June 3, 2025

Ben Hammar
Colorado Division of Reclamation, Mining, and Safety
1313 Sherman St, Rm. 215
Denver, CO 80203

Delivered Via Email
RE: Limon Sand and Gravel Resource, DRMS File M-2024-053
112 Construction Materials Permit Application - Adequacy Response

Ben Hammar,

The attached letter addresses each adequacy item in your January 30, 2025 letter regarding the Limon Sand and Gravel Resource 112 Permit Application. Feel free to contact me with any questions.

Regards,

Sydney Connor,
Lewicki & Associates, PLLC
(719)323-9867
sydney@lewicki.biz

6.2 General Requirements of Exhibits

1. *Per Rule 1.6.2(g), please provide proof of publication within a newspaper of general circulation which follows the requirements of Rule 1.6.2(d) and Rule 1.6.5 to the Division.*

The proof of publication to the newspaper is attached to this letter.

2. *Per Rule 1.6.2(b), please provide the Division with proof of a replacement public notice posted at the entrance of the proposed site. While evidence of the original sign was provided with the initial application, at the time of the pre-operation inspection conducted by DRMS the sign has since fallen into disrepair and is considered inadequate.*

A new mine sign will be placed shortly. Proof of posting will be provided to the Division once complete.

3. *Per Rule 1.6.2(e)(ii), please provide proof of notice adhering to the requirements of Rule 1.6.2(d) and Rule 1.6.5 that has been sent out to the Colorado State Land Board, who's land falls within the 200 feet boundary of the affected area near the northeast portion of the site.*

Proof of notice is provided with this letter.

6.4.1 Exhibit A – Legal Description:

4. *Per Rule6.4.1(2), please provide the latitude and longitude coordinates for the mine site entrance within the legal description section in addition to those provided in the index map.*

Exhibit A has been updated to provide the mine entrance coordinates.

6.4.2 Exhibit C – Pre-mining and Mining Plan Maps of Affected Lands

5. *On Map C-1 of the application, please include the boundary of the current active permit held within the site, DRMS permit no. M2013080.*

Map C-1 has been updated to include the existing permit boundary.

6. *On Map C-1 of the application, please provide additional information regarding the type of present vegetation covering the affected area. This may be in the form of an additional item within the provided legend generally describing the vegetation located outside of the river corridor.*

Map C-1 has been updated to show the rangeland vegetation on the affected areas of the site outside of the river corridor.

7. *On Map C-2 of the application, please include the planned locations of the topsoil piles described in exhibit D.*

Map C-2 has been updated to show typical stockpile locations. However, these locations may vary as mining will be constantly progressing in a 10-acre pit throughout the site.

6.4.3 Exhibit D – Mining Plan

8. *On page D-1 of the application, the applicant states that a conveyor belt is being considered as a part of the operation. Please commit to supplying the Division with a Technical Revision prior to any work is performed to add a conveyor belt to the current mining plan*

Exhibit D was updated to acknowledge the requirement of a TR to use a conveyor belt.

9. *Per Rule 6.4.4(j), please provide more information on if any improvement to existing roads are planned, as well as additional information regarding the locations and dimensions of any currently planned haul roads or access roads.*

Please see the revised Exhibit D for more information on the low-water crossings that will be constructed to facilitate mine access across the creek. Creek crossing designs will be submitted at a later date through a TR.

10. *On page D-1 of the application, the applicant states "during pre-mining stripping all agricultural structures will be demolished." Please elaborate on which structures are planned to be demolished. If it is the structures currently included within the structure agreement, please cite exactly which structures are planned to be removed. If there are additional structures present not included in the structure agreements, please provide additional structure agreements to include the additional structure.*

Language describing the agricultural structures that will be affected by mining is added in the revised Exhibit D. To summarize, these structures include fences, gates, windbreaks, stock wells, etc. They will only be demolished, when necessary, as part of the next 3-5 acre mining area that is being stripped. All of these structures are the landowner's property, for which a structure agreement already exists.

11. *Per 6.4.4(f)(ii), please include information describing the nature of the material directly below the material to be mined.*

Exhibit D has been updated to describe the material below the sand and gravel deposit.

12. *Within table D-2 and page D-4 of the application, the application states that the total stripped area will be 901 acres. Both the affected area and the area to be reclaimed are stated to be 957.5 acres elsewhere in the application. Please elaborate on this discrepancy, specifically what the additional 57.5 acres include that is not planned to be stripped.*

Please see the revised reclamation and mining exhibits with this discrepancy fixed. The affected area is 957.5 acres, while the disturbed area is 901 acres. The 57.5 acre difference is from the land between mining areas to account for the overhead utility setbacks. These areas will have minimal disturbance from haul roads, but no excavation. These roads are included in the 901 acre amount.

13. *On pages D-5 and E-1 of the application, the operator states that topsoil will be replaced in an average of a two-foot layer throughout the site. Elsewhere in the application it is stated that a 5-7 inch layer of topsoil is present throughout the site. Please correct this discrepancy or elaborate on the intended topsoil placement.*

This discrepancy has been fixed in the revised text. The correct topsoil depth is 5-7 inches with an average of 0.5 feet.

6.4.4 Exhibit E – Reclamation Plan

14. *As mentioned, per Rule 3.1.9(3), please include the proposed locations of topsoil piles within the mining plan map C-2.*

Map C-2 has been updated to show a typical topsoil stockpile location during the first phase of mining. However, all potential stockpile locations have not been identified because they will be constantly changing throughout the life of the mine. As mining occurs in 3-5 acre cells with previous areas immediately going into reclamation, the topsoil stockpile location will be moving along with mining. Topsoil will be placed directly for reclamation when possible, or stored and vegetated near the active mining area. Topsoil will generally be placed near the active mining and reclamation area, in areas that have already been disturbed when possible. This is clarified in the text.

15. *Per Rule 3.1.9(4), please commit to rehandling the topsoil stockpiles as little as possible during mining.*

This language has been added to the revised Exhibit E.

16. *Per Rule 3.1.13, please include a section committing to all applicable reporting requirements of any toxic or hazardous substances pursuant to the referenced rule.*

Language has been added to the revised Exhibit E stating that no toxic or hazardous materials are expected as a result of mining and reclamation.

6.4.7 Exhibit G – Water Information

17. *The discussion on the floodplain and floodway needs more detail. Given that Big Sandy Creek flows through the middle of the site, how is the site not in the floodway? Should the text state that the affected area is not in the floodway? Also, provide more detail on the "upstream data" referenced in the Floodplain section (Section 3.).*

The text has been corrected to address this error and provide more information on upstream flood patterns. The site is most likely within the floodway and floodplain, more details are provided in the text.

18. *The text appears to contain a contradiction related to storage of diesel fuel and oil. On the first page of Exhibit G, the text states that there will be no storage, but on the third page there is a discussion of secondary containment and related practices. The text needs to be revised to address this contradiction.*

The text has been revised to remove this contradiction. Diesel fuel and oil will be stored on site using secondary containment.

19. *In Section 6.1, the text states that reclamation will return the flows to pre-mining conditions. However, for three of the basins, Table G-3 indicates that post-mining flows will be higher than baseline flows. The applicant needs to add a discussion addressing this apparent contradiction between the text and table. This is related to a more general issue: the text needs to provide more explanation as to how the modeling shows that the applicant will comply with Rule 3.1.6 of the Division's Construction Materials rules.*

Please see the revised Exhibit G text and map for more information on the runoff calculation and correction of the runoff volumes during the phases of mining. The first page of Appendix G-1 describes the calculations.

The hydrology calculations have been reinterpreted to resolve the issue with more runoff during reclamation. As the site is being reclaimed to match the pre-mine vegetation (rangeland), the runoff coefficient will be the same as baseline conditions. The same runoff coefficient combined with shallower backfilled slopes results in a slightly smaller runoff amount in reclamation. Please see the revised calculations in the Exhibit G maps and text.

20. *Section 6.1.2 includes text regarding a "reclaimed reservoir." Please elaborate on where this reservoir is located. It is not apparent on the Reclamation Map, Exhibit F-1. Also not mentioned in post mining land use.*

This language has been removed from the revised text. Map F-1 is updated to state the land use as rangeland.

21. *At the bottom of the third page, a reference is made to the Mile High Flood District. This appears to be a reference to a manual or other document. Please revise the text as appropriate.*

This reference has been removed.

22. *In the text for Appendix G-1, there is a reference to six drainage basins. Is that correct or are there only five basins? Please revise the text as necessary.*

This error has been corrected.

23. *In the text for Appendix G-1, there is a reference to a "Lockhart surface hydrology model." Please provide a detailed reference for this model.*

The naming of the hydrology model is updated. The model refers to the hydrology calculations and map that correspond to this site.

24. *On G-1 Drainage Map, the scale appears to be incorrect. In addition, the legend appears to label the river corridor as rangeland. Please revise this map.*

The map has been revised to fix these issues.

25. *More details are needed to illustrate how intensity values were determined; Exhibit G should be revised accordingly. Describe the methodology, assumptions, and inputs used and provide examples. Is the middle table on page 32 of Appendix G-1 used? If so show sample calculations to illustrate how it is used. Finally, how does the methodology correspond to Chapter 5 of the Urban Storm Drainage Criteria Manual of the Mile High Flood District?*

Please see the revised Exhibit G text with more information on the stormwater runoff calculations and removal of irrelevant references. The beginning page of Appendix G-1 describes how the calculations were made using the Rational Method.

26. *More details are needed to illustrate how runoff coefficients were determined; Exhibit G should be revised accordingly. What percentage of imperviousness are assumed for different conditions (baseline, mining, reclamation) and each of the basins? What soil groups are assumed for mining and reclamation (post-mining) conditions? Furthermore, the Division calculates different coefficients than in Appendix G-1. For example, for Drainage Basin 4, Baseline condition, the application uses a runoff coefficient of 0.24. From Table 6-4 in Volume 1 of the Urban Storm Drainage Criteria Manual, the Division calculates that the runoff coefficient should be 0.49 for a 100-year storm, D-group soils, and an impervious area of two percent.*

The beginning page of Appendix G-1 describes the runoff coefficients used for the Rational Method Calculations. The coefficients were derived from the American Society of Civil Engineers (ASCE) tables and Urban Drainage Criteria Manual. The imperviousness of the site is low due to the agricultural land use. It has minimal effect on the ASCE land use values which were the primary source of the initial coefficients. However, the Urban Drainage values are taken into account for the revised Exhibit G.

The hydrology calculations have been revised with more appropriate coefficients for D-group soil types in the north of the site. Other portions of the hydrology section were updated accordingly to account for the new runoff amounts.

The soil group assumptions and reasoning were provided in Exhibits G and I. As the site is not mapped by the NRCS for soil groups, upstream soil types were assumed to be the same on site depending on the topography, vegetation, and other patterns along the creek.

27. *Please address the additional comments provided by DWR.*

These items are addressed at the end of this letter.

6.4.8 Exhibit H – Wildlife Information

28. *Please address all applicable comments provided by CPW in this section.*

These comments and recommendations are addressed after the DRMS adequacy items. Exhibit H has been updated to reflect any commitments made in response to the CPW comments.

6.4.10 Exhibit J – Vegetation Information

29. *On page J-1 of the application, the applicant states that some areas of the site are currently used as agricultural fields. Please identify these areas within pre-mining map C-1.*

Please see the revised Map C-1 which identifies the existing agricultural fields as rangeland.

6.5 Geotechnical Stability Exhibit

30. *On page GS-1 of the application, please clearly define Bishop's method of slices within the text.*

Please see the updated geotechnical exhibit.

31. *The intended mining setback is not clearly defined within the exhibit. On page GS-4 of the application, a setback of greater than 120 ft is listed for the active mining phase of the operation within table GS-2. An addition setback of 110 is listed with a FOS of 1.5. Later, a setback of 50 ft is mentioned based upon the location of a 1.5 FOS compared to the closest structure. Please clarify the total intended setback from the transmission lines.*

Please see the updated geotechnical exhibit. The setback to the powerlines is 100 feet as indicated on the maps and text. The language has been clarified to explain the various distances in the geotechnical report.

32. *On page GS-4 of the application, the applicant states that a secondary analysis was used to determine the 50 ft distance from the structures that allows for a 1.5 FOS but is not included in the exhibit. Please include this analysis and any other necessary supporting documentation.*

Please see the updated geotechnical exhibit.

Colorado Parks and Wildlife (CPW) Comments & Recommendations

1. *The Importance of High Priority Habitats (HPH)*

The CPW Mapping service was consulted in the development of the wildlife discussion of the permit. The HPH mapping was reviewed for the site in response to these comments. The HPH's identified are Aquatic Native Species Conservation Waters, Mule Deer Severe Winter Range, and Mule Deer Winter Concentration. The presence of these habitats have been added to Exhibit H with a discussion on how to manage and mitigate impacts from mining.

2. *Native Fish and Aquatic Species Conservation Waters*

The presence and importance of these habitats within the Big Sandy Creek are recognized and the Limon Sand and Gravel operation will work to limit effects from mining as much as possible.

As noted by the CPW and in the DRMS Permit materials, this is an ephemeral drainage that is dry throughout most of the year. Additionally, CPW mapping shows a general area for this habitat that only roughly corresponds to the Big Sandy Creek. On the site, this habitat better corresponds with the creek corridor which can be denoted in aerial mapping by visible drainages and denser vegetation.

All mining is planned to take place outside of this corridor in areas that have previously been disturbed or are rangeland used for grazing. The majority of disturbances near the creek will be limited in size (3-5 acre pit, and 45 acre processing area), and isolated through stormwater BMP's to prevent any pollution into the creek. The only disturbance in the creek will be the creek crossings.

Each request from the CPW regarding the native fish and aquatic species conservation waters is addressed below:

- 500 feet buffer from high water mark: A 500 foot buffer from the high water mark seems unnecessary for multiple reasons:
    - This is an ephemeral stream that runs dry for the vast majority of the year, therefore many of the aquatic species, such as fish, would also not be present for the vast majority of the year.
    - The river corridor where these species would spend most of their time will remain undisturbed apart from stream crossings which have already been disturbed. Any improvements or expansion of these crossings will use sediment control BMP's and any necessary US Army Corp of Engineer permitting to protect the potential wetlands.
    - Mining will occur in a 3-5 acre pit that will move around the site. It will be outside of this 500 foot boundary for the majority of the mine life.
    - The area within this 500 foot buffer that will be mined has already had an effect on wildlife as it is currently used by cattle for grazing or has been previously mined and reclaimed.

- Avoid stream bed disturbance from mining and construction: Mining and mine development construction will not take place in the streambed. The stream will only be interacted with at the existing crossings.
- Stream bed crossings, riparian zones, treed areas, etc: Only existing stream crossings will be used. Details on their improvement to facilitate mine access to the northern mining areas is addressed in the revised permit. These will be treated as stream crossings, with sediment controls, throughout the year regardless of if the stream contains water or is dry. They are perpendicular to the stream and outside of potential riparian zones as mapped by the National Wetlands Inventory. Stream crossing will be minimized, particularly during the wet season, but can't be avoided entirely. Trees will not be removed and the existing crossings are in areas with less trees.
- Erosion and sediment controls: BMP's will be used on all crossings and mining areas to prevent deposition into water ways. These are identified in the permit and include stormwater berms, wattles, and other methods of containing stormwater to prevent sediment discharge.

3. *Mule Deer Severe Winter Range and Mule Deer Winter Concentration Area*

The presence of these habitats was identified in the initial permit application and the applicant acknowledges the recommendations provided by the CPW. However, due to the nature of an aggregate operation, the recommended construction limitation from December 1-April 30 is not feasible. Additionally, the entirety of what will be mined has historically been disturbed to wildlife by cattle grazing. However, the river corridor and trees where the presence of mule deer is more likely will not be disturbed which provides a buffer for these important habitats. To protect these habitats, the applicant commits to limiting new ground disturbances to only occur out of the December 1 – April 30 window.

4. *Golden Eagle, Migratory Birds, and Raptors*

No active nests are mapped or known to exist at the site. Pre-construction surveys will be conducted to identify the presence of raptor nests. If they are identified, proper measures will be taken to mitigate impacts at the guidance of the CPW and. USFWS

5. *Fencing*

No new fencing is planned to be constructed in this application. If fencing is constructed in the future, it will be completed following the CPW fencing guidelines.

6. *Noxious Weeds and Native Re-seeding*

Noxious weeds and re-seeding are addressed in the reclamation section of the permit.

7. *Wildlife Escape Ramps*

The ramp used to access the pit during mining will serve as the pit ramp.

8. *Lighting*

Lighting will be limited as much as possible, and down-shielded when present.

Groundwater Monitoring Plan Adequacy Items

1. *The description of the physical geology of the site and sampling area is lacking. Provide more details about the topography, land use, surface cover, all relevant physical features, past and present activities, existing structures, etc. Provide more details about the current physical settings of the area, including more information about the topography and about the Big Sandy Creek (i.e. the total elevation change, the distribution of elevation changes, the creek's dimensions, flow direction, seasonal flow patterns, etc.).*

Please see the updated Monitoring Plan for more information on the site and Big Sandy Creek.

2. *The permit file shows that there was a previous 111 permit within the proposed permit area. Provide details about this area in the site description of the GWMP.*

Please see the updated Monitoring Plan for information on the previous 111. More information on it is provided in the reclamation permit application.

3. *More detail is needed to fully describe the geology of the area. Maps or cross section information may be helpful to better describe how the thickness of the overburden varies in depth across the site and the Big Sandy Creek. Provide information about the presence of faults and other major geological structural features of this area.*

Please see the updated Monitoring Plan with more geologic information and the C-3 map for cross sections with well depths. No faults or other major geologic structural features exist at this site since it is a simple alluvium deposit.

4. *The aquifer description provided in the proposed GWMP is for the Colorado River Basin. The proposed permit area, with the Big Sandy Creek running through it, is located in the Arkansas River Basin. Provide information about the Arkansas River basin for the proposed operation site. Include information about any known aquitards and/or confining layers present within and in the vicinity of the proposed site.*

Please see the updated Monitoring Plan with the relevant groundwater information pertaining to the Upper Big Sandy Groundwater Basin and Arkansas River Basin.

5. *Two maps are required within the GWMP. One map to show the vicinity of the proposed permit area and its geographic region. A second map to show the proposed monitoring well locations, the potentiometric contour lines of the existing water table or details about the groundwater directional flow, information on all permitted wells, all springs and seeps, and any geological*

outcrops that may be present in the area. There is one arrow provided in Figure 2 – Groundwater Sampling Locations, however, one arrow describing the groundwater flow is not sufficient given the large size of the proposed permit area. The two images provided do not meet the requirements of a map as outlined by Rule 6.2.1(2) and the Guidance Document. Please provide two maps that meet the requirements outlined in Rule 6.2.1(2) (with the exception of the scale requirements) and that includes all of the required information given in item 1.1. Site Description of the Guidance Document.

Figure 1 depicts the proposed permit area and geographic region. A map was added to Appendix 1 that depicts the remaining items.

6. *The proposed network of three groundwater monitoring wells is not sufficient to allow for the assessment of the potential impacts to the prevailing hydrologic balance by the proposed future mining operation. As stated before, the Big Sandy Creek runs through the proposed site, with the permit boundary extending to the north and south of the Big Sandy Creek. Depending on the geological setting information provided in response to item #5 above, the GWMP should have at minimum 3-4 monitoring wells for mining phases 1 and 6, 3-4 monitoring wells for mining phases 2 and 3, and 3-4 monitoring wells for mining phases 4 and 5. Please design a network of groundwater monitoring wells that will be sufficient to assess the current groundwater characteristics and be able to affectively monitor the groundwater conditions throughout mining operations.*

Please see the revised monitoring plan that meets these requirements by proposing monitoring stages as mining progresses through site.

7. *The proposed four groundwater monitoring wells, GW-1, GW-2, GW-3, and GW-4, are not all located within the proposed permit area. According to the Guidance Document, all groundwater monitoring wells should be within the permit area. The requested network (see item #6 above) should have all of the groundwater monitoring wells located within the proposed permit area.*

Based on discussions with the Division, the monitoring plan has been revised to construct new wells in the permit area, but also keep three wells that are outside of the permitting area as part of monitoring. This is detailed in the revised plan. All wells that will be used for water quality sampling are within the permit area. Three existing stock wells that are outside of the permit area will be used only for depth measurements.

8. *As stated above, the proposed use of existing wells will not be adequate as they don't meet requirements for proper installation. The existing wells that are within the proposed permitted area (GW-1, GW-2, and GW-3) are not as deep as the proposed mining project which calls for excavating to a depth of approximately 45 feet. All monitoring wells should be at a minimum*

depth of the proposed mining depth. These requirements will be determined by the nature of the aquifer(s) and the response to the overall site description (see items #1, #2, #3, and #4 above). The requested network of monitoring wells (see #6 above) should be at an appropriate depth based on the aquifer(s), geologic features, and the hydrogeology of the area. Be advised, upon the approval of a more robust monitoring network system, the information about well installation will need to meet the requirements outlined in the Guidance Document.

This comment has partially been addressed by items #1, #2, #3, and #4 above. More information regarding the well depth has been added to the GWMP. All of the existing wells were constructed and permitted with the DWR, therefore should meet the well installation Guidance. Additionally, all wells are drilled to the shale bedrock as can be seen in their construction logs. Mining will not exceed the shale bedrock, and will actually leave a minimum 2 foot buffer or more. Therefore, the wells meet or exceed the proposed mining depth. The depth of the bedrock and mining floor vary with the terraced topography created by the Big Sandy Creek. The shale bedrock, and therefore mining floor, are more shallow closer to the creek, and deeper further from the creek. Please see the C-3 cross section map that demonstrates this.

9. *Information about the how water quality data will be analyzed is not provided. According to the Guidance Document, information about how this data will be analyzed is required. If a modeling program will be used, provide an explanation for why the modeling program was selected, any assumptions that are made, parameter values for boundary conditions and initial conditions, and the model calibration.*

The information about analysis of the water quality data was provided in section 4.5 and 4.6. Groundwater modelling will not be conducted as there is no proposed slurry wall.

10. *A reporting schedule for data collection of the groundwater quantity is stated as being included with the annual report after baseline is established. The Operator should expect to follow the quarterly reporting scheduled outlined in the table below. This reporting schedule will remain in place during the baseline establishment process and for a year after mining operations have begun, at minimum (see item #18 below for more details).*

Table 1: Reporting Schedule

Quarter	Reporting Due Date
Q1	May 1
Q2	August 1
Q3	November 1
Q4	February 1 of the next year

Please see the revised monitoring plan with added language regarding the reporting schedule.

11. *Provide more detail about the anticipated effects to the groundwater quantity caused by the dewatering and the timescale over which it will be observed. Include information about the anticipated time for recovery to a steady state occur after reclamation activities have been completed.*

This comment is not relevant to this proposed mining operation. Pit dewatering will not take place as this is a wet pit.

12. *Provide more details about the anticipated effects to groundwater quality the operation may cause. It is stated that "the pit acts as a gravel filter preventing pollution from traveling to the aquifer" on page 7 of the proposed GWMP. Address any quality parameters that may increase or decrease because of the proposed mining operation and the decrease in the sand and gravel layer at the surface (approx. 45 feet in depth). Provide information about the spatial and temporal extent of the possible impacts on both the quantity and the quality of the groundwater.*

Please see the updated Monitoring Plan for more information on the predicted impacts to the groundwater.

13. *Multiple points of compliance (POC) will be required for the proposed site, including at least one located on the north side and the south side of the Big Sandy Creek and down gradient of the mining proposed mining disturbance. Please reconsider the location of the proposed POC and include at minimum one either side of the Big Sandy Creek. Additional POC locations may be required based on the full description of the site (see items #1, #2, #3, and #4 above).*

Please see the revised monitoring plan with updated POC locations.

14. *A schedule for monitoring frequency is given in the GWMP under section 3.1. Refer to the above table regarding the reporting schedule that should be expected for the monitoring wells and the POC sites.*

This comment has already been addressed, please see the revised monitoring plan.

15. *At this time, the Division cannot affectively assess the adequacy of the proposed locations of the sampling locations due to the insufficient information about the geography, geology, and hydrogeologic setting given for the area. The Division's suggestion for the number of wells for each proposed mining phase given in item #6, are speculative based on the sizes of the phases. The actual number and the location of the monitoring sites will need to be determined based on the characteristics of the aquifer(s), the geography, geology, and hydrogeology in the area (see items #1, #2, #3, and #4 above).*

This comment has already been addressed, please see the revised monitoring plan.

16. *The proposed sampling frequency given in the GWMP will not be sufficient to assess any impacts that may be occur after mining activities begin. Please refer to the above table regarding the monitoring schedule that should be expected for the monitoring wells and the POC sites. Monitoring all well sites will allow for the Operator to better implement a mitigation plan prior to any exceedances of a contaminate migrating to a POC location. The Operator should be advised that an exceedance detected at a POC may result in the Division issuing a possible violation in accordance with C.R.S. 34-32.5-116(4)(i) for failure to protect areas outside of the affected land. The Operator is advised to implement a mitigation plan when exceedances are detected at monitoring sites to prevent exceedances from occurring at any POC location.*

Parts of this comment have already been addressed. A mitigation plan for exceedances was provided in section 4.7, and has been revised in the updated version.

17. *As a mitigating procedure, the Operator proposes consulting with Garfield County Department of Environmental Health and notifying the Garfield County staff of exceedances. The proposed site is not located in Garfield County, please revise the proposed mitigation plan to include contacting local agencies and authorities.*

The plan has been updated with the relevant information.

18. *To reiterate, after five (5) consecutive quarters of acceptable data have been collected, baseline standards can be established for the site with the submission of a Technical Revision with the Division. After baseline is established, and mining operations proceed, and groundwater can be exposed. The Operator will be required to maintain a quarterly sampling frequency at all monitoring sites and the POC sites for, at a minimum, a year. The Division will consider reducing sampling frequency through a Technical Revision application that provides evidence, deemed satisfactory by the Division, for a potential reduction in frequency.*

Noted.

Attachments

- Newspaper Proof of Publication
- Public Notice to Colorado State Land Board Certified Mail Receipts
- Proof of Mine Sign Posting at Site
- Revised Permit Items:
    - Maps C-1, C-2, F-1, C-3, G-1
    - Exhibits D, E, G, H
    - Geotechnical Stability Exhibit
    - Groundwater Monitoring Plan

Publisher's Affidavit

State of Colorado)

)ss.

County of Lincoln)

I, Catherine Thurston, do solemnly affirm that I am the Publisher of THE LEADER; that the same is a weekly newspaper published at Limon, County of Lincoln, State of Colorado, and has a general circulation therein; that said newspaper has been continuously and uninterruptedly published in said County of Lincoln for a period of at least 52 consecutive weeks next prior to the first publication of the annexed notice, that said newspaper is entered in the post office at Limon, Colorado as second class mail matter and that said newspaper is a newspaper within the meaning of the Act of the General Assembly of the State of Colorado, approved March 30, 1923, and entitled "Legal Notices and Advertisements," with other Acts relating to the printing and publishing of legal notices and advertisements. That the annexed notice was published in the regular and entire issue of said newspaper, once each week for 4 successive weeks; that the first publication of said notice was in the Issue of said newspaper dated;

November 28 2024

and the last publication of said notice was in the issue of said newspaper dated;

December 19 2024

and that copies of each number of said paper in which said notice and/or list was published were delivered by carriers or transmitted by mail to each of the subscribers of said newspaper, The Leader, according to the accustomed mode of business in this office.

Publisher

The above certificate of publication was subscribed and affirmed to before me, a Notary Public, to be the identical person described in the above certificate, on the

31st day of December, 2024

Notary Public

CHEYENNE CHAMBERS
Notary Public
State of Colorado
Notary ID # 20244022749
My Commission Expires June 14, 2028

as this hearing may be adjourned, a public hearing will be held upon the Development Permit 24-05 for Lincoln County on file at the

may obtain more information at the Lincoln County Land Use Office located at: Lincoln County Land Use Office 326 8th St.

