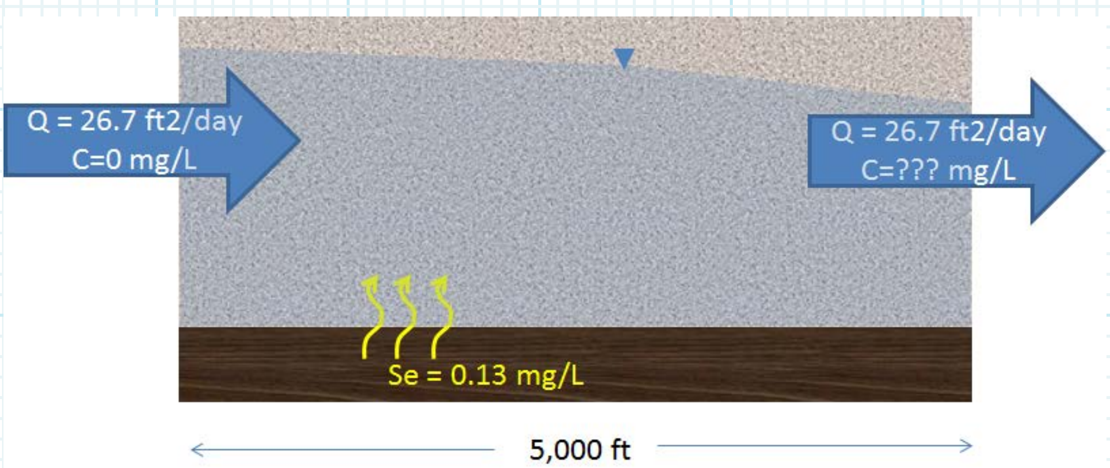
1. Find the concentration of selenium in the groundwater per unit width

Approach:

1. Create a mass balance for selenium around the alluvium
2. Use Fick's law to find the diffusive flux of selenium from the underlying shale
3. Complete the concentration gradient over a depth of 1 cm and over a depth of 2.5 ft, which is the average depth that samples from the Pierre shale were taken

Data and Assumptions:

1. Diffusion coefficient of Se^- is assumed to be similar to that of Br^-, which is 20.1×10^{-10} m^2/s
2. The concentration of selenium in the shale is 0.13 mg/L
3. The concentration of selenium in the alluvium is zero
4. The groundwater flow rate through the alluvium is 180 gpm
5. The length of the perimeter drain is 5000 ft
6. The width of the perimeter drain is 2 ft
7. The porosity of the shale is 30%



Calculations:

The mass balance of selenium around the alluvium is

$$C_{in}Q_{in} + C_F Q_F = Q_{out}C_{out}$$

C_{in} is zero because the concentration of selenium in the alluvium is zero.

$$Q_{in}=Q_{out} = 180\ gpm$$

$C_F Q_F$ is equal to the diffusive flux multiplied by the unit area.

Fick's law gives the diffusive flux (J) as being equal to the diffusivity multiplied by the concentration gradient:

$$J = -D\frac{dC}{dx}$$

Calculated with a depth of 1 cm:

$$J = -(20.1 \times 10^{-10} m^2/s)\frac{(0 - 0.13\frac{mg}{L})}{1\ cm}\left(\frac{1000\ L}{m^3}\right)\left(\frac{100\ cm}{m}\right)\left(\frac{86{,}400\ s}{day}\right)$$

$$J = 2.26\frac{mg}{m^2}/day$$

Calculated with a depth of 2.5 ft (76.2 cm):

$$J = -(20.1 \times 10^{-10} m^2/s)\frac{(0 - 0.13\frac{mg}{L})}{76.2\ cm}\left(\frac{1000\ L}{m^3}\right)\left(\frac{100\ cm}{m}\right)\left(\frac{86{,}400\ s}{day}\right)$$

$$J = 0.0296\frac{mg}{m^2}/day$$

The mass balance is now equal to:

$$0 + \frac{2.26\frac{mg}{m^2}}{day} \times 5000\ ft\ \times 2\ ft\ \times \frac{m^2}{10.7639 ft^2} \times 0.3$$

$$= 180\ gpm \times \frac{1440\ min}{day} \times \frac{ft^3}{7.48\ gal} \times \frac{m^3}{35.3147\ ft^3} \times \frac{1000\ L}{m^3} \times C_{out}$$

$$629.88\frac{mg}{day} = 981{,}245.95\ L/day \times C_{out}$$

$$C_{out} = 6.42\frac{10^{-4}mg}{L}$$

Or

$$0 + \frac{0.0296\,\frac{mg}{m^2}}{day} \times 5000\,ft\ \times 2\,ft\ \times \frac{m^2}{10.7639 ft^2} \times 0.3$$
$$= 180\,gpm \times \frac{1440\,min}{day} \times \frac{ft^3}{7.48\,gal} \times \frac{m^3}{35.3147\,ft^3} \times \frac{1000\,L}{m^3} \times C_{out}$$

$$8.25\,\frac{mg}{day} = 981{,}245.95\,L/day \times C_{out}$$

$$C_{out} = 8.41\,\frac{10^{-6} mg}{L}$$

Results:

Using a depth of 1 cm, selenium may be found in water in the perimeter drain at a concentration of 6.42 x 10^{-4} mg/L. When using a depth of 2.5 ft, selenium is estimated to be found in the perimeter drain at a concentration of 8.41 x 10^{-6} mg/L. The detection limit for selenium is 0.006 mg/L. These estimations of selenium in the perimeter drain are less than the detection limit.

MODEL INPUT FILES PROVIDED UPON REQUEST

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DATA             37 20180109_Phase5_2nd.fhd REPLACE
DATA             38 20180109_Phase5_2nd.fdn REPLACE
PCG              18 20180109_Phase5_2nd.pcg OLD
LPF              14 20180109_Phase5_2nd.lpf OLD
CHD              17 20180109_Phase5_2nd.chd OLD
RIV              21 20180109_Phase5_2nd.riv OLD
DRN              22 20180109_Phase5_2nd.drn OLD
FHB             146 20180109_Phase5_2nd.fhb OLD
RCH              24 20180109_Phase5_2nd.rch OLD
EVT              25 20180109_Phase5_2nd.evt OLD
ZONE             15 20180109_Phase5_2nd.zon OLD
MULT             16 20180109_Phase5_2nd.mlt OLD
PVAL             52 20180109_Phase5_2nd.pval OLD
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# Name File for MODFLOW created on 1/10/2018 by ModelMuse Version 3.9.0.0
LIST              11 20180109_Reclaim.lst REPLACE
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DATA              37 20180109_Reclaim.fhd REPLACE
DATA              38 20180109_Reclaim.fdn REPLACE
PCG               18 20180109_Reclaim.pcg OLD
LPF               14 20180109_Reclaim.lpf OLD
CHD               17 20180109_Reclaim.chd OLD
RIV               21 20180109_Reclaim.riv OLD
DRN               22 20180109_Reclaim.drn OLD
FHB              146 20180109_Reclaim.fhb OLD
RCH               24 20180109_Reclaim.rch OLD
EVT               25 20180109_Reclaim.evt OLD
ZONE              15 20180109_Reclaim.zon OLD
MULT              16 20180109_Reclaim.mlt OLD
PVAL              52 20180109_Reclaim.pval OLD
```

Appendix G
Water Quality Monitoring Plan

November 30, 2017

Jeff Smith
Maintenance Manager
Cache La Poudre Irrigating Ditch Company
106 Elm Avenue
Eaton, CO 80615

RE: Proposed Gravel Pit in LaPorte

Dear Jeff,

The purpose of this letter is to summarize the topics discussed at our meeting on October 27, 2017. Thank you for taking the time to discuss your concerns and to listen to our plans for mining at the Knox Pit.

LRM has agreed to incorporate the following operational procedures into our mining plan in order to protect the Little Cache La Poudre Ditch and the rights of the ditch users.

1. We will maintain clear access of a minimum of 30 feet on both sides of the ditch. The conveyor system that transports mining material across the ditch will be designed to span this distance. LRM's haul road will be separate from the ditch road.
2. Replacement bridge structures at ditch crossings will be designed so that abutments will not "pinch in" and restrict any ditch flow.
3. All dewatering from the mining cells will be pumped to the water management pond at the east end of the site. We believe this will help keep the ditch whole and prevent any ditch loss for downstream users. However, if it is determined there is excessive leakage caused by dewatering, LRM will line the ditch or work with you to determine other means of eliminating ditch loss.
4. Mining will progress in phases that open up 5 to 7 acres cell areas at a time. The mining cells will be sealed with a clay liner in progression with mining. This clay lining will help prevent ditch seapage.
5. Due to concerns over water quality that may be compromised due to dewatering and the adjacent batch plant operations, LRM will test the water management pond and one of our monitoring wells 600 feet east of the mining boundary and adjacent to ditch for the following:

Parameter
Total Suspended Solids, TSS
Total Iron
PH, minimum and maximum
Total Selenium

These monitoring parameters were determined using CDPS Stormwater General Permit COG500000 for Discharges from Sand and Gravel Mining and Processing, they include the Sector Specific Benchmarks for Concrete Batch Plants, and will use the monitoring procedures as detailed in that Permit. A comparison sample will be taken from the ditch as it enters the west end of the mining permit boundary at least once per year. Baseline comparison samples will be taken prior to any mining or production.
If measured results exceed allowable values at any time, immediate action will be taken to address the cause and remove the source of the pollutant. Copies of quarterly monitoring results will be sent to the ditch company, and will be available for ditch users review upon request.

6. All process water from the batch plant site and mining operations will be prevented from entering the ditch through grading and berming on site.
7. Ground water levels throughout the mining site will be monitored monthly using existing monitoring wells. If any major deviations in groundwater levels are identified that indicate an injury to the ditch or ditch users, you will be notified to determine if mitigation measures are required. These well readings will be submitted to the Division of Reclamation Mining and Safety with our Annual Reports.

We trust this summarizes the major topics covered at our meeting, however, if we have missed one of your concerns or if you would like us to consider adding additional monitoring, measuring, or site design requirements to our operating procedures, please advise.

Regards,

Stephanie Fancher-English
Loveland Ready Mix Concrete, Inc.

cc: file