2024

In the Leader
Legal No. 175

Mid-States Materials, whose address is 1800 NW Brickyard Rd, Topeka, KS, 66618, and phone number is (785) 835-2444, has filed an application for a REGULAR (112) Construction Materials Reclamation Permit with the Colorado Mined Land Reclamation Board under provisions of the Colorado Mined Land Reclamation Act. The proposed mine is known as Limon Sand & Gravel Resource, and is located at or near SECTION 28, TOWNSHIP 9N, RANGE 56W of the 6th Prime Meridian.

The proposed date of commencement is January 2025, and the proposed date of completion is January 2078. The proposed future use of the land is rangeland. Additional information and tentative decision date may be obtained from the Division of Reclamation, Mining, and Safety, 1313 Sherman Street, Room 215, Denver, Colorado 80203, (303) 866-3567, or at the Lincoln County Clerk & Recorder's Office, 103 3rd Avenue, Hugo, CO 80821, or the above-named applicant. A complete copy of the application is available at the above-named County Clerk and Recorder's office and at the Division's office.

Comments concerning the application and exhibits must be in writing and must be received by the Division of Reclamation, Mining, and Safety by 4:00 p.m., 20 days after the final publication of this notice.

Please note that under the provisions of C.R.S. 34-32-101 et seq. Comments related to noise, truck traffic, hours of operation, visual impacts, effects on property values and other social or economic concerns are issues not subject to this Office's jurisdiction. These subjects, and similar ones, are typically addressed by your local governments, rather than the Division of Reclamation, Mining, and Safety or the Mined Land Reclamation Board.

First publication Nov. 28, 2024
Final publication Dec.19, 2024
in The Leader
Legal No. 169

PAGE 15 THE LEADER THURSDAY, DECEMBER 19, 2024

U.S. Postal Service
Certified Mail Receipt

OUTBOUND TRACKING NUMBER
9414 7118 9956 0948 6867 95

RETURN RECEIPT TRACKING NUMBER
9490 9118 9956 0948 6867 44

FEES

Postage per piece	$0.690
Certified Fee	$4.850
Return Receipt Fee	$4.100
Total Postage & Fees:	**$9.640**

ARTICLE ADDRESS TO:

State Land Board
1127 N Sherman St
Denver CO 80203-2281

TOWER STATION PO, AURORA CO 80015
FEB 28 2025
Postmark Here
USPS

SENDER: COMPLETE THIS SECTION

- Ensure items 1, 2, and 3 are completed.
- Attach this card to the back of the mailpiece, or on the front if space permits.

COMPLETE THIS SECTION ON DELIVERY

A. Signature: (☐ Addressee or ☐ Agent)
X

B. Received By: (Printed Name)

C. Date of Delivery
3/5/25

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

1. Article Addressed to:

State Land Board
1127 N Sherman St
Denver CO 80203-2281

9490 9118 9956 0948 6867 44

2. Article Number (Transfer from service label)
9414 7118 9956 0948 6867 95

3. Service Type
☑ Certified Mail®

Limon S&G

PS Form 3811 Facsimile, July 2015 (SDC 3930)

Domestic Return Receipt

LEGEND

BUILDINGS AND RELATED STRUCTURES
- Building
- Fence

LAND SURVEYS
- Property Boundary

ROADS AND RELATED FEATURES
- Highway
- Light duty road, gravel

RIVERS, LAKES, SHORELINES, AND CANALS
- Perennial stream/ditch
- Perennial river
- Perennial lake/pond
- Waterwell — Well Permit No. Owner

VEGETATION
- River Corridor
- Rangeland
- NWI Wetlands
- Existing Trees

TRANSMISSION LINES AND PIPELINES
- Power transmission line; pole; tower

MINING FEATURES
- DRMS Permit/Affected Area
- 200' Offset of DRMS Permit Boundary
- 600' Offset of DRMS Permit Boundary

BASELINE CONTOURS
- Index — Approximate of indefinite
- Intermediate — Approximate of indefinite
- Supplementary

S21 T9S R56W
S22 T9S R56W
S24 T9S R56W
S26 T9S R56W
S27 T9S R56W
S28 T9S R56W
S33 T9S R56W
S34 T9S R56W
S35 T9S R56W

CRAIG RANCH PROPERTY
STATE LAND BOARD PROPERTY
BIG SANDY CREEK
COUNTY ROAD 3E
COUNTY ROAD 23
PERMIT AREA: 1094.5 ACRES
ALL WELLS & STRUCTURES ON AND WITHIN 200' OF PERMIT AREA ARE PROPERTY OF CRAIG RANCH (LANDOWNERS)
PRE-MINE LAND USE: RANGELAND
Active Mining Permit M-2013-080
Previously Mined 111 Permit
DAMAGED FENCE FROM PREVIOUS PERMIT 111
PERMIT 111 BOUNDARY
AFFECTED AREA TOTAL: 957.5 AC.
TRANSMISSION LINES OWNED BY MOUNTAIN VIEW ELECTRIC ASSOCIATION
SITE ACCESS
52-89 (70?)
5275'
5250'
5225'
5300'

NOTE:

WELL LOCATIONS MODIFIED FROM CDWR DATA BASED ON SITE INVESTIGATION AND LAND OWNER INFORMATION.

PARCEL BOUNDARIES ESTIMATED. NO GIS DATA AVAILABLE.

C-1 Baseline Map

Limon Sand & Gravel

DRMS Permit Number: N/A		**Bettis Companies**
Mine Entry Location:	Latitude: 39.234283	Longitude: -103.643228
State: COLORADO	County: LINCOLN	Nearest Town: LIMON, CO.
Section: 27	Township: 9	Range: 56 PM: 6TH
Major Watershed:	Arkansas	MSHA ID: ----
Map Scale: 1": 500'		

0 500' 1000'

Map Georeferencing Information:	**Datum:** NAD83	**Projection:** CO CENTRAL
Survey Source: USGS	**Drawn by:** SAC	Date: 05-09-25
Imagery Source: N/A	**Checked by:** BHM	Date: 05-09-25
Survey Date: 2023	**Approved by:** BHM	Date: ----
Imagery Date: N/A		

File Name: Limon Sand and Gravel 240724_recover

Lewicki & Associates
3375 West Powers Circle Littleton, CO USA 80123 (303)-346-5196 info@lewicki.biz

LEGEND

BUILDINGS AND RELATED STRUCTURES
- Building
- Fence

LAND SURVEYS
- Property Boundary

ROADS AND RELATED FEATURES
- Highway
- Light duty road, gravel

RIVERS, LAKES, SHORELINES, AND CANALS
- Perennial stream/ditch
- Perennial river
- Perennial lake/pond
- Waterwell (Well Name)

VEGETATION
- River Corridor
- NWI Wetlands
- Existing Trees

TRANSMISSION LINES AND PIPELINES
- Power transmission line; pole; tower

MINING FEATURES
- DRMS Permit/Affected Boundary
- Mining Areas
- Stormwater Berm

BASELINE CONTOURS
- Index — Approximate of indefinite
- Intermediate — Approximate of indefinite
- Supplemental

POST-MINING CONTOURS
- Index — Approximate of indefinite
- Intermediate — Approximate of indefinite
- Dump

BIG SANDY CREEK

COUNTY ROAD 3E

COUNTY ROAD 23

PERMIT AREA: 1094.5 ACRES

MINING AREA 4: 165 ACRES

MINING AREA 5: 70 ACRES

MINING AREA 3: 232 ACRES

MINING AREA 2: 95 ACRES

MINING AREA 1 & 6: 336 ACRES

Terrace Mining Area 4

Terrace Mining Area 5

Terrace Mining Area 3

Terrace Mining Area 2

Terrace Mining Area 1

Terrace Mining Area 6

Upland Mining Area 3

Upland Mining Area 4

Upland Mining Area 2

Upland Mining Area 5

Upland Mining Area 1

Processing Area

OVERBURDEN FROM TERRACE AREAS USED TO BACKFILL UPLAND AREAS AFTER GRAVEL IS REMOVED

LOW WATER CROSSING DEVELOPED ON EXISTING PATHS

100' EXCAVATION SETBACK

100'

MINING SLOPES MAX. 3H:1V

MINED & BACKFILLED AS OF 2024

TOPSOIL STOCKPILE LOCATION FOR 1ST MINING AREA (TYP.)

SITE ACCESS

AFFECTED AREA TOTAL: 957.5 AC.

52-89 (70²)

5275'

5250'

5225'

5300'

NOTE:

WELL LOCATIONS MODIFIED FROM CDWR DATA BASED ON SITE INVESTIGATION AND LAND OWNER INFORMATION.

PARCEL BOUNDARIES ESTIMATED. NO GIS DATA AVAILABLE.

C-2 Mining Map

Limon Sand & Gravel

DRMS Permit Number: N/A — **Bettis Companies**

Mine Entry Location:	Latitude: 39.234283	Longitude: -103.643228
State: COLORADO	County: LINCOLN	Nearest Town: LIMON, CO.
Section: 27	Township: 9	Range: 56 PM: 6TH
Major Watershed:	Arkansas	MSHA ID: ----

Map Scale: 1": 500'

0 500 1000

Map Georeferencing Information: **Datum:** NAD83 **Projection:** CO CENTRAL

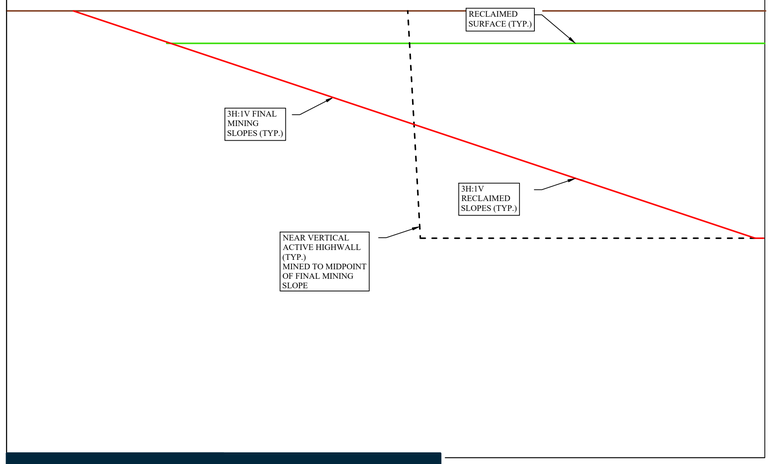
Survey Source: USGS	**Drawn by:** SAC	Date: 05-09-25
Imagery Source: N/A	**Checked by:** BHM	Date: 05-09-25
Survey Date: 2023	**Approved by:** BHM	Date: ----
Imagery Date: N/A		

File Name: Limon Sand and Gravel 240724_recover

Lewicki & Associates

3375 West Powers Circle
Littleton, CO USA 80123
(303)-346-5196
info@lewicki.biz

DETAIL 1 - TYPICAL SLOPES



LEGEND

ROADS AND RELATED FEATURES
- Highway
- Light duty road, gravel

RIVERS, LAKES, SHORELINES, AND CANALS
- Perennial stream/ditch
- Perennial river
- Perennial lake/pond

MINING FEATURES
- DRMS Permit/Affected Boundary

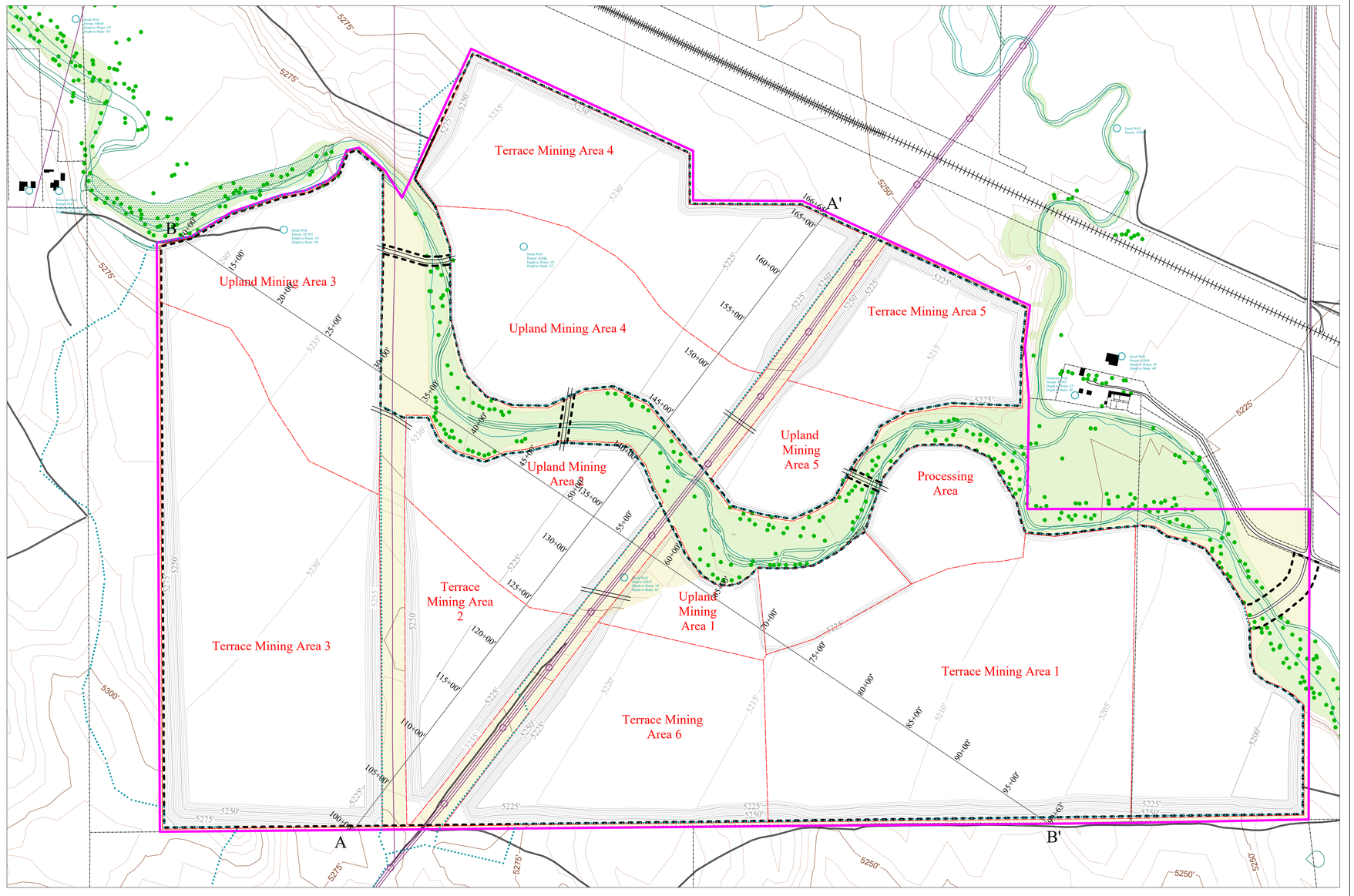
VEGETATION
- River Corridor
- NWI Wetlands

TRANSMISSION LINES AND PIPELINES
- Power transmission line; pole; tower

BASELINE CONTOURS
- Index
- Intermediate

POST-MINING CONTOURS
- Index
- Intermediate

POST-RECLAMATION CONTOURS
- Index
- Intermediate



CROSS SECTION LEGEND

MINING FEATURES
- DRMS Permit Boundary
- Disturbance Limit

CROSS SECTIONS
- Baseline Topography
- Mining
- Reclamation
- Anticipated Lake Level
- Slurry Wall

C-3 Cross Sections

Limon Sand & Gravel

DRMS Permit Number: N/A — **Bettis Companies**

Mine Entry Location:	Latitude: 39.234283	Longitude: -103.643228
State: COLORADO	County: LINCOLN	Nearest Town: LIMON, CO.
Section: 27	Township: 9	Range: 56 PM: 6TH
Major Watershed:	Arkansas	MSHA ID: ----

Map Scale: 1" = 300'

0 300 600 N

Map Georeferencing Information:	**Datum: NAD83**	**Projection: CO CENTRAL**
Survey Source: USGS	**Drawn by:** SAC	Date: 05-09-25
Imagery Source: N/A	**Checked by:** BHM	Date: 05-09-25
Survey Date: 2023	**Approved by:** BHM	Date: ----
Imagery Date: N/A		

File Name: Limon Sand and Gravel 240724_recover

Lewicki & Associates
3375 West Powers Circle Littleton, CO USA 80123 (303)-346-5196 info@lewicki.biz

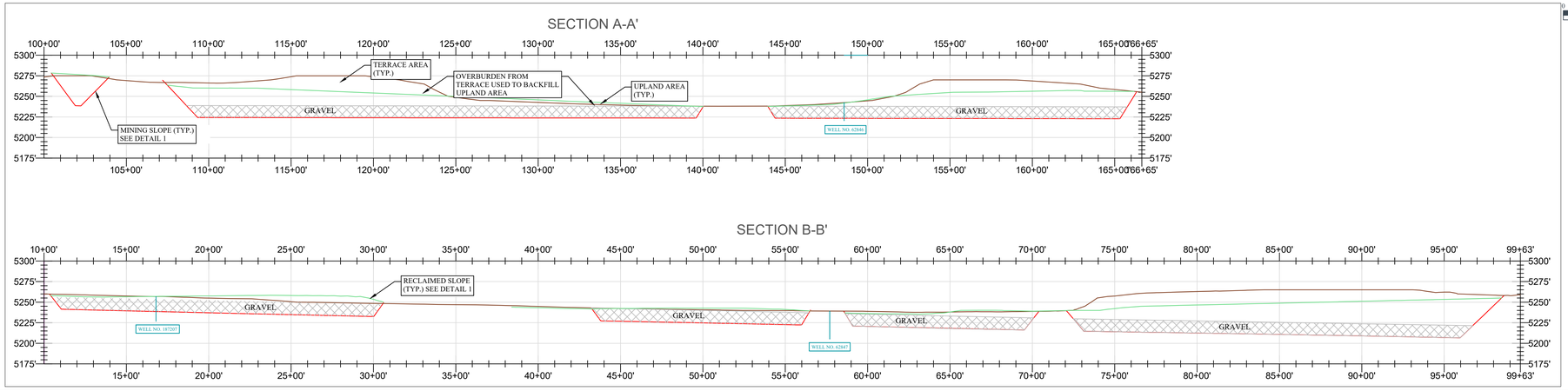


EXHIBIT D MINING PLAN

1. General Mining Plan

The property boundary has been surveyed. Map C-2 outlines the mining plan including the affected area of 957.5-acres. Sand and gravel will be extracted for use in construction materials such as crushed rock, sand, washed rock, concrete, and asphalt. There is also the possibility of incidental fill dirt production.

Access to the mine will be from County Road 23 that connects the mine to Highway 287 to the north. This road connects directly to mining areas 1 and 6. Drainage crossings and crossings under the overhead utility lines will be constructed to connect to the other mining areas.

The sand and gravel deposit to be mined averages 10 feet in thickness. The overlying overburden varies greatly in thickness due to the terracing present above the upland areas surrounding the drainage. Closer to the ephemeral drainage through the center of the site, overburden thins out, and ranges from 1-10 feet increasing towards the terraces. The deposit underlies 15-35 feet of overburden under the terraces. The terrace and upland areas in relation to the deposit are depicted on Map C-3. The sand and gravel deposit overlays shale bedrock at varying depths dependent on the overlying material.

Dozers and scrapers will strip topsoil and overburden from mining areas, storing them in designated stockpiles. Any stockpile remaining for over 90 days will be seeded to prevent erosion. During pre-mine stripping, all agricultural structures will be demolished. These structures include fences, gates, windbreaks, and some stock wells and their associated structures that are within the mining area. Areas will only be stripped when necessary for the next area of mining. Some overburden and topsoil may be directly placed as backfill, particularly the terrace overburden as backfill into the upland areas. The stockpile locations will vary as mining progresses in 3-5 acre cells. They will generally be located near the active mining and reclamation area in an area that has already been mined or disturbed when possible.

Sand and gravel extraction will involve loaders, excavators, dozers, and trucks. Mined material will then be transported to the processing area, which will move around the site as mining progresses. Processing will include crushing, washing, and screening. Portable concrete and/or asphalt plants may also be present at the site. While haul trucks are currently anticipated, there is potential for replacement by a conveyor belt in the future following a technical revision with the Division.

Sand and gravel will be mined in cells of 3-5 acres at a time within each mining area. Mining will progress from the upland areas with the least amount of overburden to the terraced areas. After each small section is mined, the overburden from that area will be used as backfill on the previously mined area. This will repeat in sections until the terraced area is mined out, with reclamation of backfilled areas occurring as mining progresses. Augmentation water will be

needed for the evaporative losses from the exposed water and from the material mined out. The operator commits to exposing no more than 5 acres of water at a time. The area from the original 111 permit has already been backfilled, graded, and reclaimed. It is located in the center of the first mining area. This area will be left as is.

Mining and reclamation will occur simultaneously to minimize overall disturbance. There is ample on-site topsoil and overburden for successful reclamation, transforming the site back into rangeland with gentle slopes towards the drainage. The reclamation process will involve backfilling, regrading, topsoiling, and revegetation.

Mining will extend to the bottom of the gravel deposit, maintaining final mining slopes at 3H:1V along the perimeter of the wet mining cells. The active highwall will have a near-vertical slope, progressing halfway down the final mining slope to enable the dozer to knock down the remaining highwall, creating the completed mining slope. Slopes will then be backfilled with overburden from the next mining area. Reclaimed slopes will be no more than 3H:1V, but will likely be much more shallow. Slope details are available on Map C-3 cross sections.

No blasting will occur at the Limon Sand & Gravel Pit. If refuse, acid, or toxic materials are unexpectedly encountered, these materials will be removed from the site and disposed of appropriately. However, materials such as these are not expected to be encountered.

2. Mining Timetable

Mining operations at the Limon Sand & Gravel Pit are expected to take approximately 53 years to complete, based on an annual average production of 300,000 tons. Actual production rates will fluctuate based on market and deposit conditions. An approximate mining timetable based on this production and the phased mining plan is shown in Table D-1.

Table D-1 Mining Timetable

Description	Time Required
Initial stripping of Upland Area 1 and Processing Area	1 month
Mining, stripping, and backfilling Area 1 in 3-5 acre cells. Reclamation work done on areas that have been mined and backfilled.	20 years
Initial stripping of Area 2	1 month
Mining, stripping, and backfilling Area 2 in 3-5 acre cells. Reclamation work done on areas that have been mined and backfilled.	2.5 years
Initial stripping of Area 3	1 month
Mining, stripping, and backfilling Area 3 in 3-5 acre cells. Reclamation work done on areas that have been mined and backfilled.	20 years
Initial stripping of Area 4	1 month
Mining, stripping, and backfilling Area 4 in 3-5 acre cells. Reclamation work done on areas that have been mined and backfilled.	5 years
Initial stripping of Area 5	1 month
Mining, stripping, and backfilling Area 53 in 3-5 acre cells. Reclamation work done on areas that have been mined and backfilled.	2.5 years
Initial stripping of Area 6	1 month
Mining, stripping, and backfilling Area 6 in 3-5 acre cells. Reclamation work done on areas that have been mined and backfilled.	2.5 years
Total	53 years

3. Mine Facilities and Operation

The site will contain the following facilities and equipment:

Facilities:

- Portable toilet
- Mine office (portable)
- Portable fuel storage
- Portable asphalt/concrete plants may be present
- Portable crushing/screening plant

Equipment:

- Front-end loaders
- Bulldozers
- Scrapers
- Haul trucks (off highway)
- Water trucks
- Graders
- Excavators
- Conveyors (Requires Technical Revision)

Mid-States Materials, LLC will provide portable toilets and bottled water to employees on site during operations. Any fuel stored on site will have full secondary containment that can carry at least 110% of the fuel tank volume. All facilities are portable and will be removed during reclamation.

4. Topsoil and Overburden Handling

Topsoil averages 5-7 inches, averaging 0.5 feet, overlying a varying level of overburden. Overburden is thinner towards the drainage at an average of 10 feet, and thickens to 35 feet atop the terraced areas. Topsoil and overburden will be stripped with appropriate earthmoving equipment as deemed suitable for the operation such as front-end loaders, dozers, excavators, and water trucks. Topsoil and overburden will be stockpiled separately onsite in either designated stockpiles, berms, or directly placed for reclamation. Mining will progress in 3-5 acre portions in each mining area, with overburden from one portion being used as backfill to reclaim the previously mined portion. Topsoil and overburden will be sufficient to meet reclamation needs.

Table D-2 Topsoil and Overburden Material Generated During Mining

	Stripping Area (ac)	Material Generated (CY)
Topsoil	901	727,000
Overburden	901	32,705,000

Topsoil will be directly placed for reclamation as much as possible. The topsoil stockpile locations will vary as mining progresses, and will typically be located in the previously mined area adjacent to the current mining area.

Topsoil and overburden will be used to achieve the final grading shown in the reclamation map in Exhibit F. Topsoil will be replaced in a 5-7 inch layer to restore the existing soil conditions. Details pertaining to reclamation can be found in Exhibit E and the maps in Exhibit F.

5. Site Access

The Limon Sand & Gravel Resource will be accessed via the existing permitted entrance from County Road 23. Access is shown on Map C-1.

5.1. Low Water Crossings

Site and mining area access will require crossing the Big Sandy Creek, an ephemeral stream. Low water crossing that facilitate landowner access to the site already exist. These crossings are in areas of lesser vegetation.

These existing crossings will require improvements to facilitate use for mining equipment. The existing crossings are approximately 10-15 feet wide and follow the natural grade as to not block the creek when it is flowing. These existing crossings will need to be widened to 20-30 feet, but will remain as a low-water crossing. The low-water crossing will follow the bed of the drainage, and be reinforced with gravel, rip-rap, or concrete bottoms. Use will be limited during wet conditions of the ephemeral creek. Crossing designs will be submitted as a TR prior to their construction.

These crossings are on National Wetlands Inventory (NWI) mapped potential wetlands, specifically riverine habitat associated with the ephemeral stream. A USACE permit will be acquired prior to constructing these crossings.

6. Water Information, Rights, and Augmentation

All water right issues such as availability of water for this operation, consumption rates, dust control, etc. are presented in Exhibit G – Water Information.

7. Schedule of Operations

Mining operations will occur as dictated by demand with an average annual production of 300,000 tons. Mining, screening, and processing will be conducted on site with portable equipment throughout the year. The operator will not have night gravel mining operations, although minor truck activity and repairs may occur after hours.

8. Lincoln County Impacts and Environmental Impacts

All potential county impacts and concerns are addressed in the Lincoln County Use by Special Review.

EXHIBIT E RECLAMATION PLAN

1. General Reclamation Plan

The total area to be reclaimed under this permit is 901 acres out of the 1,094.5-acre permit area. Reclamation of the Limon Sand & Gravel Pit will return the site to rangeland with gentle graded slopes towards the drainage. Reclamation will occur concurrently with mining. Final reclamation will be completed after mining has finished. The pre-mine land use is predominantly agriculture with some stock structures. Surrounding land uses are agriculture. Pursuant to Rule 6.4.5.2(b), the applicant evaluated the post-mine land use in regard to adopted state and local land use plans for this area and adjacent land uses. The proposed post-mine land use of rangeland is compatible with the general agricultural character of the area. Table E-1 below summarizes the anticipated final land uses within the affected area upon completion of reclamation.

Table E-1 Reclamation Areas

Description	Area (Acres)
Disturbed Area Total (Reclaimed to Rangeland)	901
Undisturbed Area	193.5
Total Affected Area	**1,094.5**

Reclamation will occur concurrently as mining progresses. Mining will progress in 3-5 acre cells, with overburden from the subsequent mining areas being used to backfill old areas. These backfilled areas will then be topsoiled and seeded for reclamation. A maximum of 5 acres will be open for mining at a time. Mining slopes will be backfilled and graded to a maximum 3H:1V slope for reclamation, but will likely be at much more shallow slopes. The slopes will then be compacted for stabilization and to prevent erosion. All portable facilities and equipment will be removed from the area. All berms will be flattened. Any other surrounding disturbances will be topsoiled and seeded for revegetation. Topsoil will be replaced in a 5-7 inch layer to restore the current soil profile. Revegetation will be completed using a native seed mix recommended by the Natural Resource Conservation Service. Revegetation efforts will be monitored following reclamation. The pit will be used for rangeland and grazing after it has been fully reclaimed and revegetated.

The site will have the same amount of topsoil replaced as removed, with all areas being retopsoiled the same amount. Table E-2 shows the volumes of topsoil and overburden required for reclamation and the material volumes that will be stripped and stockpiled. These calculations were made assuming that the site has a uniform half foot of topsoil and 22.5 feet (average of upland and terrace area thicknesses) of overburden across all areas. Topsoil will be replaced in a 5-7 inch layer across all disturbances, while overburden and other excess material will be used to backfill the site to graded slopes.

Table E-2 Reclamation Volumes

		Material Available on Site		Requirements for Reclamation	
Disturbance Area	Area (acres)	Topsoil Stripped (CY)	Overburden Stripped (CY)	Topsoil Required (CY)	Overburden Backfill Required (CY)
Mining Area & Surroundings to be Reclaimed	901	727,000	32,715,000	727,000	32,715,000

Excess material will be used for backfilling. Mid-States Materials, LLC will keep at least the minimum amount of material (topsoil and overburden) required for reclamation of the 5 acres of disturbance throughout the entire mine life.

No toxic or hazardous materials are expected to be encountered during mining or reclamation.

2. Topsoil Replacement

All topsoil will be salvaged for use only in reclamation. The topsoil will be timely replaced as mining continues. A range of 5-7 inches of topsoil will be stripped and stockpiled prior to mining. The topsoil stockpile location will vary throughout the mine life as mining progresses in 3-5 acre cells. It will generally be placed near the active mining area in areas that have already been disturbed when possible. Stripped topsoil will be immediately placed for reclamation when possible as well. Topsoil stockpiles will be rehandled as little as possible during mining. After backfilling and grading has been completed during reclamation, topsoil will be replaced at the same thickness range, at an average depth of one-half foot in a manner that is similar to the pre-mine soil profile. Replaced topsoil will be directly placed by loaders and haul trucks. All topsoiled areas will be disced to aid in root penetration.

3. Haul Roads and Access

All internal haul roads will remain following reclamation to support the future land use.

4. Reclamation Timetable and Sequence

The sequence and timing of reclamation can be seen in Table E-4 below. The reclamation schedule is dependent on the rate of mining and fluctuating market demands. The operator will reclaim the site concurrently with the progression of mining to limit the total disturbance.

Table E-4 Reclamation Timetable

Description	Time Required
Develop, mine, then reclaim Area 1	20 years
Develop, mine, then reclaim Area 2. Area 1 reclamation finalization and vegetation monitoring.	2.5 years
Develop, mine, then reclaim Area 3. Area 2 reclamation finalization and vegetation monitoring.	20 years
Develop, mine, then reclaim Area 4. Area 3 reclamation finalization and vegetation monitoring.	5 years
Develop, mine, then reclaim Area 5. Area 4 reclamation finalization and vegetation monitoring.	2.5 years
Develop, mine, then reclaim Area 6. Area 5 reclamation finalization and vegetation monitoring.	3 years
Backfill, topsoil, and revegetate remaining disturbances	1 year
Vegetation monitoring	2 years
Total	56 years

5. Revegetation Plans

Seed will be placed in all areas to be vegetated following grading, topsoiling, and discing of the soil. All disturbances that are retopsoiled will be seeded with a Rangeland Seed Mix. The Lincoln County recommended mix to be used is as follows:

5.1. Rangeland Seed Mix

Species	Pounds of pure live seed per acre (drilled)
Sand Bluestem	1.0
Sand Lovegrass	2.5
Indian Ricegrass	3.0
Prairie Sandreed	0.75
Green Needlegrass	1.5
Little Bluestem	0.75
Yellow Indiangrass	0.5
Switchgrass	1.5
Sand Dropseed	0.5
Total	**12.0**

Broadcast seeding will be done at double the drill rate. Mulch will be placed at roughly 4000 pounds per acre.

6. Post Reclamation Site Drainage

The site will drain internally following reclamation. Site drainage will return to the same patterns as it was before mining, flowing to the ephemeral drainage at the center of the site. Refer to map G-1 for the post reclamation drainage of the site.

7. Revegetation Success Criteria

Revegetation will be deemed adequate when erosion is controlled, the vegetation cover matches neighboring rangeland areas, and when it is considered satisfactory according to Division standards. This will be monitored for a minimum of two years following the completion of reclamation.

8. Weed Control

Measures will be employed for the control of any noxious weed species. The objective of this weed management plan is to control undesirable plants on the Limon Sand & Gravel property. Plants identified through the Colorado Noxious Weed Act (C.R.S 35-5.5) and the Lincoln County Noxious Weed List as undesirable and designated for management within the county will be

removed. Any weeds identified as List A species will be eradicated. Other lower listed plants identified as noxious weeds will be managed by control measures. A Weed Control Plan will be utilized as follows:

1) Each April, a weed survey will be taken of the permit area.
2) If any patches or plants have been identified, they will be sprayed by backpack sprayer or 4-wheeler using chemicals approved for use by the weed control staff of Lincoln County.
3) After reclamation, weed surveys and spraying will continue until the perennial cover and production of the site have met DRMS requirements and bond release has been obtained.

The Division and Lincoln County staff will be consulted regarding any weed infestation areas and any control measures prior to their initiation. The plan does not contemplate total weed removal on the property. Rather, the goal is to prevent the spread of weeds into uninfected areas through eradication, containment, suppression, and restoration as is the primary goal of the Lincoln County Weed Management Plan. The methods of weed management suggested by Lincoln County that will be employed may include, but are not limited to;

1) Biological management: the use of an organism to disrupt the growth of noxious weed.
2) Chemical management: the use of herbicides or plant growth regulators to disrupt the growth of noxious weeds.
3) Cultural management: methodologies or management practices that favor the growth of desirable plants over noxious weeds, including maintaining an optimum fertility and plant moisture status in an area, planting at optimum density and spatial arrangement in an area, and planting species most suited to an area.
4) Mechanical management: methodologies or management practices that physically disrupt plant growth, including tilling, mowing, burning, flooding, mulching, hand-pulling, hoeing, and grazing.

Each year during the mining operation, the permit area will be monitored closely, through which the operator may determine if any additional weeds have grown. If any new species of weeds are found, Lincoln County and the Division will be consulted in order to formulate the best plan for the new infestation.

8.1. Weed List

Weeds listed in are those that are identified as noxious by Lincon County. List A species are to be eradicated and List B are to be managed in accordance with Lincoln County's suggested weed control measures.

Table E-1 are those that are identified as noxious by Lincon County. List A species are to be eradicated and List B are to be managed in accordance with Lincoln County's suggested weed control measures.

Table E-1. Lincoln County Weed List

Eradication	Suppression
List A (State)	
African rue	Medusahead
Camelthom	Myrtle spurge
Common crupina	Orange hawkweed
Cypress spurge	Purple loosestrife
Dyer's woad	Rush skeletonweed
Giant salvinia	Sericea lespedeza
Hydrilla	Squarrose knapweed
Meadow knapweed	Tansy ragwort
Mediterranean sage	Yellow starthistle
List B (in Lincoln County)	
Absinth Wormwood	Bull thistle
Canada thistle	Common tansy
Bull Thistle	Common teasel
Chinese Clematis	Corn chamomile
Dalmation toadflax, broad leaved	Cutleaf teasel
Diffuse knapweed	Dame's rocket
Field bindweed	Eurasian watermilfoil
Leafy spurge	Hoary cress
Musk thistle	Houndstongue
Plumeless thistle	Mayweed chamomile
Russian knapweed	Moth mullein
Scotch thistle	Oxeye daisy
Spotted knapweed	Perennial pepperweed
Tamarisk	Quackgrass
Black henbane	Redstem filaree
Bouncingbet	Russian-olive
Scentless chamomile	Spurred anoda
Sulfur cinquefoil	Venice mallow
Wild caraway	Yellow nutsedge
Yellow toadflax	

EXHIBIT F RECLAMATION MAPS

Map F-1 Reclamation Plan

LEGEND

BUILDINGS AND RELATED STRUCTURES
- Building
- Fence

LAND SURVEYS
- Property Boundary

ROADS AND RELATED FEATURES
- Highway
- Light duty road, gravel

RIVERS, LAKES, SHORELINES, AND CANALS
- Perennial stream/ditch
- Perennial river
- Perennial lake/pond
- Waterwell — Well Name

VEGETATION
- River Corridor
- Rangeland
- NWI Wetlands
- Existing Trees

TRANSMISSION LINES AND PIPELINES
- Power transmission line; pole; tower

MINING FEATURES
- DRMS Permit/Affected Boundary

BASELINE CONTOURS
- Index — Approximate of indefinite
- Intermediate — Approximate of indefinite
- Supplementary

POST-RECLAMATION CONTOURS
- Index — Approximate of indefinite
- Intermediate — Approximate of indefinite
- Dump

BIG SANDY CREEK

PERMIT AREA: 1094.5 ACRES

COUNTY ROAD 3E

REVEGETATE TO POST MINE LANE USE OF RANGELAND

REVEGETATE TO POST MINE LANE USE OF RANGELAND

REVEGETATE TO POST MINE LANE USE OF RANGELAND

REVEGETATE TO POST MINE LANE USE OF RANGELAND

AFFECTED AREA TOTAL: 957.5 AC.

52-89 (70?)

COUNTY ROAD 23

SITE ACCESS

PERMIT AREA: 1094.5 ACRES

NOTE:

WELL LOCATIONS MODIFIED FROM CDWR DATA BASED ON SITE INVESTIGATION AND LAND OWNER INFORMATION.

PARCEL BOUNDARIES ESTIMATED. NO GIS DATA AVAILABLE.

F-1 Reclamation Map

Limon Sand & Gravel

DRMS Permit Number: N/A — **Bettis Companies**

Mine Entry Location:	Latitude: 39.234283	Longitude: -103.643228
State: COLORADO	County: LINCOLN	Nearest Town: LIMON, CO.
Section: 27	Township: 9	Range: 56 PM: 6TH
Major Watershed:	Arkansas	MSHA ID: ----
Map Scale: 1"= 500'		

0 500 1000

Map Georeferencing Information:	**Datum: NAD83**	**Projection: CO CENTRAL**
Survey Source: USGS	**Drawn by:** SAC	Date: 05-09-25
Imagery Source: N/A	**Checked by:** BHM	Date: 05-09-25
Survey Date: 2023	**Approved by:** BHM	Date: ----
Imagery Date: N/A		

File Name: Limon Sand and Gravel 240724_recover

Lewicki & Associates

3375 West Powers Circle Littleton, CO USA 80123 (303)-346-5196 info@lewicki.biz

EXHIBIT G WATER INFORMATION

1. General

The Limon Sand & Gravel Resource's primary hydrologic features are the Big Sandy Creek that runs through the center of the site from northwest to southeast. This is surrounded by a riparian area and small areas of potential wetlands as documented by the National Wetlands Inventory (NWI). The Federal Emergency Management Agency (FEMA) has not mapped the area for flood potential. However, based on flood mapping directly upstream and features of the site, it is likely that the creek is within the floodway and while the surrounding areas are within the 100-year floodplain. Groundwater is located roughly 10 feet below the ground in the upland areas. It runs deeper near the terraces, at a maximum depth of 35 feet. Groundwater roughly corresponds to the gravel deposit location. All groundwater on-site is part of the Big Sandy Creek aquifer.

2. Water Quality Protection

The primary concerns surrounding water quality protection at the Limon Sand & Gravel Resource are the potential impacts to the surface and groundwater from sediment, hydraulic fluids, and diesel fuel. Sediment will be controlled through the use of stormwater retention within the disturbance area through the life of the mine. The site will be graded in a manner that maintains all surficial flows within the disturbed area, in turn containing all sediment and unwanted discharges from leaving the site. Stormwater berms will be constructed at the edge of mining to prevent sediment discharges in the Big Sandy Creek. Hydraulic fluids and diesel fuels will be contained within vehicles that follow best practices of maintenance; these practices include regular inspections of vehicles, hydraulic lines, and any other potential spill sources. Diesel fuel or other oils will be stored on site contained in secondary containment with 110% carrying capacity to prevent pollution of these items to surface waters.

Any surface water discharges from the site will be sampled in accordance with the NPDES discharge permit. All discharge will be via the approved Outfall, the proposed location of which is shown on Map C-3.

Table G-1. Surface Water Discharge Monitoring Requirements in NPDES Discharge Permit

Parameter	Monitoring Frequency	Sample Type
Flow	Instantaneous, Monthly	In-situ
pH	2x/month	Grab
Total Suspended Solids	2x/month	Grab
Oil and Grease Visual	2x/month	Visual
Oil and Grease	Contingent on visibility of oil and grease	Grab
Total Flow	Instantaneous, Monthly	Calculated
Selenium, Potentially Dissolved	2x/month	Grab
Total Dissolved Solids	Quarterly	Grab

Note: these are the anticipated analytes based on operator experience at similar sites. CDPHE may issue different sampling requirements with the permit.

3. Floodplain

The site has not been mapped for flood potential by the Federal Emergency Management Agency (FEMA). Based on upstream data, the areas surrounding the drainage are likely within the 100-year floodplain , and partially within the floodway of the Big Sandy Creek. Upstream mapping is shown on FEMA Firm panels 08073C0381C (partially shown in the northwest) and 08073C0268C (southwestern corner).

Based on upstream FEMA mapping patterns, the floodway seems to correspond with the river corridor as denoted on the aerial imagery by increased vegetation. This portion of the site is not going to be mined and will only be disturbed for the creek crossings. The 100-year floodplain appears to extend out further based on topography. Therefore, it can be assumed that at least some of the operation and pit will be within the floodplain.

The mining operation should not cause any negative impacts to the floodplain and floodway that are likely present on the site. Mining will be lowering the ground level, and no permanent structures or large piles will be created that could potentially raise the flood level.

4. Wetlands

The National Wetlands Inventory aerial-based mapping indicates the presence of potential wetlands within the permit area. These wetlands are mostly in the existing drainage and will not be disturbed, aside from wetlands crossings for access. A USACE Wetlands Permit will be obtained prior to any wetlands disturbances. Exhibit C and F maps show the NWI mapped potential wetlands.

5. Aquifers

The Big Sandy Creek aquifer is the only identified aquifer located at the site. It has an approximate thickness of 10 feet in the upland areas of the site. It is approximately 35 feet below the surface of the terraces further from the creek.

6. Surface Water

The mining operation will impact surface water in the area through the stormwater runoff that enters the site. Map G-1 shows the drainage patterns and how they are affected throughout the life of the mine. The maps include information on the drainage basins currently, during mining, and post reclamation. The primary concern for surface water protection at the site is preventing the discharge of sediment, oil, and/or hydraulic fluids from the operation areas. Oils and hydraulic fluids are stored on site following the standard best management practices. These practices include the use of secondary containment at fluid storage and transfer points, spill kits, and employee training regarding safe handling practices. Sediment is trapped onsite using controls and best management practices by directing and controlling surface water runoff that enters the disturbed areas. More information on sediment and surface water control is provided below.

6.1. Surface Water Handling

Pre-mining, stormwater flows and is carried off site in the Big Sandy Creek. Reclamation will return the flows to their pre-mining conditions, to drain towards the Big Sandy Creek in the center of the site. Map G-1 depicts the surface drainage patterns and amounts for each phase of the site: baseline, mining, and reclamation.

6.1.1. Mining

All stormwater from disturbed areas will either be contained in the pit or within stormwater bermed areas. Map G-1 contains information on the berm location and minimum specifications to contain a 100-year storm event.

6.1.2. Post Reclamation

The drainage patterns will return to pre-mining conditions following reclamation. All surface water will runoff to the Big Sandy Creek. Reclamation will re-establish the undisturbed soil and vegetation profile which will result in the same runoff conditions. The site will be entirely backfilled and graded to create shallower slopes that direct water to the creek in the center of the site. With the same baseline runoff coefficient from the soil and vegetative cover, and shallower grading, the discharge will be the same or less than baseline conditions. The site grading will direct surface water in the same manner as baseline conditions to the creek in the center of the site.

6.2. Disturbed Area Runoff

During all stages of mining, there is enough water storage capacity to contain the 5-year and 100-year 24-hour storm events and prevent erosion from surface water discharge. The expected rainfall from these events at the Limon Sand and Gravel Site is provided in Table G-2 below.

Table G-2. Area Storm Events (from NOAA[1])

Event Probability	Event Rainfall (inches)
100-YR 24-HR	4.84

The peak runoff was generated from these values for the various drainage basins during all stages of mining. Pre-mine, mining, and reclamation conditions are delineated on the Drainage Map. The discharge volumes from these storm events are calculated in Appendix G-1 at the end of this exhibit. Table G-3 summarizes the runoff volumes and storage volumes for each drainage. All drainage calculations were made using the Rational Method.

Table G-3. Drainage Calculations

Drainage Basin 1					
Site Condition	Area (ac)	Runoff Coefficient	100-Yr 24-Hr Runoff (ac-ft)	Discharge Flow Rate (gpm)*	Detention Capacity (ac-ft)***
Base	364	0.13	20.5	26,600	0
Mine		0.18	25.4	1,000-3,000**	63.5
Reclamation		0.13	18.3	20,800	0
Drainage Basin 2					
Site Condition	Area (ac)	Runoff Coefficient	100-Yr 24-Hr Runoff (ac-ft)	Discharge Flow Rate (gpm)*	Detention Capacity (ac-ft)***
Base	120	0.13	6.5	11,790	0
Mine		0.28	13.5	1,000-3,000**	14.1
Reclamation		0.13	6.3	10,500	0
Drainage Basin 3					
Site Condition	Area (ac)	Runoff Coefficient	100-Yr 24-Hr Runoff (ac-ft)	Discharge Flow Rate (gpm)*	Detention Capacity (ac-ft)***
Base	331	0.13	19.1	31,500	0
Mine		0.19	27.4	1,000-3,000**	43.2
Reclamation		0.13	18.8	37,400	0
Drainage Basin 4					
Site Condition	Area (ac)	Runoff Coefficient	100-Yr 24-Hr Runoff (ac-ft)	Discharge Flow Rate (gpm)*	Detention Capacity (ac-ft)***

[1] National Oceanic and Atmospheric Administration

Base	168	0.49	33.1	30,900	0
Mine		0.51	34.3	1,000-3,000**	50.1
Reclamation		0.49	33.0	36,200	0
Drainage Basin 5					
Site Condition	Area (ac)	Runoff Coefficient	100-Yr 24-Hr Runoff (ac-ft)	Discharge Flow Rate (gpm)*	Detention Capacity (ac-ft)***
Base	80.1	0.49	12.9	18,900	0
Mine		0.51	15.8	1,000-3,000**	24.3
Reclamation		0.49	12.7	28,100	0

* The discharge flow rate is calculated from the peak discharge of the 100-Yr 24-Hr storm event using the Rational Method.

**Discharge flow rate is variable and controlled during mining as all discharges are pumped from the pit
***Detention Capacity calculated in CAD as the surface volume above the stormwater berms with various heights at the edge of disturbance.

7. Groundwater

Groundwater is located approximately five feet below the surface at the Limon site. This was determined from wells installed onsite. Table G-4 outlines all existing wells within 600' of the permit area. These well locations are also shown on Map C-2. Groundwater quality data will be gathered in advance of mining. This data and discussion of it can be seen in the Groundwater Monitoring Plan in Appendix G-2.

Table G-4. Wells Within 600' of Permit Area

Applicant/Well ID	Permit ID	Total Depth (feet)	Purpose	Distance from nearest mining area (ft)
Craig, John W.	187207-	30	Stock	0
Craig, John W.	62846-	22	Stock	0
Craig, John W.	62847-	34	Stock	0
Craig, John W.	47593-	45	Domestic	450'

7.1. Groundwater – Mining

Mining will be performed wet, and groundwater will not be pumped out or discharged from the site. An augmentation plan will be implemented for evaporative losses.

7.2. Groundwater – Reclamation

There will be no groundwater consumptive use in reclamation as all water exposure will be backfilled. Mining will temporarily expose groundwater, while reclamation will use the excess overburden and sand to completely backfill the pit.

8. Water Related Permits

The operator is applying for all necessary permits that have not already been acquired for water handling at the Limon Sand and Gravel Resource. This includes a discharge permit with the Colorado Department of Public Health and Environment and a gravel well permit for initial dewatering of each pod with the Colorado Division of Water Resources.

9. Water Consumption and Source

Water for dust control will be the primary consumptive use at the Limon Sand and Gravel Resource site. Water will be purchased from a local source during operations for consumptive uses. Evaporative losses will require an augmentation plan and augmented water source. Table G-5 summarizes the estimated water consumption for the operation throughout the year.

Table G-5. Water Consumption

Month	Dust Control (ac-ft)	Evaporative Depletions (ac-ft)	Water Removed from Mining (ac-ft)	Total (ac-ft)
Jan	0.0	0.41	0.00	0.4
Feb	0.0	0.48	0.00	0.5
Mar	0.0	0.75	0.00	0.8
Apr	0.1	1.23	0.69	2.0
May	0.1	1.65	0.72	2.5
Jun	0.1	1.99	0.69	2.8
Jul	0.1	2.06	0.72	2.9
Aug	0.1	1.85	0.72	2.7
Sep	0.1	1.37	0.69	2.2
Oct	0.1	0.96	0.72	1.8
Nov	0.0	0.55	0.00	0.5
Dec	0.0	0.41	0.00	0.4
Total	**0.8**	**13.71**	**4.95**	**19.4**

The Limon Sand and Gravel Resource sources water for operations via water contract. Any groundwater exposure will be covered by a gravel well permit with the Colorado Division of Water Resources.

Appendix G-1 Hydrology Calculations

Drainage basins are shown on the Exhibit G maps. There are 5 drainage basins at the site, all draining to the Big Sandy Creek through the center of the site.

Runoff conditions are calculated in three conditions: premine, mining, and reclaimed. This is to show the baseline runoff condition of the site, how mine disturbance will change that, and what the post-mine runoff conditions will be.

All stormwater designs are based on the 100-YR 24-HR storm event for this area of Colorado. Runoff modelling is conducted for both operating and reclaimed conditions. Calculations of runoff, both in terms of volume and flow, are according to the Rational Method.

The Rational Method is a widely used technique in hydrology for estimating peak discharge from small drainage basins during storm events. It is based on the premise that peak discharge is proportional to rainfall intensity, catchment area, and a runoff coefficient that accounts for land use and soil type. The method uses the formula Q = CiA, where Q is the peak discharge (cubic feet per second or cubic meters per second), C is the runoff coefficient, i is the rainfall intensity (inches per hour or millimeters per hour), and A is the catchment area (acres or hectares). This method is particularly useful for catchments where the time of concentration is relatively short.

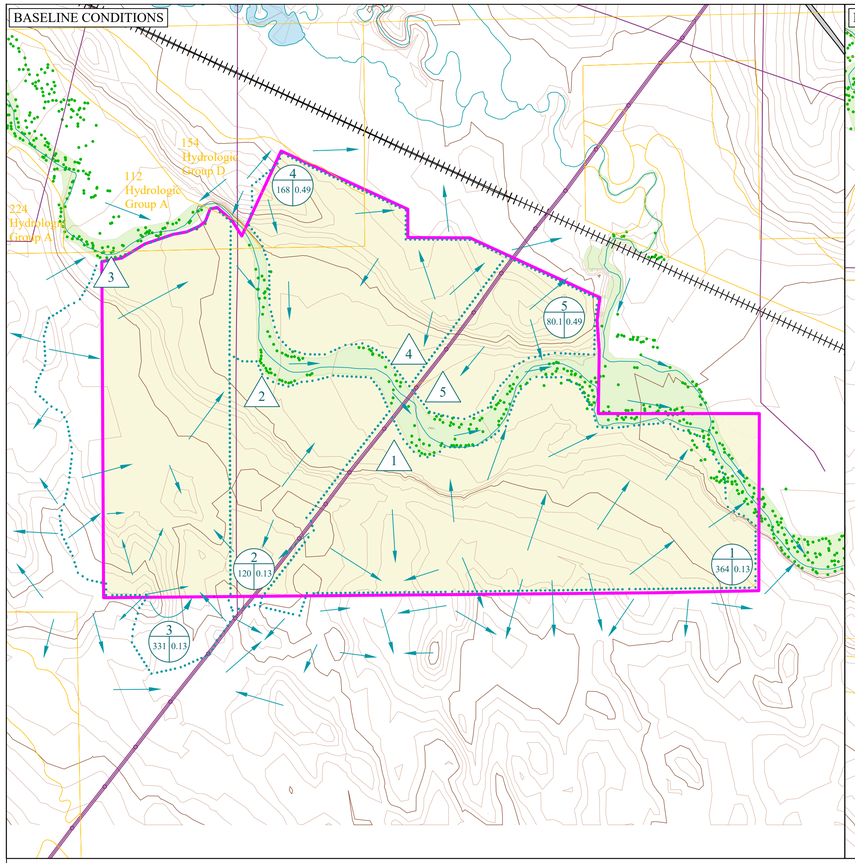
The Exhibit G maps summarize the drainage basins (A). Runoff coefficients are based on land conditions (C). NOAA data for rainfall intensity (i) is used. Runoff coefficients are typical values from ASCE[2] tables included in the hydrology software as well as the Urban Storm Drainage Citeria Manual. The coefficients are based on the soil type and either unimproved ground (0.13-0.49) or light industrial ground (0.5-0.55) for the vegetated and disturbed conditions of the site respectively. The runoff coefficient during mining was calculated using a weighted average of 50 acres of disturbance (light industrial ground) and the remaining phase area as undisturbed and vegetated (unimproved grounds). This accounts for the open area for mining, processing, and areas where reclamation is in process.

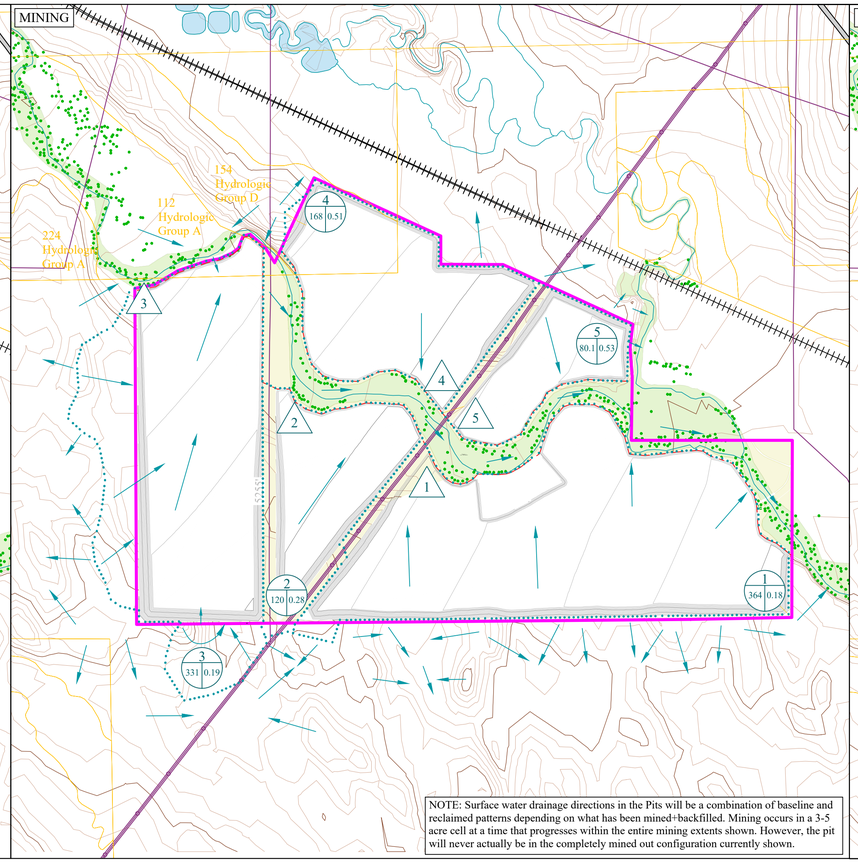
Assumptions: The following assumptions are made for the Limon Sand and Gravel surface hydrology model.

1. NOAA rainfall intensities that are publicly available are accurate.
2. The computed maximum rate of runoff to the design point is a function of the average rainfall rate during the time of concentration to that point.
3. The hydrologic losses in the catchment are homogeneous and uniform.
4. The runoff coefficients represent the average soil antecedent moisture condition, imperviousness, and type of soil.

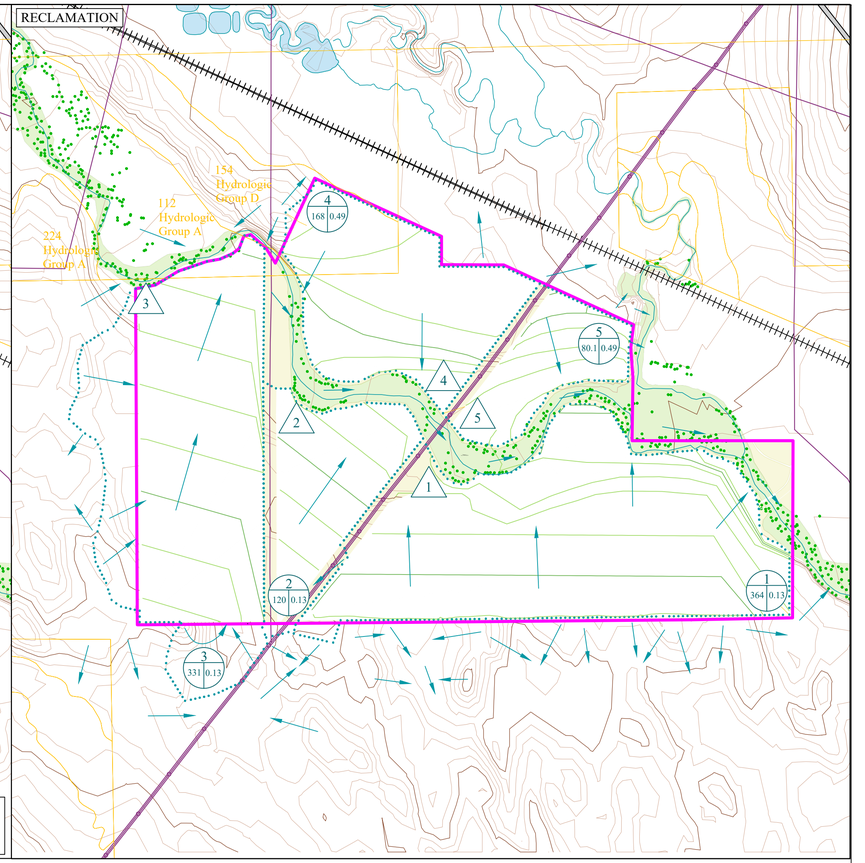
[2] American Society of Civil Engineers

5. The depth of rainfall used is one that occurs from the start of the storm to at least the time of concentration, and the design rainfall depth during that time period is converted to the average rainfall intensity for that period.
6. The maximum runoff rate occurs when the entire area is contributing flow.





NOTE: Surface water drainage directions in the Pits will be a combination of baseline and reclaimed patterns depending on what has been mined+backfilled. Mining occurs in a 3-5 acre cell at a time that progresses within the entire mining extents shown. However, the pit will never actually be in the completely mined out configuration currently shown.



LEGEND

ROADS AND RELATED FEATURES
- Light duty road, gravel

RIVERS, LAKES, SHORELINES, AND CANALS
- Perennial stream/ditch
- Perennial river
- Perennial lake/pond
- Drainage Basin
- Drainage Direction

MINING FEATURES
- DRMS Permit Boundary
- Affected Area
- Stormwater Berm

TRANSMISSION LINES AND PIPELINES
- Power transmission line; polic; tower

VEGETATION
- Riparian Corridor
- Rangeland
- NWI Wetlands
- Soils

BASELINE CONTOURS
- Index
- Intermediate

POST-MINING CONTOURS
- Index
- Intermediate

POST-RECLAMATION CONTOURS
- Index
- Intermediate

G-1 Drainage Map

Limon Sand & Gravel

DRMS Permit Number: N/A — **Bettis Companies**

Mine Entry Location:	Latitude: 39.234283	Longitude: -103.643228	
State: COLORADO	County: LINCOLN	Nearest Town: LIMON, CO.	
Section: 27	Township: 9	Range: 56	PM: 6TH
Major Watershed:	Arkansas	MSHA ID: ----	

Map Scale: 1"= 1100'

0 — 1100 — 2200

N

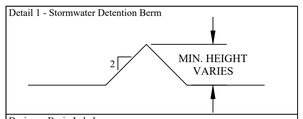
Map Georeferencing Information: **Datum:** NAD83 **Projection:** CO CENTRAL

Survey Source: USGS	**Drawn by:** SAC	Date: 05-09-25
Imagery Source: N/A	**Checked by:** BHM	Date: 05-09-25
Survey Date: 2023	**Approved by:** BHM	Date: ----
Imagery Date: N/A		

File Name: Limon Sand and Gravel 240724_recover

Lewicki & Associates
3375 West Powers Circle Littleton, CO USA 80123 (303)-346-5196 info@lewicki.biz

Detail 1 - Stormwater Detention Berm



Drainage Basin Labels

*The runoff coefficient was determined using the assumed hydrologic soil group. The permit area soils are not mapped by the NRCS, so they have been assumed to be consistent with the upstream soil types.

Drainage Basin Runoff & Detention (Rational Method)

Drainage Basin	Area (ac)	Assumed Hydrologic Soil Group*	Phase of Operation	Runoff Coefficient	100-YR 24-HR Runoff (ac-ft)	Min. Berm Height (ft)	Detention Capacity
1	364	A	Baseline	0.13	18.5	--	0
			Mining	0.18	25.4	2	63.5
			Reclamation	0.13	18.3	--	0
2	120	A	Baseline	0.13	7.0	--	0
			Mining	0.28	13.5	4	14.1
			Reclamation	0.13	6.3	--	0
3	331	A	Baseline	0.13	19.3	--	0
			Mining	0.19	27.4	4	43.2
			Reclamation	0.13	18.8	--	0
4	168	D	Baseline	0.49	33.1	--	0
			Mining	0.51	34.3	8	50.1
			Reclamation	0.49	33.0	--	0
5	80.1	D	Baseline	0.49	12.9	--	0
			Mining	0.51	15.8	4	24.3
			Reclamation	0.49	12.7	--	0

NOTE: Rational method used for calculations. Detention capacity calculated in AutoCAD as surface volume stored behind the stormwater berms.

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

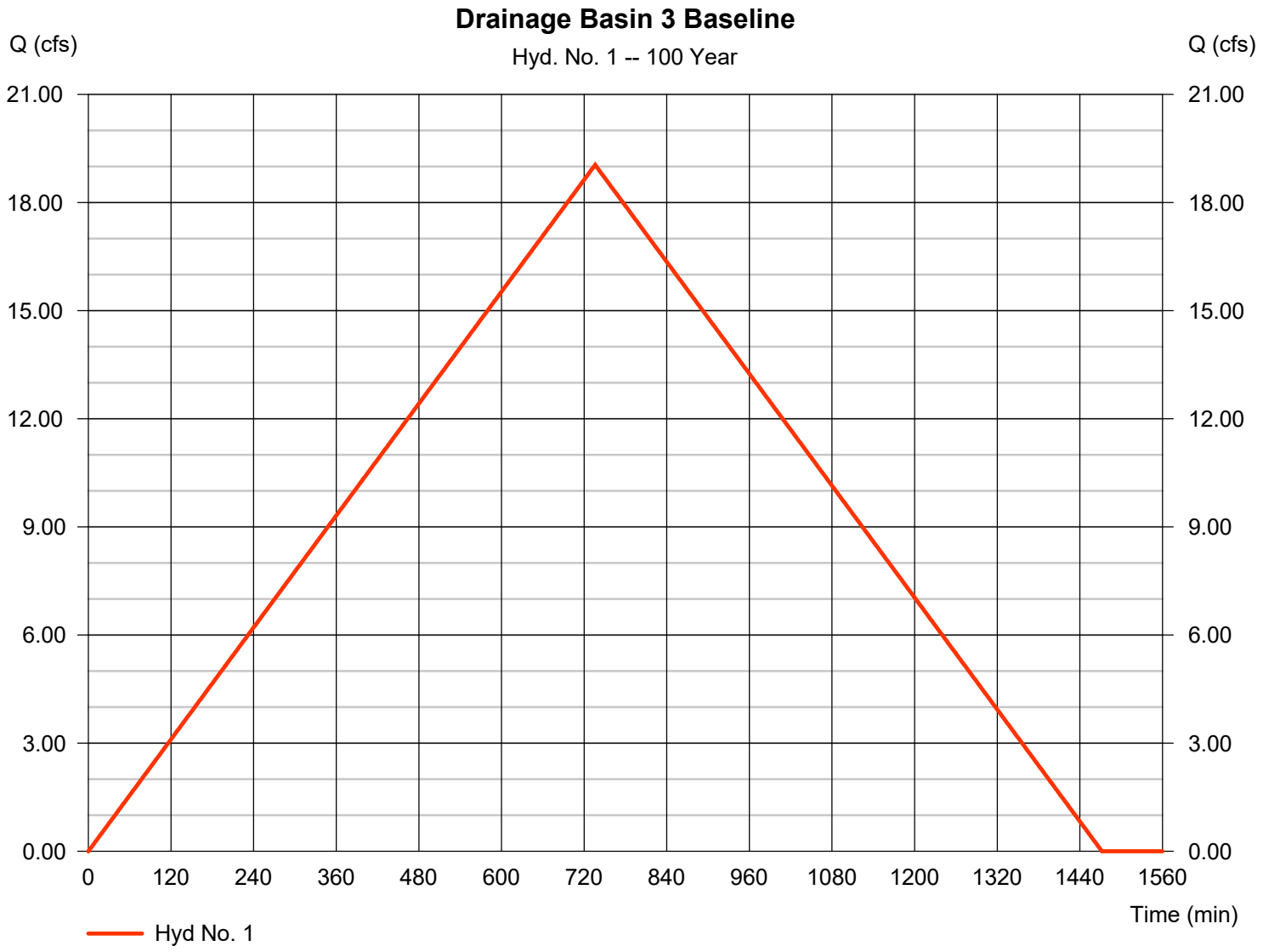
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	19.05	1	736	841,055	------	------	------	Drainage Basin 3 Baseline
2	Rational	7.119	1	709	302,828	------	------	------	Drainage Basin 2 Baseline
3	Rational	37.83	1	355	805,846	------	------	------	Drainage Basin 1 Baseline
4	Rational	58.60	1	410	1,441,669	------	------	------	Drainage Basin 4 Reclamation
5	Rational	61.07	1	153	560,601	------	------	------	Drainage Basin 5 Baseline
6	Rational	31.68	1	628	1,193,766	------	------	------	Drainage Basin 3 Mining
7	Rational	23.83	1	412	588,988	------	------	------	Drainage Basin 2 Mining
8	Rational	54.62	1	337	1,104,435	------	------	------	Drainage Basin 1 Mining
9	Rational	62.48	1	398	1,491,933	------	------	------	Drainage Basin 4 Mining
10	Rational	41.05	1	280	689,627	------	------	------	Drainage Basin 5 Mining
11	Rational	21.68	1	628	816,787	------	------	------	Drainage Basin 3 Reclamation
12	Rational	11.06	1	412	273,459	------	------	------	Drainage Basin 2 Reclamation
13	Rational	39.45	1	337	797,648	------	------	------	Drainage Basin 1 Reclamation
14	Rational	59.54	1	402	1,436,199	------	------	------	Drainage Basin 4 Reclamation
15	Rational	63.32	1	146	554,672	------	------	------	Drainage Basin 5 Reclamation

Hydrograph Report

Hyd. No. 1

Drainage Basin 3 Baseline

Hydrograph type	=	Rational	Peak discharge	=	19.05 cfs
Storm frequency	=	100 yrs	Time to peak	=	736 min
Time interval	=	1 min	Hyd. volume	=	841,055 cuft
Drainage area	=	331.000 ac	Runoff coeff.	=	0.13
Intensity	=	0.443 in/hr	Tc by TR55	=	736.00 min
IDF Curve	=	Limon.IDF	Asc/Rec limb fact	=	1/1



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Hyd. No. 1

Drainage Basin 3 Baseline

Description		A		B		C		Totals
Sheet Flow								
Manning's n-value	=	0.011		0.011		0.011		
Flow length (ft)	=	0.0		0.0		0.0		
Two-year 24-hr precip. (in)	=	0.00		0.00		0.00		
Land slope (%)	=	0.00		0.00		0.00		
Travel Time (min)	**=**	**0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**
Shallow Concentrated Flow								
Flow length (ft)	=	1056.00		2339.00		1652.00		
Watercourse slope (%)	=	0.03		0.00		0.02		
Surface description	=	Unpaved		Unpaved		Unpaved		
Average velocity (ft/s)	=	0.29		0.07		0.20		
Travel Time (min)	**=**	**60.98**	**+**	**540.27**	**+**	**134.91**	**=**	**736.16**
Channel Flow								
X sectional flow area (sqft)	=	0.00		0.00		0.00		
Wetted perimeter (ft)	=	0.00		0.00		0.00		
Channel slope (%)	=	0.00		0.00		0.00		
Manning's n-value	=	0.015		0.015		0.015		
Velocity (ft/s)	=	0.00		0.00		0.00		
Flow length (ft)		({0})0.0		0.0		0.0		
Travel Time (min)	**=**	**0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

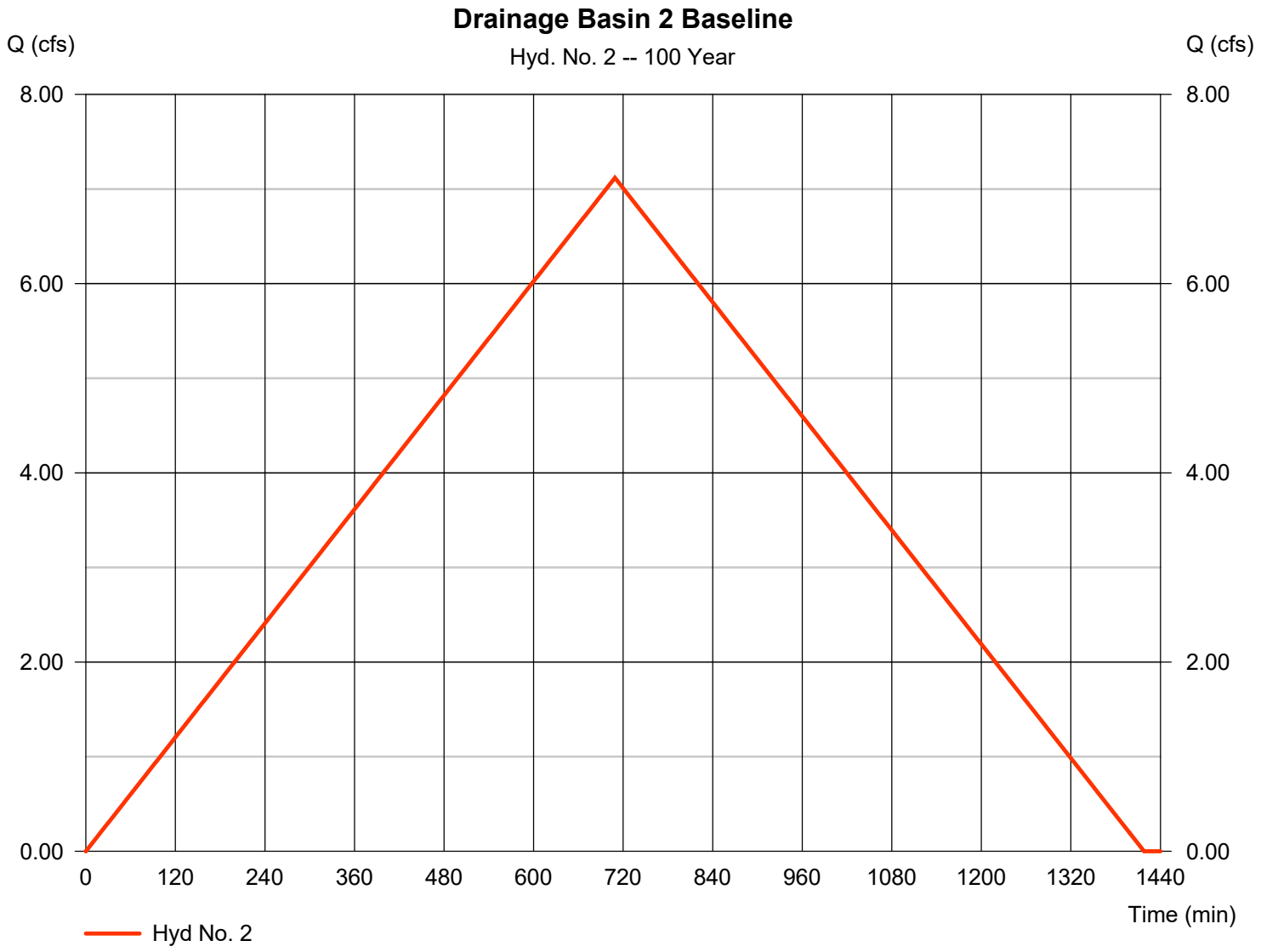
Total Travel Time, Tc ..... 736.00 min

Hydrograph Report

Hyd. No. 2

Drainage Basin 2 Baseline

Hydrograph type	=	Rational	Peak discharge	=	7.119 cfs
Storm frequency	=	100 yrs	Time to peak	=	709 min
Time interval	=	1 min	Hyd. volume	=	302,828 cuft
Drainage area	=	120.000 ac	Runoff coeff.	=	0.13
Intensity	=	0.456 in/hr	Tc by TR55	=	709.00 min
IDF Curve	=	Limon.IDF	Asc/Rec limb fact	=	1/1



TR55 Tc Worksheet

Hyd. No. 2

Drainage Basin 2 Baseline

Description	A	B	C	Totals
Sheet Flow				
Manning's n-value	= 0.011	0.011	0.011	
Flow length (ft)	= 0.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 0.00	0.00	0.00	
Land slope (%)	= 0.00	0.00	0.00	
Travel Time (min)	**= 0.00**	**+ 0.00**	**+ 0.00**	**= 0.00**
Shallow Concentrated Flow				
Flow length (ft)	= 2169.00	320.00	1683.00	
Watercourse slope (%)	= 0.00	0.06	0.01	
Surface description	= Unpaved	Unpaved	Unpaved	
Average velocity (ft/s)	=0.07	0.40	0.14	
Travel Time (min)	**= 501.00**	**+ 13.17**	**+ 194.37**	**= 708.54**
Channel Flow				
X sectional flow area (sqft)	= 0.00	0.00	0.00	
Wetted perimeter (ft)	= 0.00	0.00	0.00	
Channel slope (%)	= 0.00	0.00	0.00	
Manning's n-value	= 0.015	0.015	0.015	
Velocity (ft/s)	=0.00			
		0.00		
			0.00	
Flow length (ft)	({0})0.0	0.0	0.0	
Travel Time (min)	**= 0.00**	**+ 0.00**	**+ 0.00**	**= 0.00**

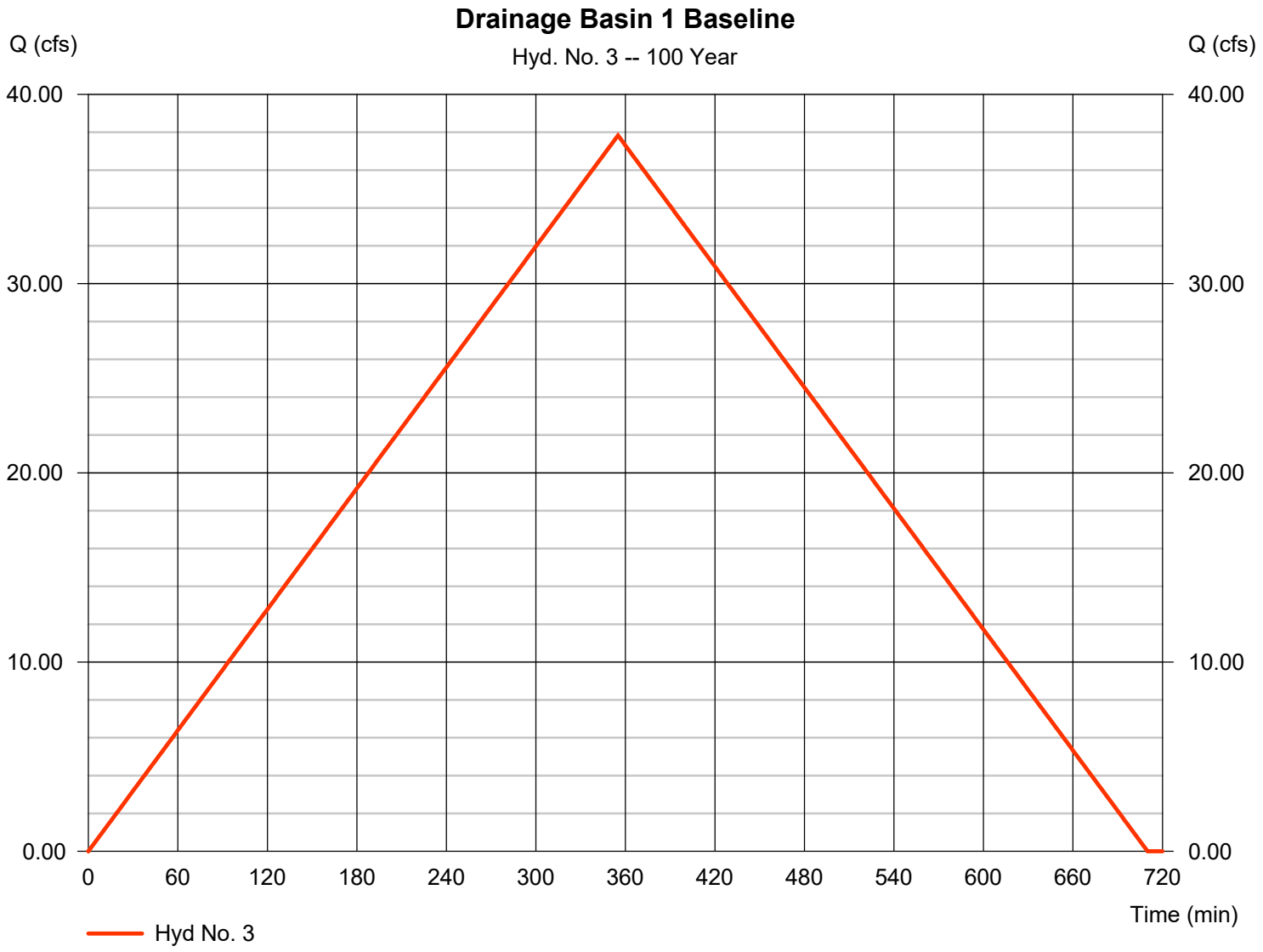
Total Travel Time, Tc ..... 709.00 min

Hydrograph Report

Hyd. No. 3

Drainage Basin 1 Baseline

Hydrograph type	=	Rational	Peak discharge	=	37.83 cfs
Storm frequency	=	100 yrs	Time to peak	=	355 min
Time interval	=	1 min	Hyd. volume	=	805,846 cuft
Drainage area	=	364.000 ac	Runoff coeff.	=	0.13
Intensity	=	0.800 in/hr	Tc by TR55	=	355.00 min
IDF Curve	=	Limon.IDF	Asc/Rec limb fact	=	1/1



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Hyd. No. 3

Drainage Basin 1 Baseline

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.011		0.011		0.011		
Flow length (ft)	= 0.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 0.00		0.00		0.00		
Land slope (%)	= 0.00		0.00		0.00		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**
Shallow Concentrated Flow							
Flow length (ft)	= 3258.00		0.00		0.00		
Watercourse slope (%)	= 0.01		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=0.15		0.00		0.00		
Travel Time (min)	**= 354.75**	**+**	**0.00**	**+**	**0.00**	**=**	**354.75**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

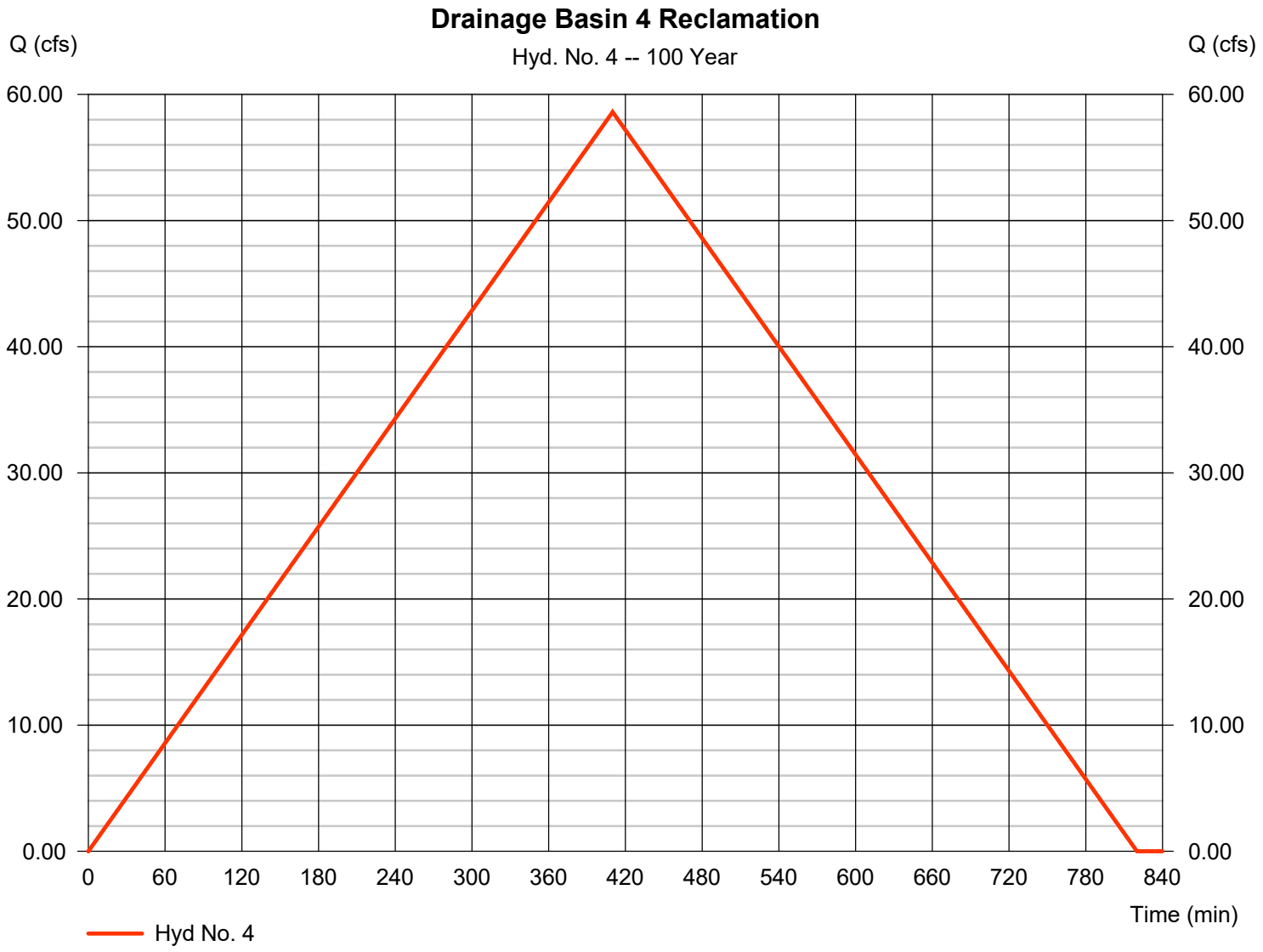
Total Travel Time, Tc ..... 355.00 min

Hydrograph Report

Hyd. No. 4

Drainage Basin 4 Reclamation

Hydrograph type	=	Rational	Peak discharge	=	58.60 cfs
Storm frequency	=	100 yrs	Time to peak	=	410 min
Time interval	=	1 min	Hyd. volume	=	1,441,669 cuft
Drainage area	=	168.000 ac	Runoff coeff.	=	0.49
Intensity	=	0.712 in/hr	Tc by TR55	=	410.00 min
IDF Curve	=	Limon.IDF	Asc/Rec limb fact	=	1/1



TR55 Tc Worksheet

Hyd. No. 4

Drainage Basin 4 Reclamation

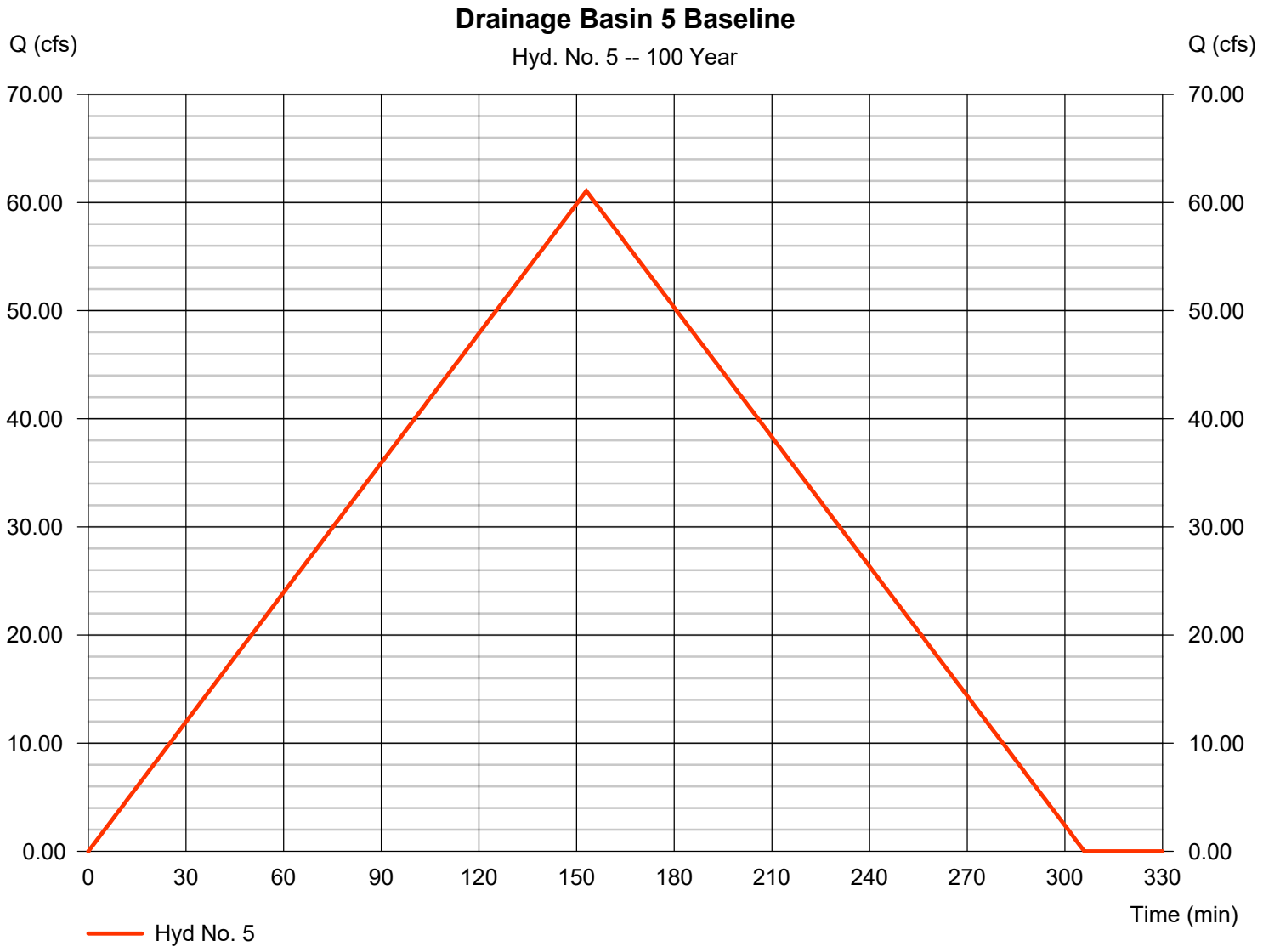
Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.011		0.011		0.011		
Flow length (ft)	= 0.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 0.00		0.00		0.00		
Land slope (%)	= 0.00		0.00		0.00		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**
Shallow Concentrated Flow							
Flow length (ft)	= 2907.00		245.00		960.00		
Watercourse slope (%)	= 0.01		0.07		0.01		
Surface description	= Unpaved		Unpaved		Unpaved		
Average velocity (ft/s)	=0.15		0.44		0.19		
Travel Time (min)	**= 316.53**	**+**	**9.37**	**+**	**83.81**	**=**	**409.71**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**
Total Travel Time, Tc							**410.00 min**

Hydrograph Report

Hyd. No. 5

Drainage Basin 5 Baseline

Hydrograph type	=	Rational	Peak discharge	=	61.07 cfs
Storm frequency	=	100 yrs	Time to peak	=	153 min
Time interval	=	1 min	Hyd. volume	=	560,601 cuft
Drainage area	=	80.100 ac	Runoff coeff.	=	0.49
Intensity	=	1.556 in/hr	Tc by TR55	=	153.00 min
IDF Curve	=	Limon.IDF	Asc/Rec limb fact	=	1/1



TR55 Tc Worksheet

Hyd. No. 5

Drainage Basin 5 Baseline

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.011		0.011		0.011		
Flow length (ft)	= 0.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 0.00		0.00		0.00		
Land slope (%)	= 0.00		0.00		0.00		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**
Shallow Concentrated Flow							
Flow length (ft)	= 1153.00		917.00		0.00		
Watercourse slope (%)	= 0.02		0.02		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=0.24		0.21		0.00		
Travel Time (min)	**= 80.30**	**+**	**72.65**	**+**	**0.00**	**=**	**152.95**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 153.00 min

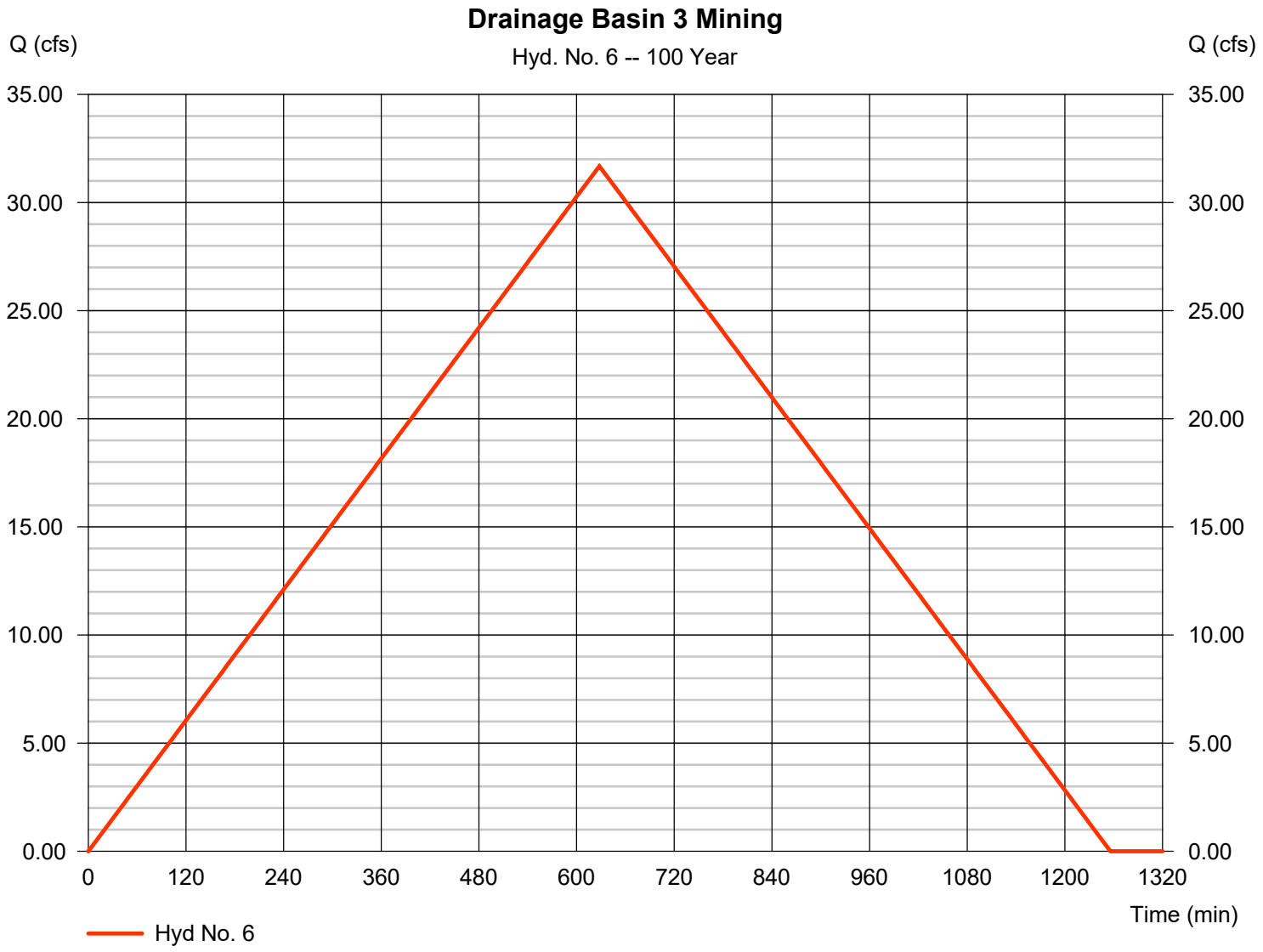
Hydrograph Report

Hyd. No. 6

Drainage Basin 3 Mining

Hydrograph type	=	Rational	Peak discharge	=	31.68 cfs
Storm frequency	=	100 yrs	Time to peak	=	628 min
Time interval	=	1 min	Hyd. volume	=	1,193,766 cuft
Drainage area	=	331.000 ac	Runoff coeff.	=	0.19*
Intensity	=	0.504 in/hr	Tc by TR55	=	628.00 min
IDF Curve	=	Limon.IDF	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(281.000 x 0.13) + (50.000 x 0.50)] / 331.000



TR55 Tc Worksheet

Hyd. No. 6

Drainage Basin 3 Mining

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.011		0.011		0.011		
Flow length (ft)	= 0.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 0.00		0.00		0.00		
Land slope (%)	= 0.00		0.00		0.00		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**
Shallow Concentrated Flow							
Flow length (ft)	= 6075.00		0.00		0.00		
Watercourse slope (%)	= 0.01		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=0.16		0.00		0.00		
Travel Time (min)	**= 627.54**	**+**	**0.00**	**+**	**0.00**	**=**	**627.54**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 628.00 min

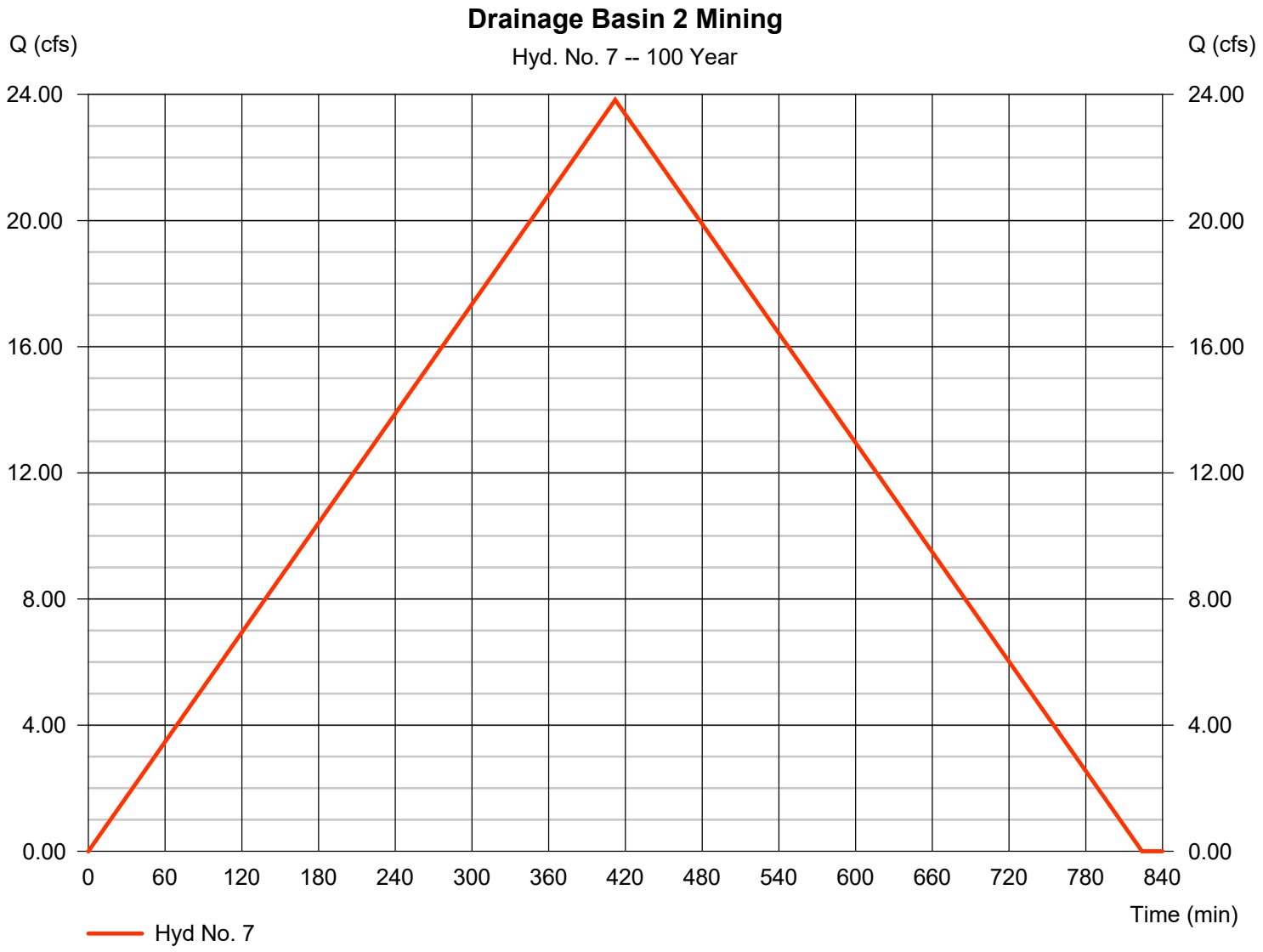
Hydrograph Report

Hyd. No. 7

Drainage Basin 2 Mining

Hydrograph type	=	Rational	Peak discharge	=	23.83 cfs
Storm frequency	=	100 yrs	Time to peak	=	412 min
Time interval	=	1 min	Hyd. volume	=	588,988 cuft
Drainage area	=	120.000 ac	Runoff coeff.	=	0.28*
Intensity	=	0.709 in/hr	Tc by TR55	=	412.00 min
IDF Curve	=	Limon.IDF	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(50.000 x 0.50) + (70.000 x 0.13)] / 120.000



TR55 Tc Worksheet

Hyd. No. 7

Drainage Basin 2 Mining

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.011		0.011		0.011		
Flow length (ft)	= 0.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 0.00		0.00		0.00		
Land slope (%)	= 0.00		0.00		0.00		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**
Shallow Concentrated Flow							
Flow length (ft)	= 3987.00		0.00		0.00		
Watercourse slope (%)	= 0.01		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=0.16		0.00		0.00		
Travel Time (min)	**= 411.85**	**+**	**0.00**	**+**	**0.00**	**=**	**411.85**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 412.00 min

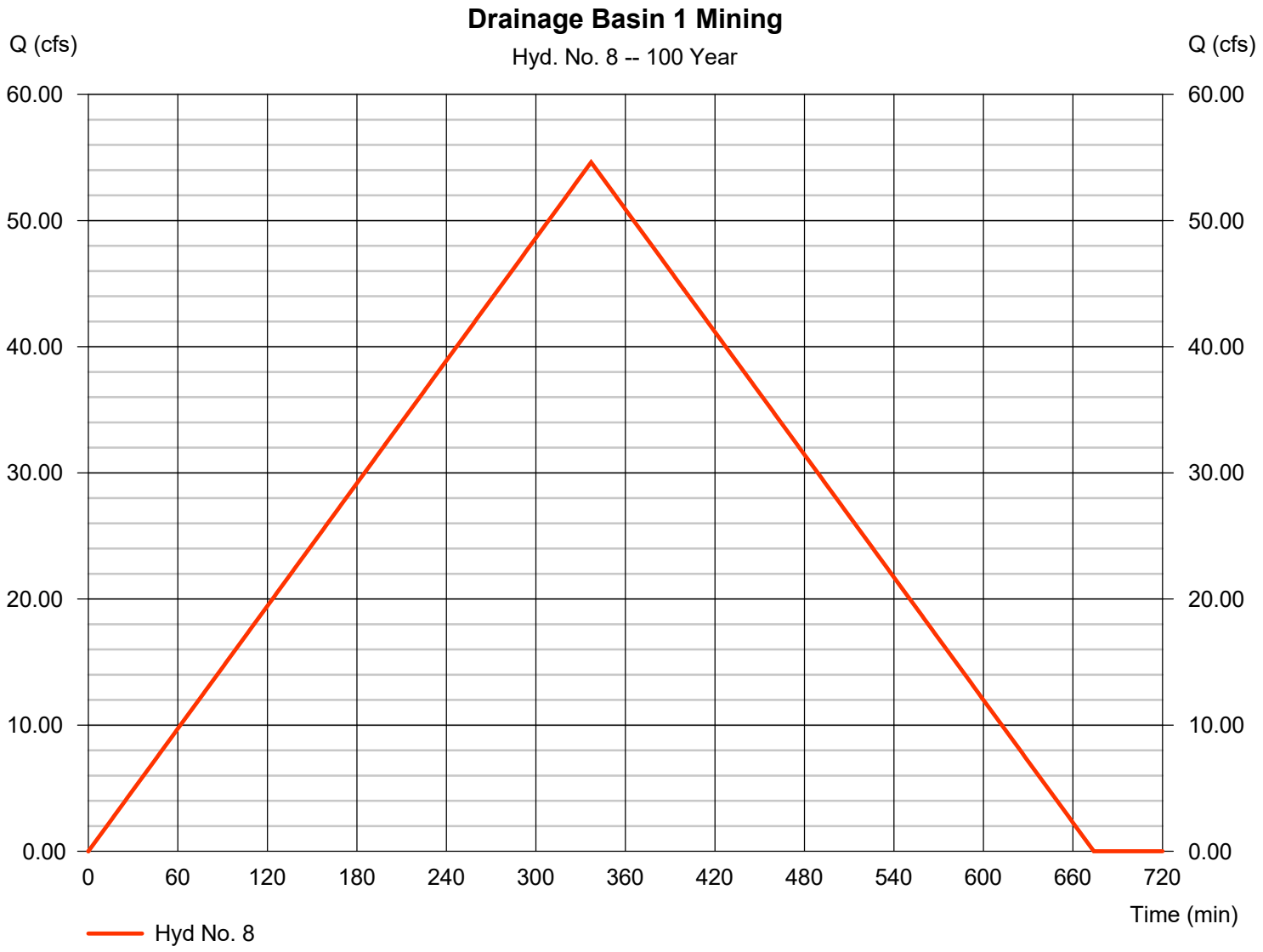
Hydrograph Report

Hyd. No. 8

Drainage Basin 1 Mining

Hydrograph type	=	Rational	Peak discharge	=	54.62 cfs
Storm frequency	=	100 yrs	Time to peak	=	337 min
Time interval	=	1 min	Hyd. volume	=	1,104,435 cuft
Drainage area	=	364.000 ac	Runoff coeff.	=	0.18*
Intensity	=	0.834 in/hr	Tc by TR55	=	337.00 min
IDF Curve	=	Limon.IDF	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(50.000 x 0.50) + (314.000 x 0.13)] / 364.000



TR55 Tc Worksheet

Hyd. No. 8

Drainage Basin 1 Mining

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.011		0.011		0.011		
Flow length (ft)	= 0.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 0.00		0.00		0.00		
Land slope (%)	= 0.00		0.00		0.00		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**
Shallow Concentrated Flow							
Flow length (ft)	= 3259.00		0.00		0.00		
Watercourse slope (%)	= 0.01		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=0.16		0.00		0.00		
Travel Time (min)	**= 336.65**	**+**	**0.00**	**+**	**0.00**	**=**	**336.65**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 337.00 min

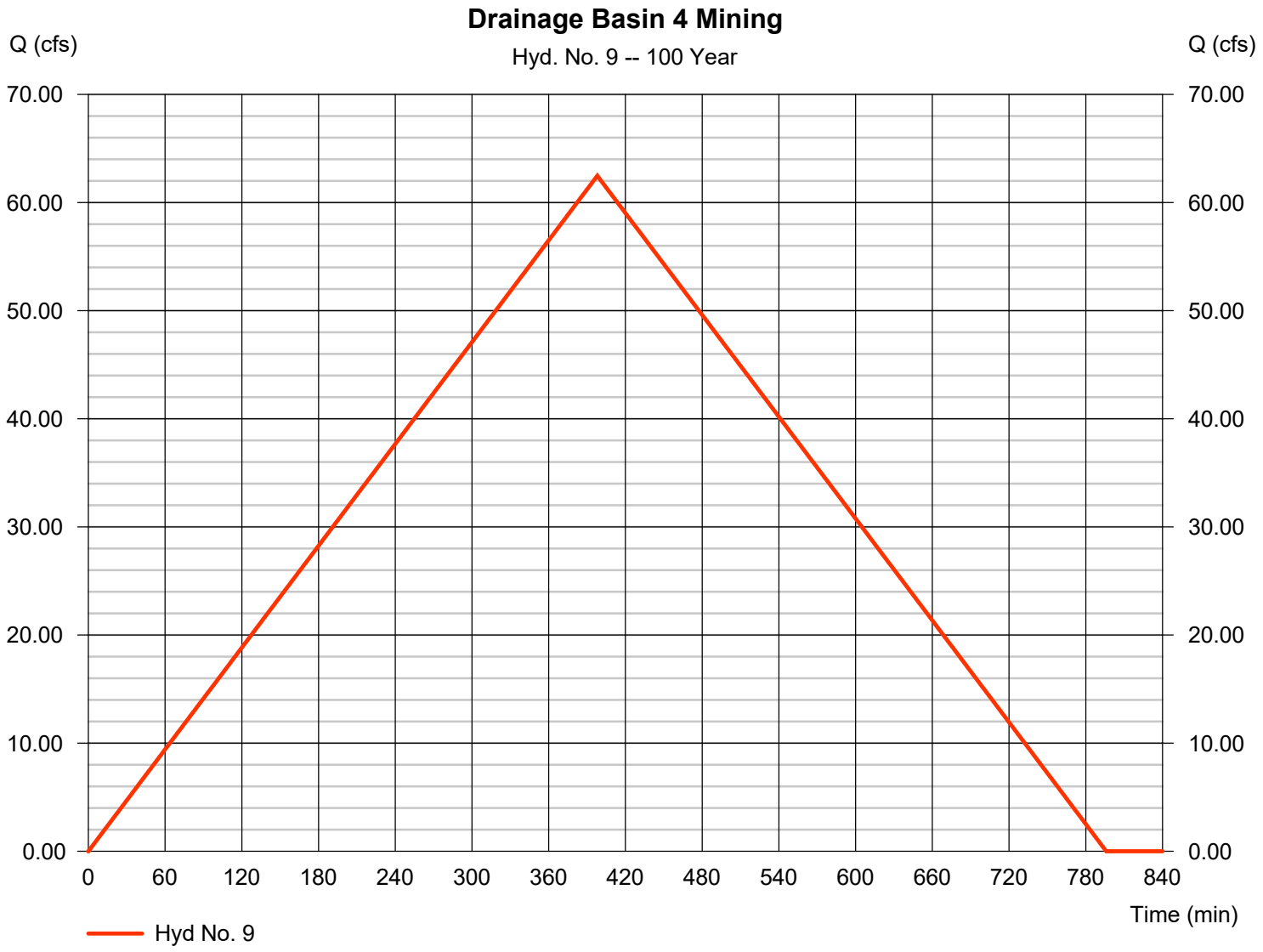
Hydrograph Report

Hyd. No. 9

Drainage Basin 4 Mining

Hydrograph type	=	Rational	Peak discharge	=	62.48 cfs
Storm frequency	=	100 yrs	Time to peak	=	398 min
Time interval	=	1 min	Hyd. volume	=	1,491,933 cuft
Drainage area	=	168.000 ac	Runoff coeff.	=	0.51*
Intensity	=	0.729 in/hr	Tc by TR55	=	398.00 min
IDF Curve	=	Limon.IDF	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(110.000 x 0.49) + (50.000 x 0.55)] / 168.000



TR55 Tc Worksheet

Hyd. No. 9

Drainage Basin 4 Mining

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.011		0.011		0.011		
Flow length (ft)	= 0.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 0.00		0.00		0.00		
Land slope (%)	= 0.00		0.00		0.00		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**
Shallow Concentrated Flow							
Flow length (ft)	= 3853.00		0.00		0.00		
Watercourse slope (%)	= 0.01		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=0.16		0.00		0.00		
Travel Time (min)	**= 398.01**	**+**	**0.00**	**+**	**0.00**	**=**	**398.01**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**
Total Travel Time, Tc							**398.00 min**

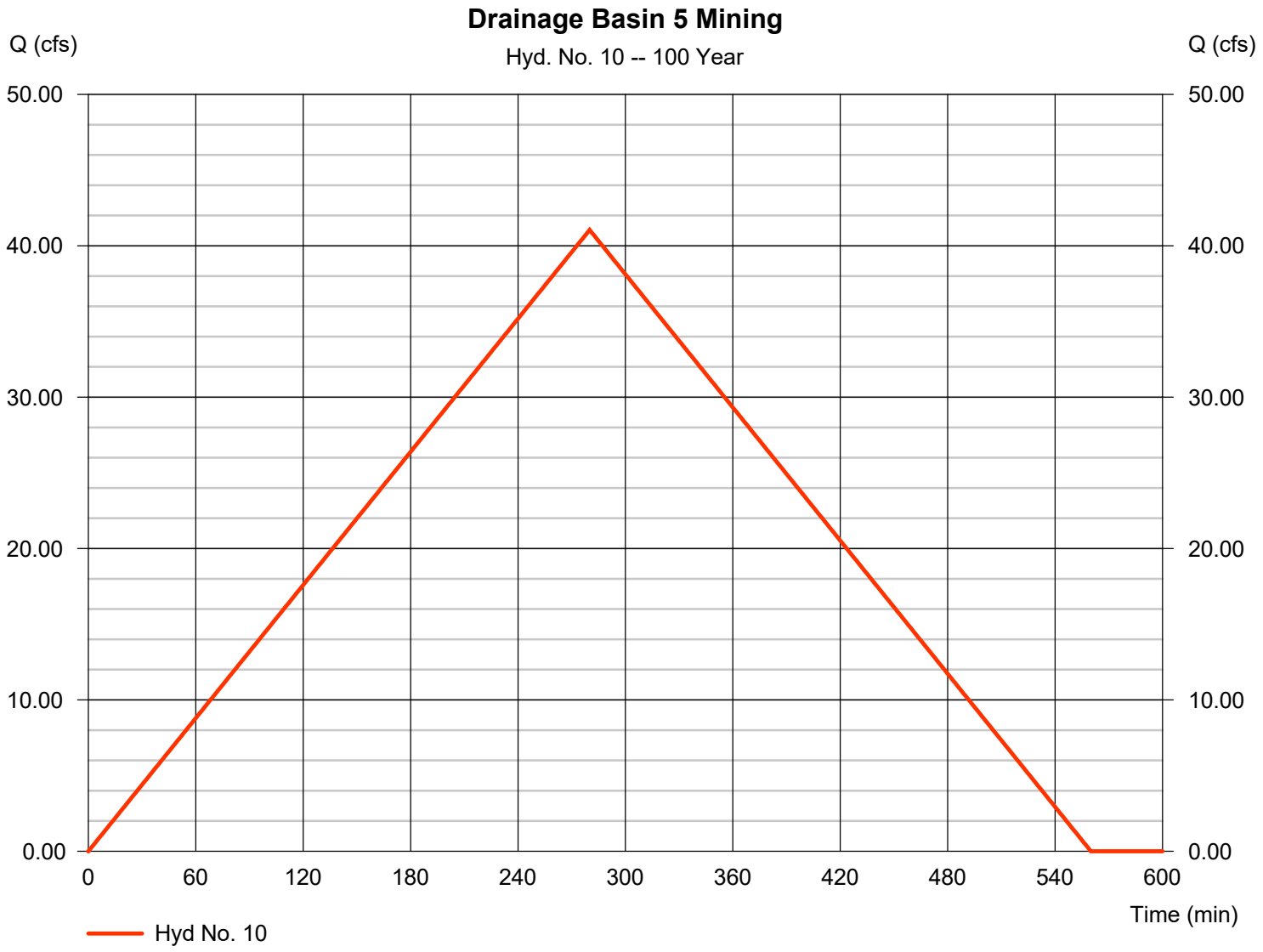
Hydrograph Report

Hyd. No. 10

Drainage Basin 5 Mining

Hydrograph type	=	Rational	Peak discharge	=	41.05 cfs
Storm frequency	=	100 yrs	Time to peak	=	280 min
Time interval	=	1 min	Hyd. volume	=	689,627 cuft
Drainage area	=	80.100 ac	Runoff coeff.	=	0.53*
Intensity	=	0.967 in/hr	Tc by TR55	=	280.00 min
IDF Curve	=	Limon.IDF	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(30.100 x 0.49) + (50.000 x 0.55)] / 80.100



TR55 Tc Worksheet

Hyd. No. 10

Drainage Basin 5 Mining

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.011		0.011		0.011		
Flow length (ft)	= 0.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 0.00		0.00		0.00		
Land slope (%)	= 0.00		0.00		0.00		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**
Shallow Concentrated Flow							
Flow length (ft)	= 1413.00		0.00		0.00		
Watercourse slope (%)	= 0.01		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=0.16		0.00		0.00		
Travel Time (min)	**= 145.96**	**+**	**0.00**	**+**	**0.00**	**=**	**145.96**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

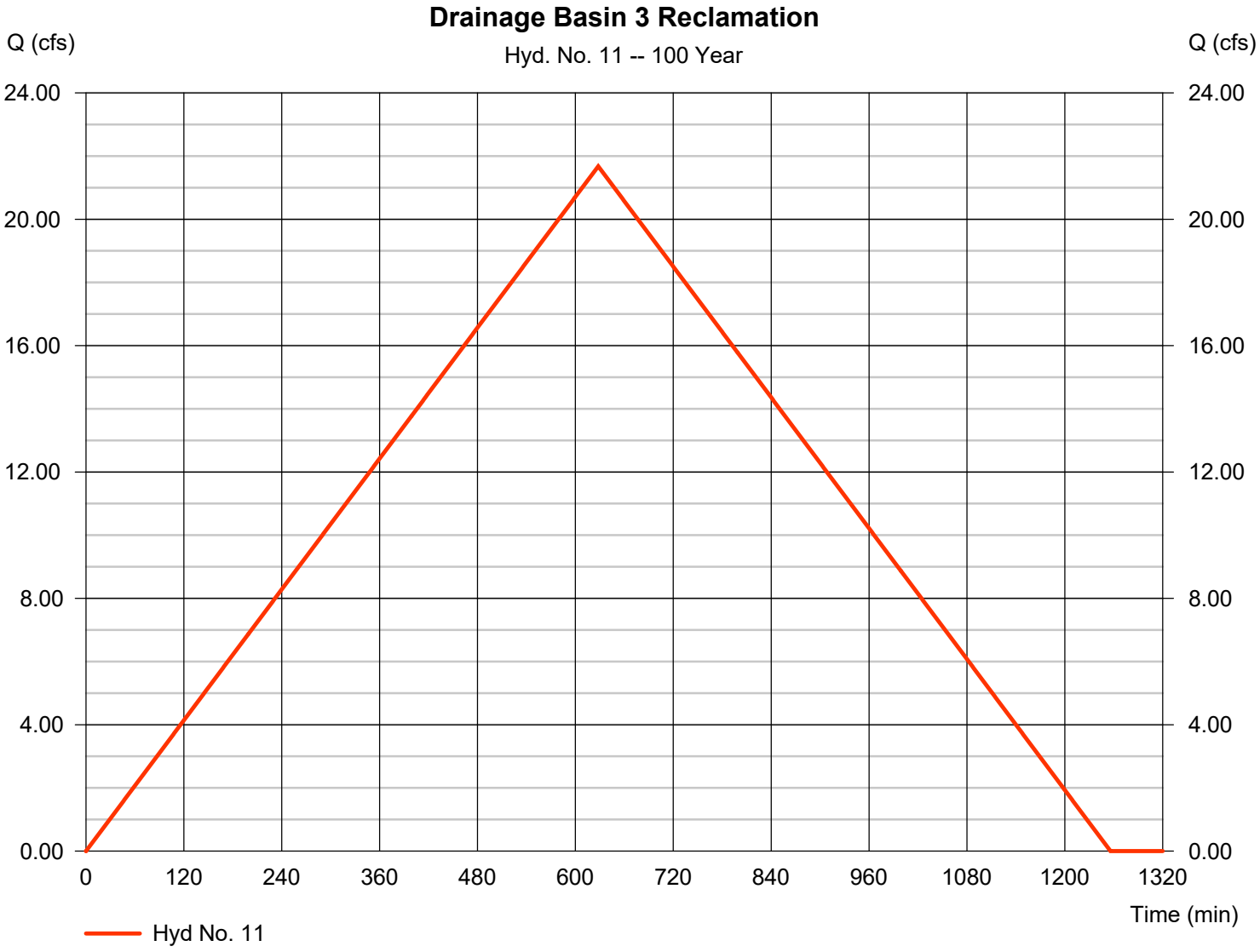
Total Travel Time, Tc ..... 280.00 min

Hydrograph Report

Hyd. No. 11

Drainage Basin 3 Reclamation

Hydrograph type	=	Rational	Peak discharge	=	21.68 cfs
Storm frequency	=	100 yrs	Time to peak	=	628 min
Time interval	=	1 min	Hyd. volume	=	816,787 cuft
Drainage area	=	331.000 ac	Runoff coeff.	=	0.13
Intensity	=	0.504 in/hr	Tc by TR55	=	628.00 min
IDF Curve	=	Limon.IDF	Asc/Rec limb fact	=	1/1



TR55 Tc Worksheet

Hyd. No. 11

Drainage Basin 3 Reclamation

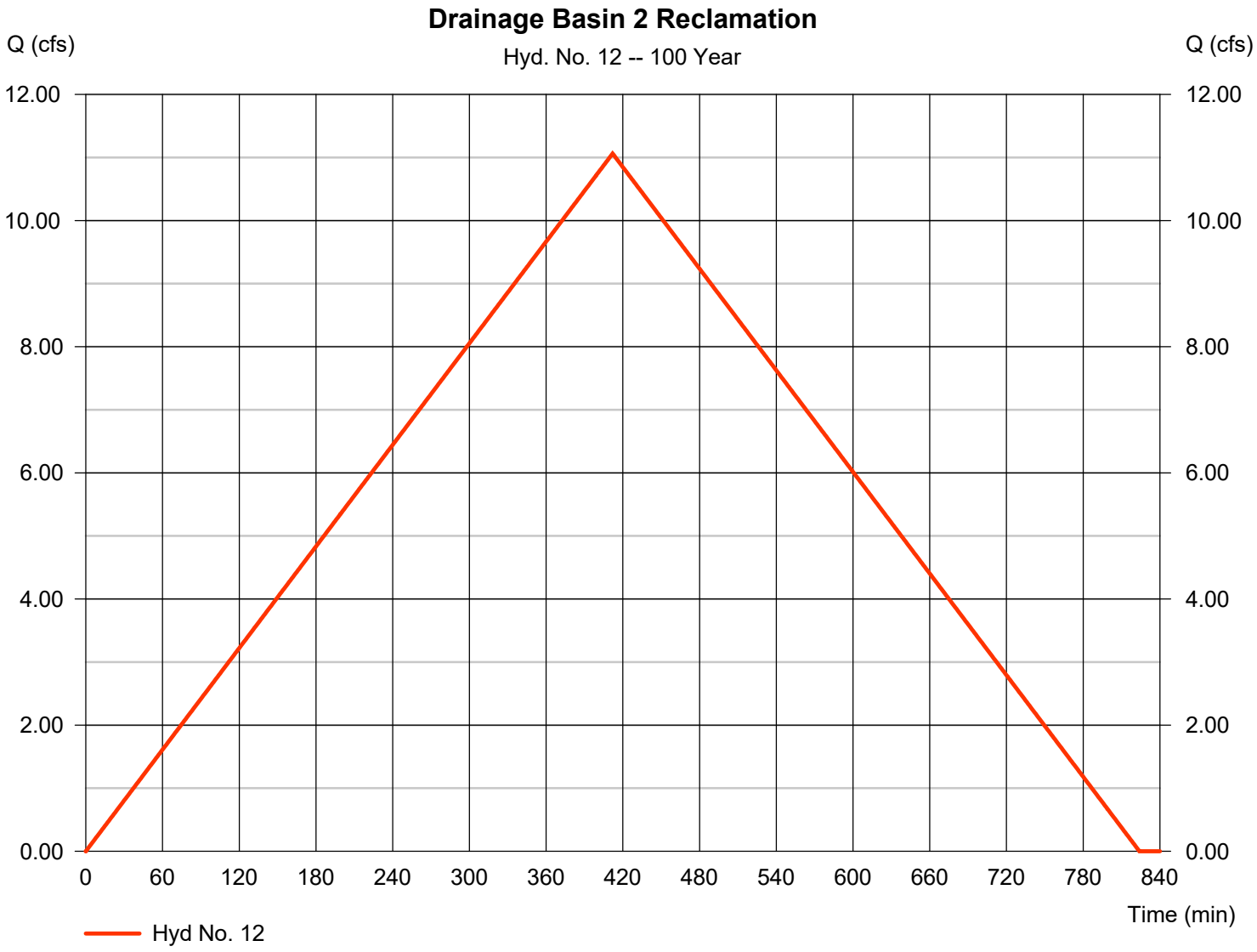
Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.011		0.011		0.011		
Flow length (ft)	= 0.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 0.00		0.00		0.00		
Land slope (%)	= 0.00		0.00		0.00		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**
Shallow Concentrated Flow							
Flow length (ft)	= 6075.00		0.00		0.00		
Watercourse slope (%)	= 0.01		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=0.16		0.00		0.00		
Travel Time (min)	**= 627.54**	**+**	**0.00**	**+**	**0.00**	**=**	**627.54**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**
Total Travel Time, Tc							**628.00 min**

Hydrograph Report

Hyd. No. 12

Drainage Basin 2 Reclamation

Hydrograph type	=	Rational	Peak discharge	=	11.06 cfs
Storm frequency	=	100 yrs	Time to peak	=	412 min
Time interval	=	1 min	Hyd. volume	=	273,459 cuft
Drainage area	=	120.000 ac	Runoff coeff.	=	0.13
Intensity	=	0.709 in/hr	Tc by TR55	=	412.00 min
IDF Curve	=	Limon.IDF	Asc/Rec limb fact	=	1/1



TR55 Tc Worksheet

Hyd. No. 12

Drainage Basin 2 Reclamation

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.011		0.011		0.011		
Flow length (ft)	= 0.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 0.00		0.00		0.00		
Land slope (%)	= 0.00		0.00		0.00		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**
Shallow Concentrated Flow							
Flow length (ft)	= 3987.00		0.00		0.00		
Watercourse slope (%)	= 0.01		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=0.16		0.00		0.00		
Travel Time (min)	**= 411.85**	**+**	**0.00**	**+**	**0.00**	**=**	**411.85**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

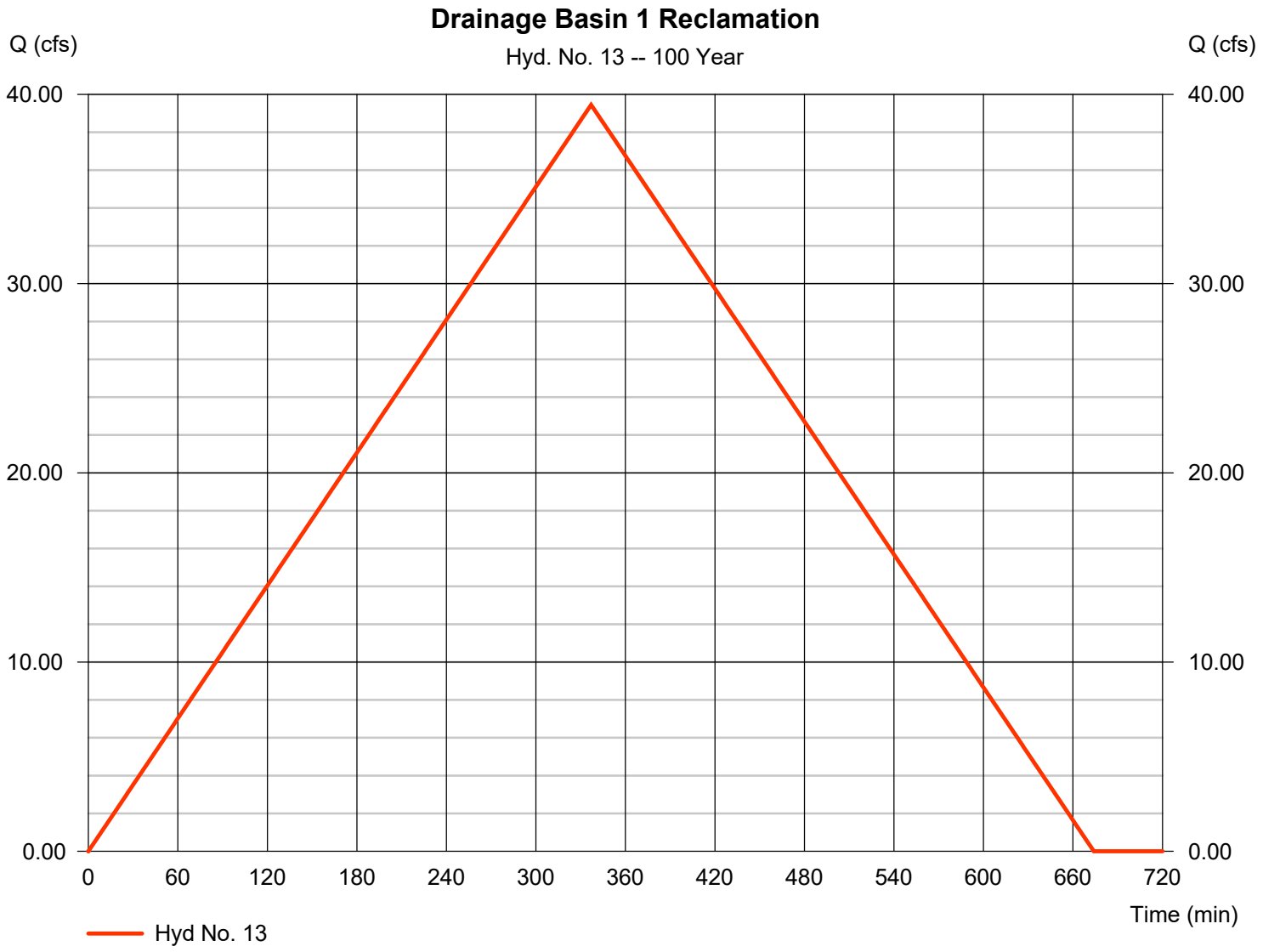
Total Travel Time, Tc ..... 412.00 min

Hydrograph Report

Hyd. No. 13

Drainage Basin 1 Reclamation

Hydrograph type	=	Rational	Peak discharge	=	39.45 cfs
Storm frequency	=	100 yrs	Time to peak	=	337 min
Time interval	=	1 min	Hyd. volume	=	797,648 cuft
Drainage area	=	364.000 ac	Runoff coeff.	=	0.13
Intensity	=	0.834 in/hr	Tc by TR55	=	337.00 min
IDF Curve	=	Limon.IDF	Asc/Rec limb fact	=	1/1



TR55 Tc Worksheet

Hyd. No. 13

Drainage Basin 1 Reclamation

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.011		0.011		0.011		
Flow length (ft)	= 0.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 0.00		0.00		0.00		
Land slope (%)	= 0.00		0.00		0.00		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**
Shallow Concentrated Flow							
Flow length (ft)	= 3258.00		0.00		0.00		
Watercourse slope (%)	= 0.01		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=0.16		0.00		0.00		
Travel Time (min)	**= 336.55**	**+**	**0.00**	**+**	**0.00**	**=**	**336.55**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

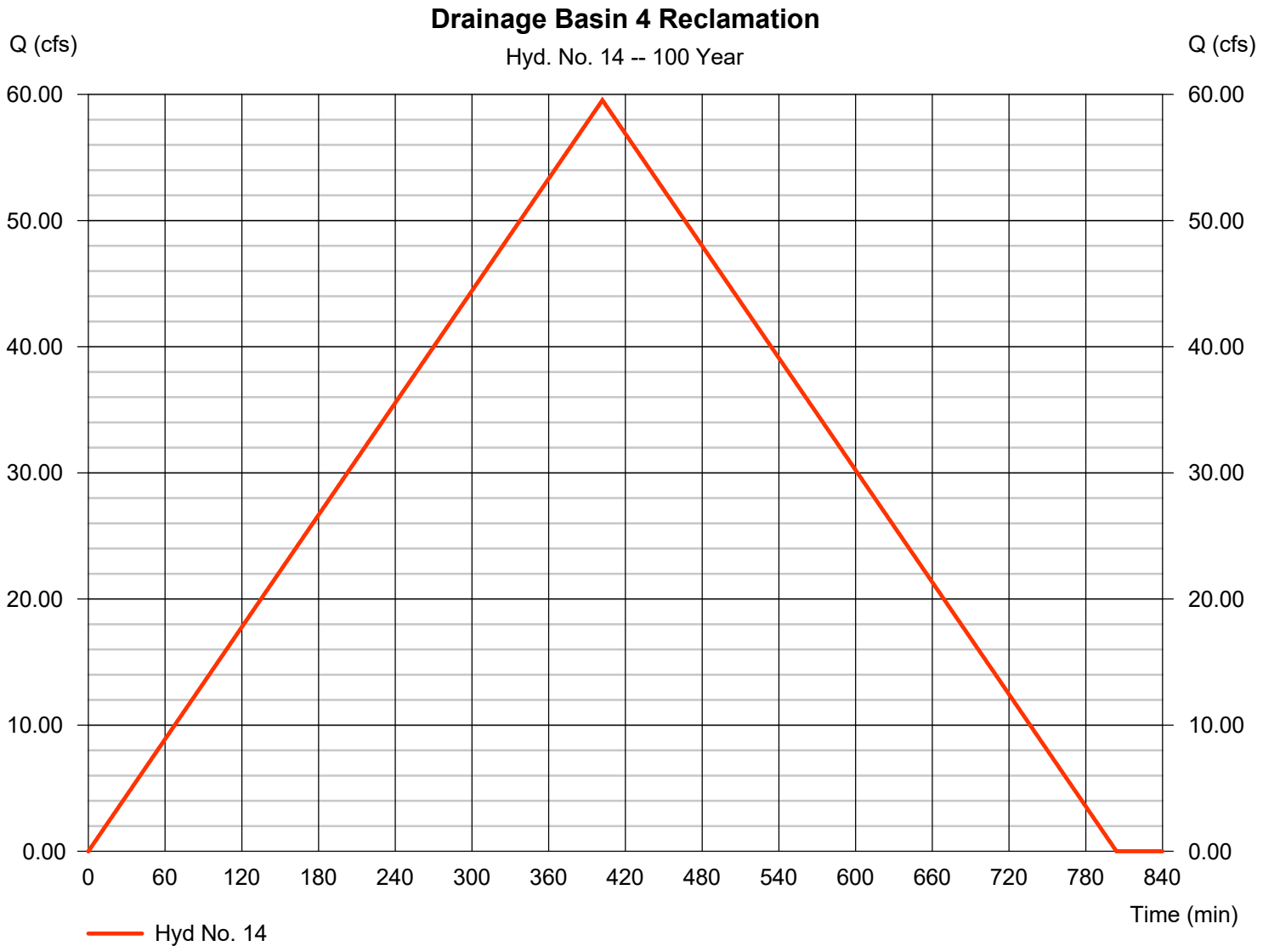
Total Travel Time, Tc ..... 337.00 min

Hydrograph Report

Hyd. No. 14

Drainage Basin 4 Reclamation

Hydrograph type	=	Rational	Peak discharge	=	59.54 cfs
Storm frequency	=	100 yrs	Time to peak	=	402 min
Time interval	=	1 min	Hyd. volume	=	1,436,199 cuft
Drainage area	=	168.000 ac	Runoff coeff.	=	0.49
Intensity	=	0.723 in/hr	Tc by TR55	=	402.00 min
IDF Curve	=	Limon.IDF	Asc/Rec limb fact	=	1/1



TR55 Tc Worksheet

Hyd. No. 14

Drainage Basin 4 Reclamation

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.011		0.011		0.011		
Flow length (ft)	= 0.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 0.00		0.00		0.00		
Land slope (%)	= 0.00		0.00		0.00		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**
Shallow Concentrated Flow							
Flow length (ft)	= 2588.00		1265.00		0.00		
Watercourse slope (%)	= 0.01		0.02		0.00		
Surface description	= Unpaved		Unpaved		Unpaved		
Average velocity (ft/s)	=0.14		0.20		0.00		
Travel Time (min)	**= 298.89**	**+**	**103.31**	**+**	**0.00**	**=**	**402.20**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

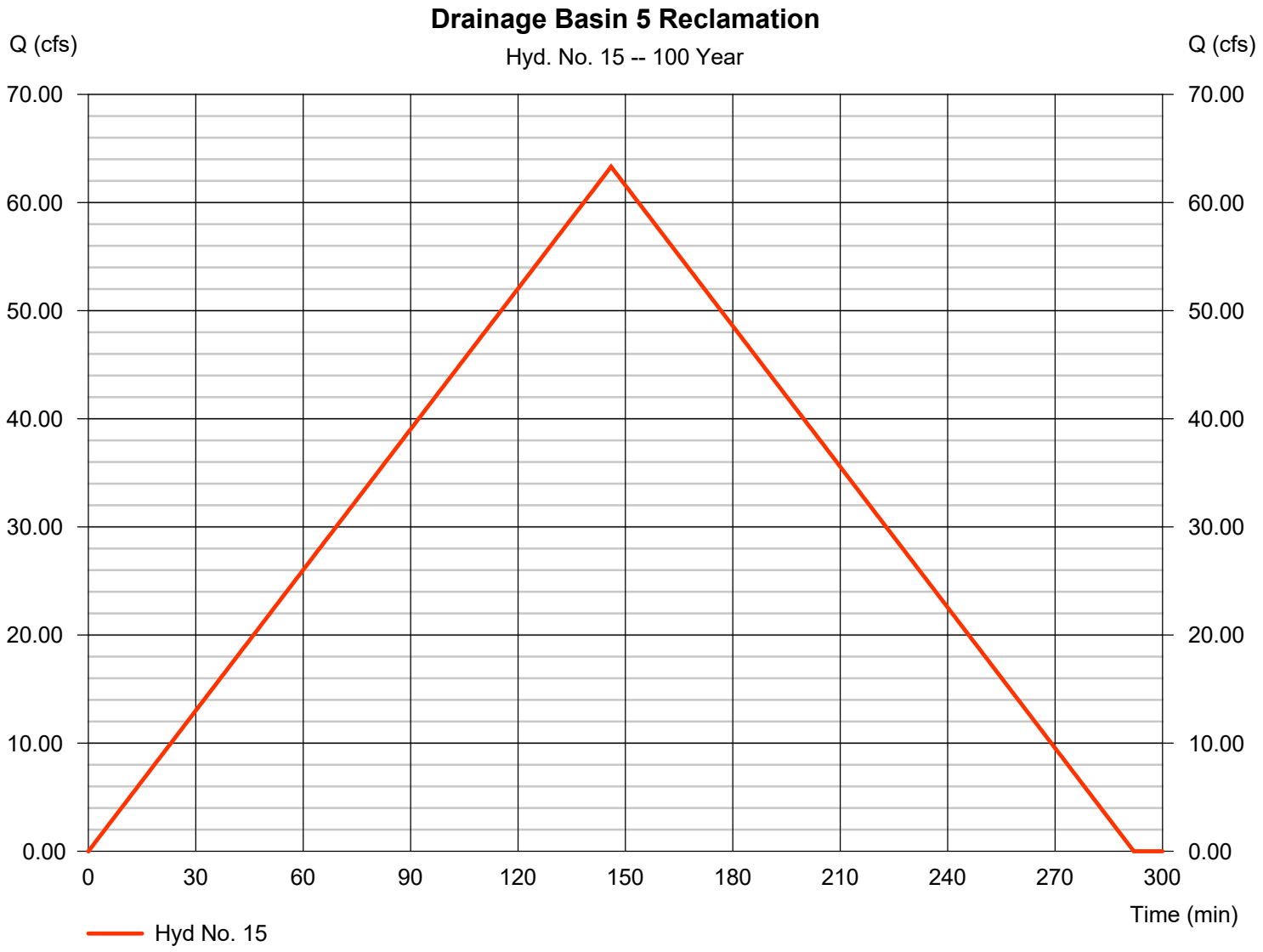
Total Travel Time, Tc ..... 402.00 min

Hydrograph Report

Hyd. No. 15

Drainage Basin 5 Reclamation

Hydrograph type	=	Rational	Peak discharge	=	63.32 cfs
Storm frequency	=	100 yrs	Time to peak	=	146 min
Time interval	=	1 min	Hyd. volume	=	554,672 cuft
Drainage area	=	80.100 ac	Runoff coeff.	=	0.49
Intensity	=	1.613 in/hr	Tc by TR55	=	146.00 min
IDF Curve	=	Limon.IDF	Asc/Rec limb fact	=	1/1



TR55 Tc Worksheet

Hyd. No. 15

Drainage Basin 5 Reclamation

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.011		0.011		0.011		
Flow length (ft)	= 0.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 0.00		0.00		0.00		
Land slope (%)	= 0.00		0.00		0.00		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**
Shallow Concentrated Flow							
Flow length (ft)	= 1413.00		0.00		0.00		
Watercourse slope (%)	= 0.01		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=0.16		0.00		0.00		
Travel Time (min)	**= 145.96**	**+**	**0.00**	**+**	**0.00**	**=**	**145.96**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 146.00 min

Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	--------
2	37.1523	10.7000	0.8283	--------
3	0.0000	0.0000	0.0000	--------
5	54.3344	10.7000	0.8283	--------
10	67.4323	10.7000	0.8283	--------
25	82.2202	10.7000	0.8283	--------
50	94.8955	10.7000	0.8283	--------
100	106.1626	10.7000	0.8283	--------

File name: Limon.IDF

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	3.80	3.02	2.52	2.18	1.92	1.72	1.57	1.44	1.33	1.24	1.16	1.09
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	5.55	4.42	3.69	3.19	2.81	2.52	2.29	2.10	1.94	1.81	1.70	1.60
10	6.89	5.48	4.58	3.95	3.49	3.13	2.84	2.61	2.41	2.25	2.11	1.98
25	8.40	6.68	5.59	4.82	4.25	3.82	3.47	3.18	2.94	2.74	2.57	2.42
50	9.70	7.71	6.45	5.56	4.91	4.41	4.00	3.67	3.40	3.16	2.96	2.79
100	10.85	8.63	7.21	6.22	5.49	4.93	4.48	4.11	3.80	3.54	3.31	3.12

Tc = time in minutes. Values may exceed 60.

Precip. file name: C:\Users\Sydney\Dropbox (GLA)\Elam\Delta Paving\AutoCAD\Hydrology\Precipitation.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	0.00	0.00	0.00	2.39	2.86	3.57	4.18	4.84
SCS 6-Hr	0.00	0.00	0.00	1.99	2.42	3.08	3.65	4.26
Huff-1st	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Appendix G-2 Groundwater Monitoring Plan

Limon Sand & Gravel Resource

Groundwater Monitoring Plan

May 2025

By:

Mid-State Materials, LLC

Represented by:

Lewicki & Associates

Contents

Introduction 1
1. Background Information 2
1.1. Site Description 2
1.2. Baseline Groundwater Characterization 5
2. Predicted Impacts to Hydrologic Balance 8
3. Groundwater Monitoring Plan 8
3.1. Groundwater Points of Compliance 9
4. Sampling Methods 9
4.1. Sampling Location 9
4.2. Sampling Frequency 10
4.3. Sampling Parameters 10
4.4. Sampling Procedure 12
4.5. Analytical Procedures 14
4.6. State Water Quality Standards 14
4.7. Reporting 15
4.8. Sampling Quality Assurance Project Plan (QAPP) 15
Appendix 1 - Map 16
Appendix 2 - Baseline Groundwater Quality Data 17
Appendix 3 – CDWR Permits 18
Appendix 4 – Industry Standard Field Sampling Sheet ..... **Error! Bookmark not defined.**
Appendix 5 – Sample Data Report ..... **Error! Bookmark not defined.**

Introduction

This groundwater quality monitoring plan will be implemented at the Limon Sand & Gravel Resource located just southeast of Limon, CO. This plan outlines the methods that the mine operator, Mid-States Materials, LLC, will follow to protect and monitor the integrity of the local groundwater quality and quantity. This plan is intended to meet the requirements of the Division of Reclamation, Mining, and Safety (DRMS) Mineral Rules and Regulations Rule 3.1.7(7)(b) and the Colorado Department of Public Health & Environment (CDPHE) Regulation No. 41. The Limon Sand & Gravel site is not located on any classified areas regarding groundwater; therefore, the statewide regulations (CDPHE Regulation 41) will be followed.

This monitoring plan requires the collection of pre-operational groundwater data that will be used as the baseline data to compare to the results of continued long-term groundwater monitoring. At least five quarters of monitoring data will be collected prior to operations commencing onsite. Continued monitoring will take place during mining operations. Results of this monitoring will be used to evaluate if any adverse impacts on groundwater have taken place as a result of the Limon Sand & Gravel mining operations.

The mining operation will directly interact with groundwater as it infiltrates freely into the pit. Groundwater will be pumped out during mining to an approved CDPHE discharge point. The interaction of groundwater by mining is not anticipated to cause any adverse impacts to groundwater as the pit itself acts as a gravel filter keeping sediments and other pollution from entering the local groundwater aquifer. Based on these conditions, sampling of water chemistry at the Limon Sand & Gravel resource will be conducted on a quarterly basis.

1. Background Information

1.1. Site Description

The Limon Sand & Gravel site is located roughly 2 miles southeast of Limon in Lincoln County, Colorado. The site is located at 39.2352, -103.6406. The mine permit encompasses a total of 1,094.5 acres. The mine site is located on the Craig Ranch, a multi-thousand acre ranch. This gives the mining area a significant buffer (greater than 500 ft in most directions) between its affected area and surrounding properties. The nearest neighbor to the planned mining area is the Colorado State Land Board 30 feet to the northeast as shown on the maps.

The Limon Sand & Gravel site is composed of upland and terraced areas divided by the Big Sandy Creek through the center. The site ranges from 5300'-5350' feet in elevation. The center of the site with the Big Sandy Creek is the lowest in elevation, while the topography gently increases away from the creek. The creek is an ephemeral stream that runs dry throughout most of the year. The creek is active during snowmelt periods in the spring, and after large precipitation events. The creek is most active in the spring following snowmelt and during heavy rains. It meanders through the site, generally flowing from the northwest to the southeast with a consistent elevation change of roughly 40 feet over more than 2 miles. At this site, the creek width ranges drastically from more confined channels of 20-40 feet, to larger channels upwards of 100 feet. The creek supports denser vegetation and cottonwoods that are not present on the dryer areas of the site. The Big Sandy Creek is a tributary to the Arkansas River. The site as a whole is part of the greater Arkansas River Basin.

Surrounding the creek, the upland areas rise in elevation gradually away from the creek towards the terraces. The terraces rise roughly 10-15' from the upland areas, then steadily increase in elevation towards the edges of the site. The upland and terrace areas contain dry rangeland vegetation that is used for cattle grazing. The site topography is shown on the maps.

The site is currently undeveloped rangeland used for grazing with various agriculture related structures such as stock wells and fences. An overhead utility line crosses the site from the southwest to northeast. An area towards the southeast of the site was previously mined and reclaimed. It has been backfilled by on-site materials such as waste fines, overburden, and topsoil. This area is outlined in the maps.

The conditions of the site and surroundings are shown on the map in Appendix 1. Surrounding the property is mostly undeveloped, agricultural, or oil and gas land uses. Most of the surrounding land is part of the Craig Ranch property, which has a few residential and agriculture related buildings and wells. Most of these structures are downstream or adjacent to mining, on various sides of the creek. The site location is shown in the vicinity map in Figure 1 below.

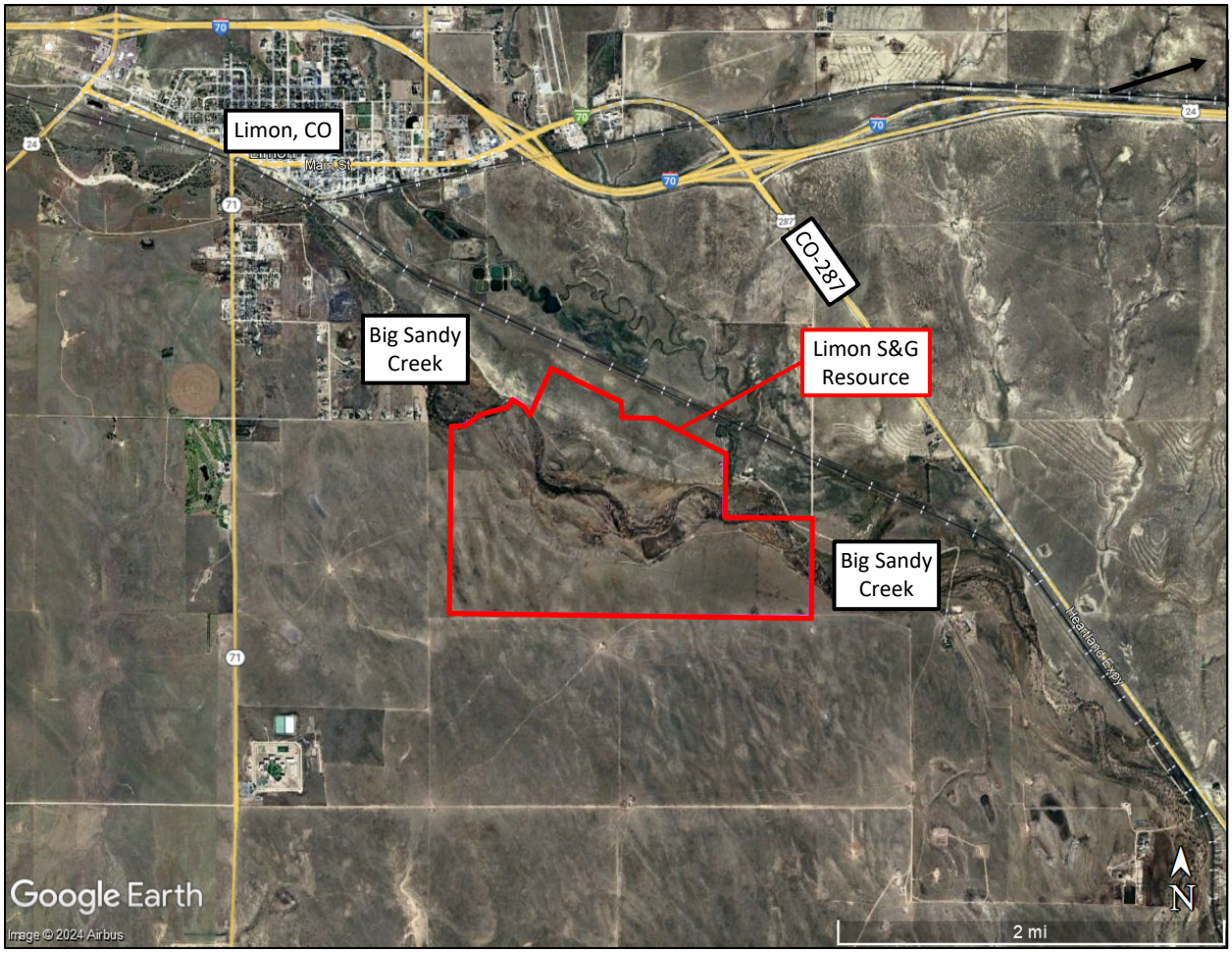


Figure 1 – Vicinity Map

The surface geology of the site is composed of a valley-fill sand and gravel alluvial deposit created by the Big Sandy Creek[1]. The creek and northern area of mining is silt, sand, and gravel alluvium, while the southern portion of mining is similar but sandier and siltier. The deposit is overlain by approximately 6 inches of topsoil and a varying thickness of overburden ranging from 10 feet towards the creek, and 35 feet on the terraces further from the creek. The deposit itself is composed of sand and gravel, and is approximately 10 feet thick. The bedrock below the alluvial deposit is Pierre Shale at approximately 20-45 feet below the surface. There are no faults or other major geologic structures that would affect groundwater at the site.

The aquifer present at the site is the Upper Big Sandy Groundwater Basin, a designated basin of the Denver Aquifer[2]. It is an unconfined alluvial aquifer related to the Big Sandy Creek alluvium deposit that is proposed to be mined. It covers a large area over 280,000 acres across El Paso, Elbert, and Lincoln counties. The aquifer follows the Big Sandy Creek, which generally

[1] D. Coffin, C. Horr, "*Geology and Ground-water Resources of the Big Sandy Creek Valley Lincoln, Cheyenne, and Kiowa Counties, Colorado."* U.S. Geological Survey, 1967.
[2] Martin and Wood Water Consultant, Inc. *"Upper Big Sandy Designated Ground Water Basin Phase 2 Water Balance Report,"* Upper Big Sandy Ground Water Management District, June 2009.

flows northwest until it turns southeast near Limon, CO. The proposed mine is near the downstream end of this aquifer. The aquifer depth at this site, based on well data, corresponds with the creek elevation. It is approximately 10 feet below the surface in the upland areas, and 35 feet below on the terraces. The aquifer thickness corresponds with the alluvium deposit, which is approximately 10 feet at the site. The hydraulic conductivity is 136 to 287 ft/day. The aquifer is primarily recharged through rainfall and snowmelt infiltration into the ground and creek. The bedrock aquifer is not clearly defined at this site; however, it will not be interacted with as mining will only be within the alluvial aquifer of the Big Sandy Creek.

A potentiometric surface was developed using Colorado Division of Water Resources (DWR) well data. This is shown on the Map in Appendix 1. The potentiometric surface confirms the overall aquifer characteristics, and corresponds to the flow of the Big Sandy Creek to the southwest.

A baseline map showing proposed wells and existing hydrologic conditions of the site is attached in Appendix 1.

1.2. Baseline Groundwater Characterization

Water quality and quantity sampling will take place in three stages as mining progresses through the various mining areas and sides of the creek. In general, each phase requires three points of data collection over 5 quarters to establish the baseline groundwater characterization prior to mining. Two points establish the baseline quality upstream and downstream of mining, while all three points triangulate the water table and flow direction. These stages are shown on Figure 2. Prior to mining in each new stage, baseline water monitoring must occur for 5 quarters. The monitoring points for each stage are outlined in Table 2.

All proposed sampling points are shown on the map in Appendix 1 and on Figure 2 below. Details on these sampling points and how they will be used for the monitoring plan are provided in Table 1 and 2. All wells that will be used for quality data are within the permit boundary. Wells outside of the permit boundary will only be used for water level measurements, and are on the Craig Ranch property which the mine operator has access to. All wells are drilled to the shale bedrock. Mining will proceed to 2 feet above the bedrock.

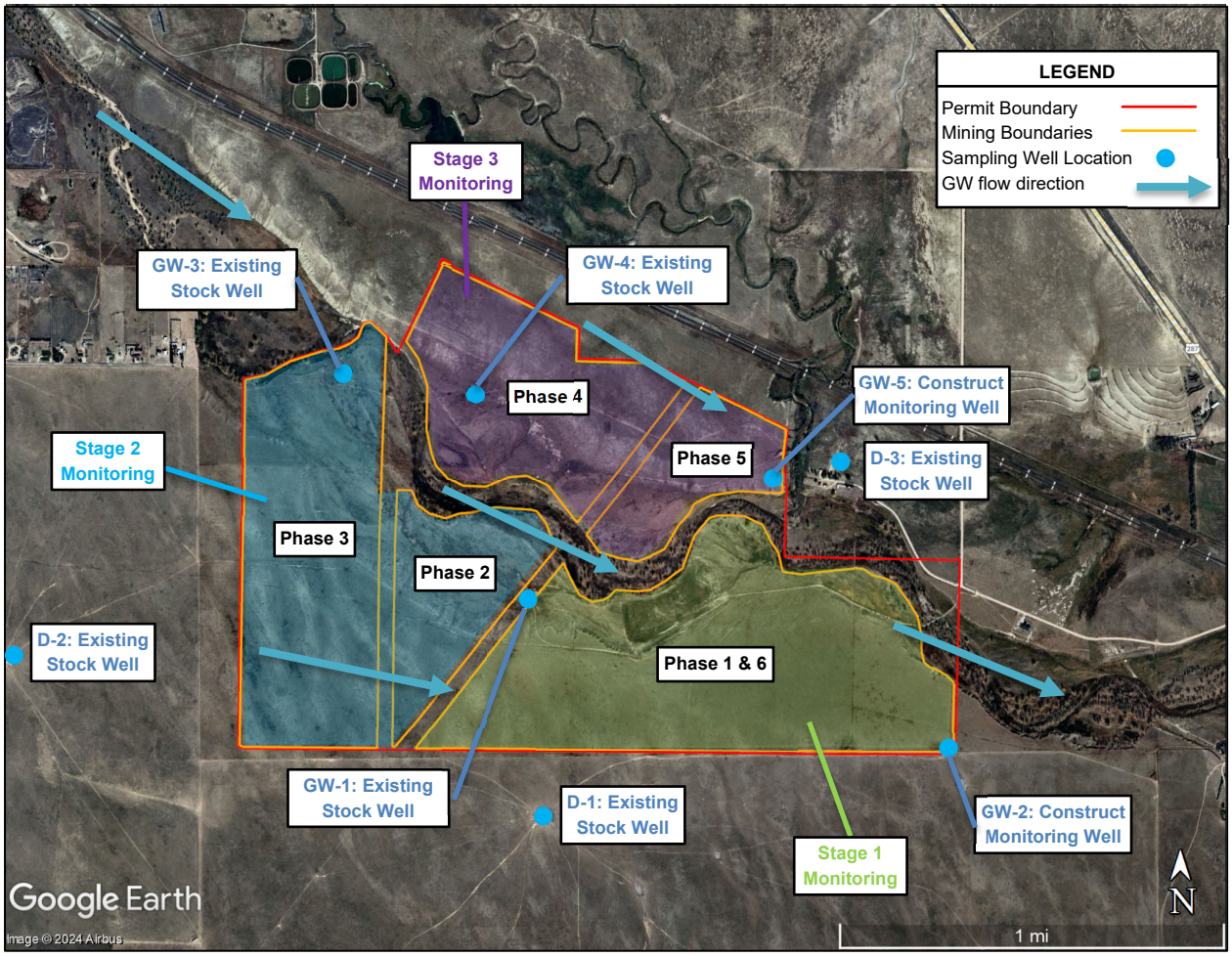


Figure 2 – Groundwater Sampling Locations

Table 1 – Groundwater Sampling Location Data

ID	Description	Lat	Long	Surface Elev. (ft)	Top of Casing Elev. (ft)	Total Depth (ft)	Depth to Water (ft)	Completion Date
GW-1	Center on site – south of creek	39.2351	-103.6609	5242	TBD	34	10	12-24-61
GW-2	Southwestern corner of site – south of creek	TBD	TBD	TBD	TBD	TBD	TBD	TBD
GW-3	Northwest on site – south of creek	39.2433	-103.6713	5254	TBD	30	10	5-19-95
GW-4	Northwest on site – north of creek	39.2429	-103.6639	5249	TBD	22	10	12-22-61
GW-5	Northeast on site – north of creek	TBD	TBD	TBD	TBD	TBD	TBD	TBD
D-1	South offsite	39.2271	-103.6607	5256	TBD	67	26	4-8-64
D-2	West offsite	39.2328	-103.6867	5329	TBD	110	52	7-1-68
D-3	Northeast offsite	39.2411	-103.6461	5232	TBD	40	20	7-1-65

Table 2 – Groundwater Sampling Stages

	Mine Phase	Upstream Monitoring Point	Downstream Monitoring Point	Third Monitoring Point
Stage 1	Phase 1, 6, & Processing Area	GW-1	GW-1	D-1
Stage 2	Phase 2 & 3	GW-3	GW-1	D-2
Stage 3	Phase 4 & 5	GW-4	GW-5	D-3

1.2.1. Monitoring Well Installation

All wells being used for monitoring were or will be constructed by a licensed contractor following the State Engineer's Office (SEO) guidelines. Construction information and lithology for each well are provided in Appendix 3 under the associated CDWR permit documents. Other characteristics of the wells are provided in Table 1 above. Table 3 below lists the CDWR permit numbers for each of these wells.

Table 3 – CDWR Well Permits

ID	CDWR Permit No.	Use
GW-1	62847	Stock
GW-2	TBD	Monitoring
GW-3	187207	Stock
GW-4	62846	Stock
GW-5	TBD	Monitoring
D-1	19131	Stock
D-2	34455	Stock
D-3	62844	Stock

1.2.2. Baseline Groundwater Quantity

The baseline water level will be quantified with at least 15 months (once a month for five quarters) of static water level prior to mining in each stage of monitoring (e.g. GW-1, GW-2, and D-1 for 15 months prior to mining in phase 1 & 6). The water level will be measured using depth measuring equipment such as a sounder from the top of the well casing, using the sampling methods outlined later in this plan. Data will be re corded in table and graph format in Appendix 1. This data will be analyzed to show the water level against time in graph format. A potentiometric groundwater model will be developed from this quantity data to ensure that POC monitoring is in the correct location to characterize downstream water qualities.

Quantity sampling will continue following the start of mining on a monthly basis. Results will be reported to the DRMS in table and graph format with the annual report.

1.2.3. Baseline Groundwater Quality

The baseline water quality will be quantified with at least five quarters of water quality sampling at all sampling locations within each stage of monitoring. Quality samples will be taken prior to mining in each stage of monitoring (e.g. GW-1, GW-2, and D-1 for 5 quarters prior to mining in phase 1 & 6). Quality sampling includes field and laboratory analysis. Quality sampling will meet Regulation 41 standards and parameters using the sampling methods described in this plan. Data will be recorded in a table and reported in Appendix 1.

2. Predicted Impacts to Hydrologic Balance

Impacts to the hydrologic balance are not anticipated to occur at the Limon Sand & Gravel site. Groundwater will be able to flow freely through the pit so quantity should not be affected. Groundwater exposure in the pit will be limited to 5 acres which should result in minimal evaporative losses, of which will be augmented back into the watershed.

Groundwater quality should not be drastically impacted for multiple reasons:

- Sand and gravel are being mined from their in-situ composition, without the use of chemicals or explosives. The excavation of this material does not introduce any pollutants to the groundwater.
- Material used to backfill will be sourced from on site materials that were already interacting with the groundwater.
- Sands (fill) and gravels that exist in-situ or will be backfilled back into the pit are effective filters for water flow. They trap suspended solids as water flows through them acting as a filtering media.
- Mining and backfilling will not introduce any pollutant sources or other substances that could lead to a negative impact to groundwater quality.
- The material in the pit (backfill or in-situ alluvium) acts as a gravel filter for any potential pollutants that enter the pond, preventing them from travelling in the aquifer.
- The site utilizes stormwater BMP's to prevent sediment or diesel oil discharge to exit the site. A spill kit and SPCC will be maintained to prevent diesel pollution into the water. All discharges will be permitted and sampled for quality.
- Monitoring of the groundwater throughout the life of the mine will show any impacts to groundwater quality. While these impacts are unanticipated, they will be identified and mitigated to prevent long-term effects on the local groundwater.

The sampling and monitoring methods in this plan will work to identify any impacts to the hydrologic balance once mining starts. Also, outlined in this plan are actions to take in the case that adverse impacts to the groundwater are encountered. Potential contaminants from mining operations include total dissolved solids (TDS) and some heavy metals, both from the equipment operation, disturbed sediments, and material processing.

3. Groundwater Monitoring Plan

This groundwater monitoring plan will be enacted at the Limon Sand and Gravel site to identify and quantify any potential impacts of mining to the local groundwater aquifer.

3.1. Groundwater Points of Compliance

The points of compliance (POC) at the Limon Sand & Gravel site will be used to monitor quality and quantity of groundwater during mining operations. This will identify if mining produces any adverse effects on the groundwater, and ensure that compliance with Regulation 41 standards are maintained. The points of compliance will be downstream of any active mining or disturbance such as the processing and operating area. The POC will change throughout the stages of the water monitoring plan. GW-2 will remain a POC throughout the life of the mine, starting with Phase 1 development, and continuing as that area is used for processing and operations. GW-1 and GW-5 will also serve as POC's at different periods of time as mining occurs upstream of them. This is also outlined in Table 4.

Monitoring will begin quarterly at the designated POC for the first 12 months after mining in each monitoring stage begins. If monitoring shows no adverse effects of mining at the POC, monitoring frequency may be decreased through a technical revision (TR) with the DRMS. With the division's approval, sampling frequency will be decreased to twice a year (every 6 months), or to a schedule recommended by the DRMS. Results of the quality and quantity sampling at the POC will be provided to the DRMS with the annual report. If adverse effects are identified, the DRMS will be notified immediately and the operator will start a water quality mitigation plan to be approved by the DRMS.

4. Sampling Methods

This section identifies the sampling methods that will be used to quantify the groundwater conditions at the Limon Sand & Gravel site.

4.1. Sampling Location

The sampling locations, including frequency and sampling type, are detailed in the table below. This table is separated by monitoring stages as the sampling locations will change during the progression of mining. Figure 2 shows the sampling locations and stages. Mining will not begin in a new stage until 5 quarters of baseline sampling have been completed.

- **Monitoring Stage 1:** Life of Mine – Mining Phases 1, 6, & the Processing/Operating Area
- **Monitoring Stage 2:** Mining Phases 2 & 3
- **Monitoring Stage 3:** Mining Phases 4 & 5

Table 4 – Sampling Type and Frequency

	Baseline Sampling – 5 Quarters Prior to Mining in each Monitoring Stage		POC Sampling – Duration of Mining in each Monitoring Stage	
Stage	**Quantity Sampling Location & Frequency**	**Quality Sampling Frequency**	**Quantity Sampling Frequency**	**Quality Sampling Frequency***
1	GW-1, GW-2, & D-1 Monthly	GW-1 GW-2 Quarterly	GW-1, GW-2, & D-1 Monthly	GW-2
2	GW-1, GW-3, & D-2 Monthly	GW-1 GW-3 Quarterly	GW-1, GW-3, & D-2 Monthly	GW-1 & GW-2
3	GW-4, GW-5, & D-3 Monthly	GW-4 GW-5 Quarterly	GW-4, GW-5, & D-3 Monthly	GW-5 & GW-2

*Quarterly sampling will take place at the POC after the first 12 months of mining in each new monitoring stage. After 12 months, it may be decreased through a TR with the DRMS. POC Monitoring at GW-2 will continue throughout the mine life.

4.2. Sampling Frequency

Baseline groundwater sampling will begin at least five quarters in advance of mining in each monitoring stage at the Limon Sand & Gravel Resource. One sample per quarter will be taken at each of the baseline sampling locations depending on which phase of mining is about to be opened.

Point of compliance sampling will begin after mining has started. It will start out as quarterly sampling for the initial 12 months after the beginning of mining. If adverse impacts have not been encountered after five quarters of sampling, the frequency may be decreased with approval from the DRMS.

4.3. Sampling Parameters

The operator or qualified person will perform field and laboratory analysis of their samples for the water quality parameters identified in Table 4. These parameters are consistent with those required by the DRMS for Construction Material Sites, derived from Regulation 41 Tables 1-4. All laboratory analysis of the groundwater samples will be performed by a State of Colorado certified laboratory that follows industry standards and quality assurance/quality control (QA/QC) procedures.

Table 5 – Water Quality Parameters

Analyte		Table Value Standard (mg/L unless stated otherwise)	Reg.41 Table Reference (1-4)
1	pH (Field)	6.5-8.5 units	2 & 3
2	TDS	400, or 1.25 x Background	4
3	Chloride - Dissolved	250	2
4	Fluoride - Dissolved	2	3
5	Nitrate (NO3)	10	1
6	Nitrite (NO2)	1.0	1
7	Nitrite + Nitrate as Nitrogen	10	1
8	Sulfate - Dissolved	250	2
9	Aluminum - Dissolved	5	3
10	Antimony - Dissolved	0.006	1
11	Arsenic - Dissolved	0.01	1
12	Barium - Dissolved	2	1
13	Beryllium - Dissolved	0.004	1
14	Boron - Dissolved	0.75	3
15	Cadmium - Dissolved	0.005	1
16	Chromium - Dissolved	0.1	1 & 3
17	Cobalt - Dissolved	0.05	3
18	Copper - Dissolved	0.2	3
19	Iron - Dissolved	0.3	2
20	Lead - Dissolved	0.05	1
21	Lithium - Dissolved	2.5	3
22	Manganese - Dissolved	0.05	2
23	Mercury - Dissolved	0.002	1
24	Molybdenum - Dissolved	0.21	1
25	Nickel - Dissolved	0.1	1
26	Selenium - Dissolved	0.02	3
27	Silver - Dissolved	0.05	1
28	Thallium - Dissolved	0.002	1
29	Uranium - Dissolved	0.0168-0.03	1
30	Vanadium - Dissolved	0.1	3
31	Zinc - Dissolved	2	3

4.4. Sampling Procedure

The following protocol will be used for the collection and testing of water samples by field personnel. This procedure was developed using the *SESCPROC-301-R3: Groundwater Sampling Operating Procedure* published by the United States Environmental Protection Agency (EPA).

General Precautions

1) Proper safety precautions must be observed when collecting groundwater sampling. This procedure should be enacted in tandem with the judgement of a competent and experienced professional. Proper Personal Protective Equipment (PPE) should be worn depending on the conditions of the site and materials/chemicals being handled. Potential hazards of the site should be identified prior to sampling, particularly when sampling is occurring on an active mine site. All chemicals will be provided with Material Safety Data Sheets.

Prior to Sampling

1) **Laboratory Selection & Bottle Procurement:** Specific bottles will be ordered from an appropriate and certified analytical laboratory which will be used for collecting water samples. The bottles are retrieved from the lab cleaned and preconditioned. The bottles will either already be prepared with the preservative(s), or the preservatives will be provided from the laboratory.
2) **Decontamination:** Field sampling equipment will be cleaned and calibrated prior to sampling. This is important to get accurate data and prevent contamination of samples. The calibration of the equipment will be performed as described in the equipment manual. Decontamination of equipment will be achieved in accordance with the SESDPROC-205 Field Equipment Cleaning and Decontamination procedure published by the EPA. The procedures for the equipment to be used are as follows:
    a. **Well Sounder or Tape:**
        i. Wash with Liquinox or other appropriate equipment detergent and tap water.
        ii. Rinse with tap water.
        iii. Rinse with deionized water.
    b. **Pump and Wetted Portion of Tubing or Hose:**
        i. Disconnect power and wash exterior of pump and hose with Liquinox or other appropriate equipment detergent and tap water.
        ii. Rinse with tap water.
        iii. Rinse with deionized water.
        iv. Keep clean between uses.

1) **Depth Measurement:** The static water level of the groundwater well will be measured and recorded using a water level well sounder prior to pumping of the well. The measurement location at the top edge of the well casing will be marked with a permanent ink pen. This mark will be touched up with fresh ink each time a sample is taken.
2) **Purging the well:** The contents of the well will be purged prior to sample collection using a low-flow, submersible pump. This pump will be cleaned prior to being placed in the well. Sampling will not occur until conditions of the water have stabilized AND at least three well volumes have been removed from the well. If the required volume has been purged, and the water appears to not be stabilized, then additional purging must occur until stabilization. Stabilization of the groundwater can be determined based on the following:
    a. Water is running clear with little to no sediment for a prolonged period of time.
    b. Field measurements, such as those listed below, have stabilized.
3) **Field Measurements**: Water will be collected in a clean and empty container for various field measurements. Between sampling locations, the container must be cleaned or rinsed thoroughly, preferably with water from the source to be sampled next. The following field measurements will be taken with cleaned and calibrated meters. Field measurements will be reported in a manner that is consistent with industry standards for field sampling logbooks. An example of the logbook to be used is shown in Appendix 4.
    a. pH
    b. Temperature
    c. Dissolved Oxygen
    d. Conductivity
4) **Collecting Samples:** Water will be pumped from the well into a clean pitcher or bottle which will be used to fill the bottles from the laboratory. The bottles will be marked with the date, time, and site location of the sample as well as the person who collected the sample. If a pump controller system is used, the sample bottles may be filled directly from the well. Samples will be preserved and shipped in accordance with the method requirements. Filled sample bottles will then be placed in a cooler with ice for transport to the lab.
5) **Contamination Prevention:** Special care must be exercised to prevent contamination of samples. Samples must be stored in a secure location to prevent alteration of the sample properties. The chain of custody procedure must be followed. Sampling shall occur from the least contaminated, to the most contaminated location.
6) **Chain of Custody:** A chain of custody will be completed for the sample which indicates what analyses need to be performed, the date and time of sampling, sample identification, and who assembled the sample. The samples will be delivered to the lab the day of collection. Samples shall be custody sealed during shipment or long term storage. Sampled must remain in the custody of the sampler sample custodian until the samples are relinquished to the laboratory.

4.5. Analytical Procedures

The results from the analytical water quality testing will be evaluated through comparison with the State groundwater quality standards. The Limon Sand & Gravel Resource is not within any WQCC specified areas that would require conformance with anything other than statewide water quality standards. Baseline groundwater data can be found in Appendix 2.

4.6. Site-Specific Numeric Protection Levels

Baseline water quality data gathering may show ambient levels of a regulated parameter at a level higher than that specified in Regulation 41. In such a case, the operator will propose a Site-Specific Numeric Protection Level through a TR. Site-Specific Numeric Protection Levels at the Limon Sand & Gravel site will be proposed after the five quarters of baseline sampling. They will be determined by the results of baseline water quality data. The Site-Specific Numeric Protection Levels will be based on the two-sigma (95-percentile) statistical value for the parameter sampled.

4.7. State Water Quality Standards

The analytical results of water quality testing during mining will be compared to the regulatory limits established by Water Quality Control Commission (WQCC) and those otherwise defined by the DRMS. The groundwater of the Limon Sand & Gravel site is subject to the statewide groundwater quality standards as defined in Tables 1-4 of the WQCC Regulation 41. The site is not within any specified areas identified by the WQCC to have specific groundwater quality standards. If any exceedance of applicable water quality standards is detected during mining at the mine, the DRMS will be notified in accordance with Rule 3.1.7(9) and the operator will initiate a water quality mitigation plan.

If any exceedances of the WQCC Regulation 41 basic groundwater standards are encountered, the operator will implement the following reporting and mitigation procedures:

- Notify the DRMS of the exceedance within five (5) working days of receiving the analytical report from the laboratory.
- Implement DRMS proposed corrective actions, as defined in a subsequent TR, such as the following:
- Identify the potential cause or source of the exceedance. Halt activities that have been deemed as a potential cause.
- Implement supplemental water quality sampling. Sampling and testing of the groundwater well will be increased until the parameter(s) drop below the allowable limit. Only parameter(s) that were in exceedance will be measured as part of this supplemental sampling.
- Consult with the Lincoln County Department of Environmental Health on appropriate mitigation methods of the exceedance.

- Provide a report to Lincoln County staff and the DRMS with details of the exceedance, mitigation measures, and results.

4.8. Reporting

Water quality and quantity data for baseline and POC monitoring will be reported to the CDRMS on a quarterly basis. Data reporting will be in table format and graph format when necessary. The Reporting Schedule is as follows:

- Quarter 1 Reporting Due Date: May 1
- Quarter 2 Reporting Due Date: August 1
- Quarter 3 Reporting Due Date: November 1
- Quarter 4 Reporting Due Date: February 1 of the next year

Baseline standards will be determined following the submittal of a TR to the Division after the 5 quarters of baseline monitoring per each monitoring stage.

4.9. Sampling Quality Assurance Project Plan (QAPP)

The operator's quality assurance methods for water sampling includes only using Colorado State certified laboratories with an industry standard Quality Assurance/Quality Control plan in place. On-site quality assurance for field sampling is included in the Sampling Procedure described in Section 1.4. Certain steps of the procedure such as clearing three well volumes before sampling and using cleaned and calibrated testing equipment help to ensure that the testing results are accurate and free of altering contaminants. Any samples that are collected will include information on who took the sample, when it was taken, sample identification, and the chain of custody. A sample data collection sheet from previous baseline monitoring at the site is provided in Appendix 5.

Appendix 1 - Map

LEGEND

BUILDINGS AND RELATED STRUCTURES
- Building
- Fence

LAND SURVEYS
- Property boundary

ROADS AND RELATED FEATURES
- Highway
- Light duty road, gravel

RIVERS, LAKES, SHORELINES, AND CANALS
- Perennial stream/ditch
- Perennial river
- Perennial lake/pond
- Waterwell — Well Name

VEGETATION
- River Corridor
- Rangeland
- NWI Wetlands
- Existing Trees

TRANSMISSION LINES AND PIPELINES
- Power transmission line; pole; tower

MINING FEATURES
- DRMS Permit Boundary
- Affected Area Boundary

BASELINE CONTOURS
- Index — Approximate of indefinite
- Intermediate — Approximate of indefinite
- Supplementary

POTENTIOMETRIC SURFACE CONTOURS
- Index
- Intermediate

GW-3 EXISTING STOCK WELL
Stock Well
Depth to Water: 10'
Depth to Shale: 30'

GW-4 EXISTING STOCK WELL
Stock Well
Permit: 62846
Depth to Water: 10'
Depth to Shale: 22'

GW-5 CONSTRUCT MONITORING WELL

D-3 EXISTING STOCK WELL
Stock Well
Permit: 62844
Depth to Water: 20'
Depth to Shale: 40'

D-2 EXISTING STOCK WELL

GW-1 EXISTING STOCK WELL
Stock Well
Permit: 62847
Depth to Water: 10'
Depth to Shale: 34'

D-1 EXISTING STOCK WELL
Stock Well
Permit: 47031
Depth to Water: 20'
Depth to Shale: 42'

GW-2 CONSTRUCT MONITORING WELL

Stock Well
Permit: 39630
Depth to Water: 10'
Depth to Shale: 30'

Domestic Well
Permit: 47031
Depth to Water: 20'
Depth to Shale: 42'

Stock Well
Permit: 27046

Domestic Well
Permit: 47031
Depth to Water: 23'
Depth to Shale: 25'

Domestic Well
Permit: 47031
Depth to Water: 20'
Depth to Shale: 42'

5275' 5250' 5240' 5230' 5220' 5210' 5225' 5300'

GWMP Map

Limon Sand & Gravel

DRMS Permit Number: N/A — **Bettis Companies**

Mine Entry Location:	Latitude: 39.234283	Longitude: -103.643228
State: COLORADO	County: LINCOLN	Nearest Town: LIMON, CO
Section: 27	Township: 9	Range: 56 PM: 6TH
Major Watershed:	Arkansas	MSHA ID: ----

Map Scale: 1": 400'

0 200 800 N

Map Georeferencing Information:	**Datum: NAD83**	**Projection: CO CENTRAL**
Survey Source: USGS	**Drawn by:** SAC	Date: 05-09-25
Imagery Source: N/A	**Checked by:** BHM	Date: 05-09-25
Survey Date: 2023	**Approved by:** BHM	Date: ----
Imagery Date: N/A		

File Name: Limon Sand and Gravel 240724_recover

Lewicki & Associates
3375 West Powers Circle
Littleton, CO USA 80123
(303)-346-5196
info@lewicki.biz

Appendix 2 - Baseline Groundwater Quality Data

Will be updated and provided to the DRMS as sampling occurs.

Appendix 3 – CDWR Permits

Documents provided in the following order:

ID	CDWR Permit No.
GW-1	62847
GW-2	TBD
GW-3	187207
GW-4	62846
GW-5	TBD
D-1	19131
D-2	34455
D-3	62844

COLORADO
Division of Water Resources
Department of Natural Resources

WELL PERMIT NUMBER 62847-
RECEIPT NUMBER 9090626

ORIGINAL PERMIT APPLICANT(S)

WILLIAM H CRAIG

APPROVED WELL LOCATION

Water Division: 2 Water District: 67
Designated Basin: UPPER BIG SANDY
Management District: UPPER BIG SANDY
County: LINCOLN
Parcel Name: N/A
Physical Address: N/A

SE 1/4 SE 1/4 Section 28 Township 9.0 S Range 56.0 W Sixth P.M.

UTM COORDINATES (Meters, Zone: 13, NAD83)

Easting: 615627.7 Northing: 4343442.9

REGISTRATION OF EXISTING WELL

See the original well permit file for permit conditions of approval and additional details. The original permit file can be viewed using the Well Permit Search Tool at www.water.state.co.us

Date Issued: 8/3/1972
Expiration Date: N/A

Issued By

PERMIT HISTORY

01-22-2020 CHANGE IN OWNER NAME/MAILING ADDRESS. CHANGED TO JOHN WILLIAM CRAIG

WRJ-25-72

THIS FORM MUST BE SUBMITTED PRIOR TO THE EXPIRATION OF THE PERMIT. TYPE OR PRINT IN BLACK INK.

COLORADO DIVISION OF WATER RESOURCES

101 Columbine Bldg., 1845 Sherman St.
Denver, Colorado 80203

RECEIVED
1972
WATER RESOURCES
STATE ENGINEER
COLO.

X STATEMENT OF BENEFICIAL USE OF GROUND WATER
____ AMENDMENT OF EXISTING RECORD

PERMIT NUMBER 62847

STATE OF COLORADO
COUNTY OF Lincoln } SS.

THE AFFIANT(S) William H. Craig

whose address is Box 116 Limon, Colorado 80828

being duly sworn upon oath, deposes and says that he (they) is (are) the owner(s) of the well described hereon; the well is located in the SE ¼ of the SE ¼ of Section 28, Township 9 5 (N. or S.), Range 56 W (E. or W.), 6 P.M. at distances of 1200 feet from the South (North or South) section line and 500 feet from the East (East or West) section line; the total depth of the well is 24 feet; water from this well was first applied to a beneficial use for the purpose(s) described herein on the 24 day of Dec, 1961; the maximum sustained pumping rate of the well is 8 gallons per minute, the pumping rate claimed hereby is 7 gallons per minute; the average annual amount of water to be diverted is ____ acre-feet; for which claim is hereby made for Stockwater purpose(s); the legal description of the land on which the water from this well is to be used is Sec. 28 T9S R56W. 6 P.M.

which totals 640 acres and which is illustrated on the map on the reverse side of this form; that this well was completed in compliance with the permit approved therefor; this statement of beneficial use of ground water is filed in compliance with law; he (they) has (have) read the statements made hereon; knows the content thereof; and that the same are true of his (their) knowledge.

Signature(s) William H. Craig

Subscribed and sworn to before me on this 12 day of April, 1972

My Commission expires: Jan 10 - 1976
(Seal)

Louise Hamacher
Notary Public

ACCEPTED FOR FILING IN THE OFFICE OF THE STATE ENGINEER OF COLORADO ON THIS 3 DAY OF Aug, 1972

STATE ENGINEER

WHITE COPY FOR DIVISION OF WATER RESOURCES
PINK COPY FOR WELL OWNER

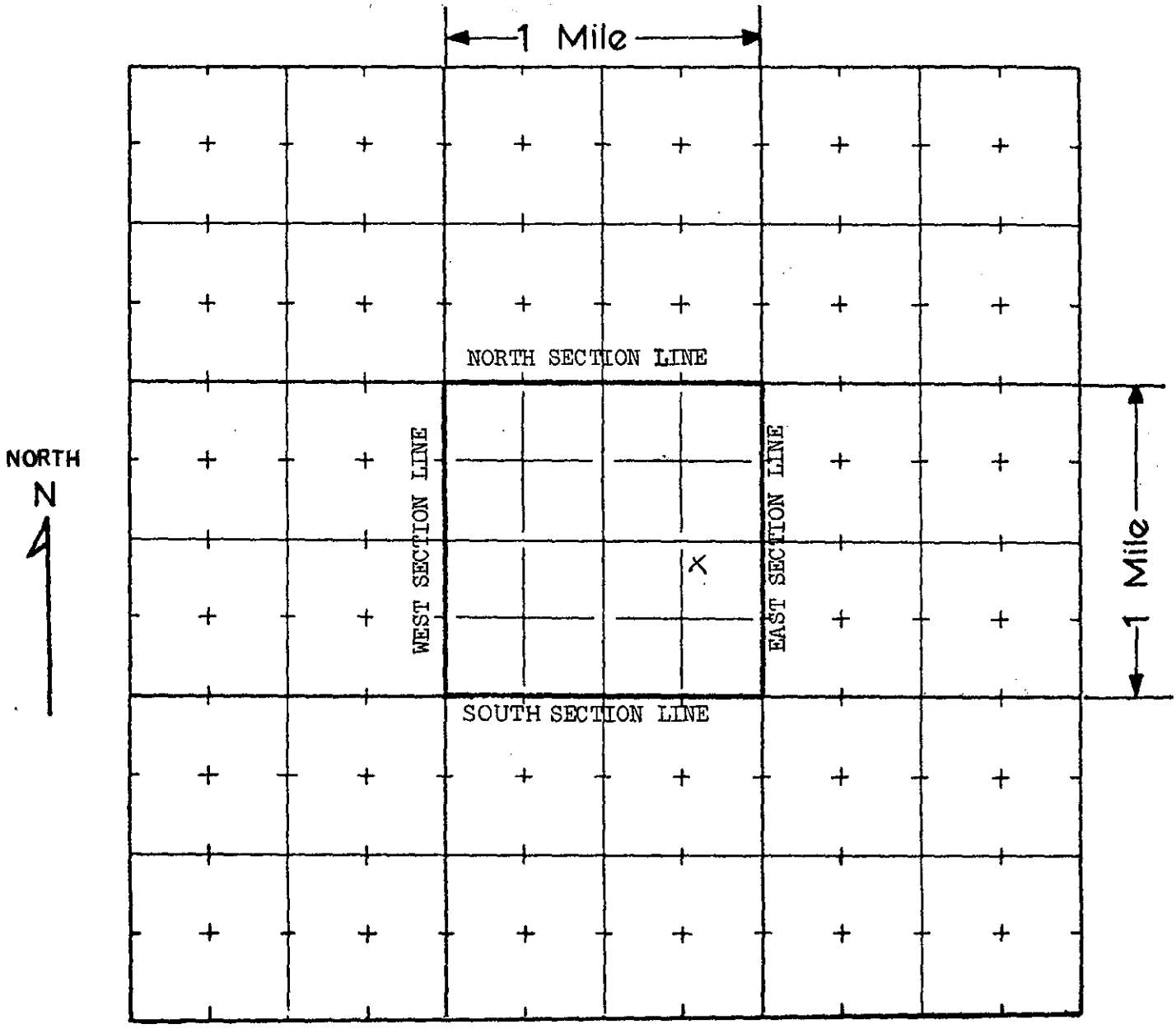
FOR OFFICE USE ONLY

Prior. Date ____, ____, 19____
Well Use 2
____ ¼, ____ ¼, ____ ¼, Sec. ____,
T. ____, R. ____, ____ P.M.
Yield ____ W.D. 2-67
Co. 37
Index ____

30522

THE LOCATION OF THE WELL MUST BE SHOWN AND THE AREA ON WHICH THE WATER IS USED MUST BE SHADED OR CROSS-HATCHED ON THE DIAGRAM BELOW.

This diagram represents nine (9) sections. Use the **CENTER SQUARE** (one section) to indicate the location of the well, if possible.



THE SCALE OF THE DIAGRAM IS TWO INCHES EQUALS ONE-MILE

Meter Serial No._____ ☐ Flow Meter ☐ Electric Meter ☐ Fuel Meter

Owner of land on which water is being used_____

WATER EQUIVALENTS TABLE *(Rounded Figures)*

An acre-foot covers 1 acre of land 1 foot deep.
1 cubic foot per second (cfs) . . . 449 gallons per minute (gpm).
1 acre-foot . . . 43,560 cubic feet . . . 325,900 gallons.
1,000 gpm pumped continuously for one day produces 4.42 acre-feet.
100 gpm pumped continuously for one year produces 160 acre-feet.

WRJ-26-72

THIS FORM MUST BE SUBMITTED WITHIN 60 DAYS OF COMPLETION OF THE WORK DESCRIBED HEREON. TYPE OR PRINT IN BLACK INK.

COLORADO DIVISION OF WATER RESOURCES

101 Columbine Bldg., 1845 Sherman St.
Denver, Colorado 80203

WELL COMPLETION AND PUMP INSTALLATION REPORT

PERMIT NUMBER Late Reg - 62847

WELL OWNER Bill Craig

ADDRESS Lyons, Colo.

DATE COMPLETED Dec 22, 1961

SE ¼ of the SE ¼ of Sec. 28

T. 9, R. 56 W, 6th P.

WELL LOG

From	To	Type and Color of Material	Water Loc.
0 -	10	sand + clay -	
10 -	22	sand.	
22.	34	blue shale -	

TOTAL DEPTH 34 ft.

Use additional pages necessary to complete log.

HOLE DIAMETER

9 in. from 0 to 34 ft.

___ in. from ___ to ___ ft.

___ in. from ___ to ___ ft.

CASING RECORD:

Plain Casing

Size 6 in & kind plastic from 0 to 14 ft

Size ___ & kind ___ from ___ to ___ ft

Size ___ & kind ___ from ___ to ___ ft

Perforated Casing

Size 6 in & kind plastic from 14 to 34 ft

Size ___ & kind ___ from ___ to ___ ft

Size ___ & kind ___ from ___ to ___ ft

GROUTING RECORD

Material Cement

Intervals ___

Placement Method ___

GRAVEL PACK: Size 3/8 in

Interval ___

TEST DATA

Date Tested Dec 22, 1961

Static Water Level Prior to Test 10 ft

Type of Test Pump bailed

Length of Test 1 hr.

Sustained Yield (Metered) 8 gal

Final Pumping Water Level 11½ ft.

PUMP INSTALLATION REPORT

ump Make _____

ype _____

owered by _____ HP _____

ump Serial No. _____

lotor Serial No. _____

)ate Installed _____

'ump Intake Depth _____

Remarks _____

_____

NELL TEST DATA WITH PERMANENT PUMP

)ate Tested _____

Static Water Level Prior to Test _____

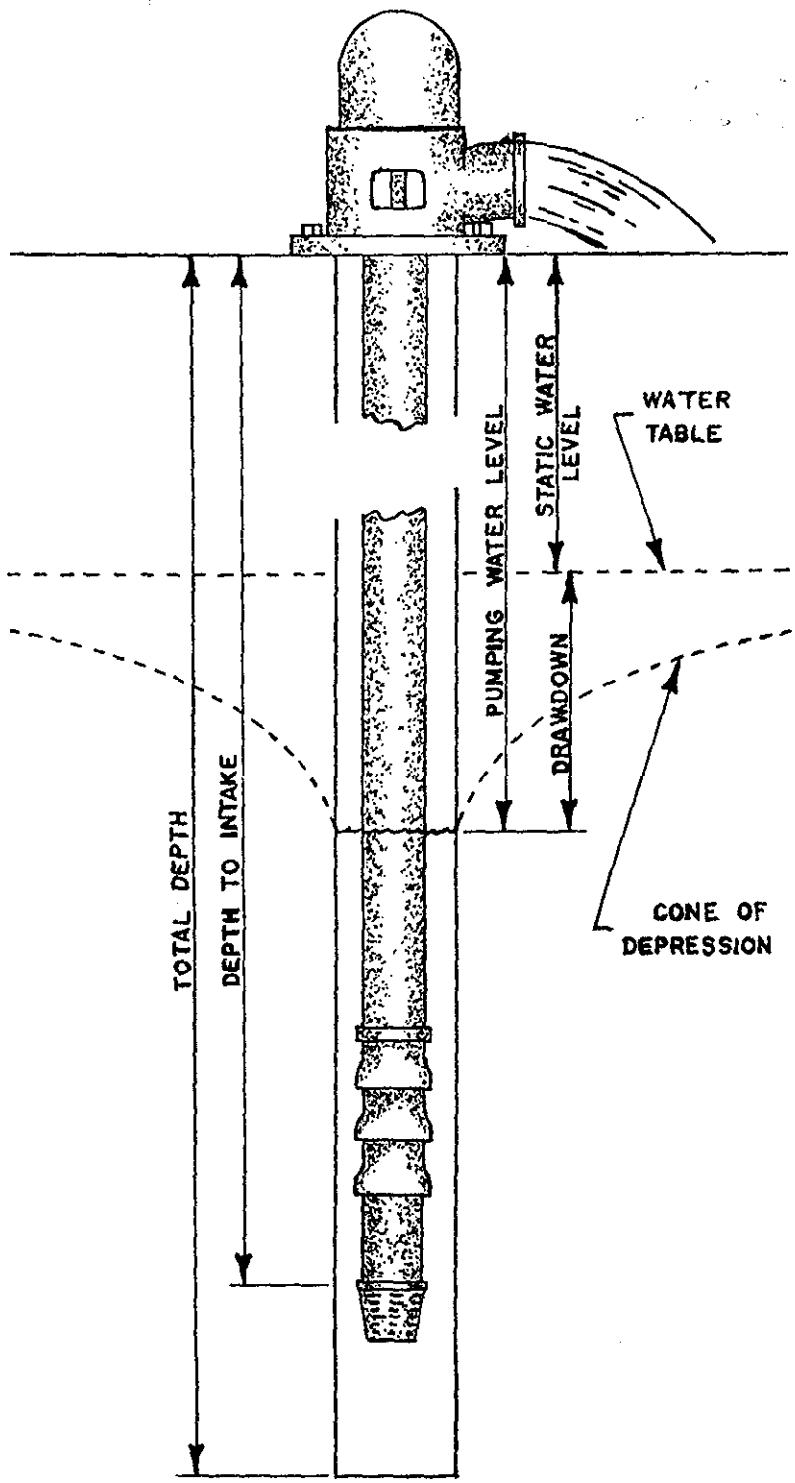
Length of Test _____ Hours

Sustained yield (Metered) _____ GPM

'umping Water Level _____

Remarks _____

_____



CONTRACTORS STATEMENT

The undersigned, being duly sworn upon oath, deposes and says that he is the contractor of the well or pump installation described hereon; that he has read the statement made hereon; knows the content thereof, and that the same is true of his own knowledge.

Signature O. K. Hamacher License No. 270

State of Colorado, County of Elbert SS

Subscribed and sworn to before me this 12 day of April , 1972

My Commission expires: Jan 10 , 1976.

Notary Public Louise Hamacher.

FORM TO BE MADE OUT IN QUADRUPLICATE: WHITE FORM must be an original copy on both sides and signed. WHITE AND GREEN copies must be filed with the State Engineer. PINK COPY is for the Owner and YELLOW COPY is for the Driller.

COLORADO
Division of Water Resources
Department of Natural Resources

WELL PERMIT NUMBER 187207-
RECEIPT NUMBER 0383745

ORIGINAL PERMIT APPLICANT(S)

CRAIG JOHN III

APPROVED WELL LOCATION

Water Division: 2 Water District: 67
Designated Basin: UPPER BIG SANDY
Management District: UPPER BIG SANDY
County: LINCOLN
Parcel Name: N/A
Physical Address: N/A

NE 1/4 NW 1/4 Section 28 Township 9.0 S Range 56.0 W Sixth P.M.

UTM COORDINATES (Meters, Zone: 13, NAD83)

Easting: 614613.5 Northing: 4344609.9

See the original well permit file for permit conditions of approval and additional details. The original permit file can be viewed using the Well Permit Search Tool at www.water.state.co.us

Issued By

Date Issued: 5/23/1995
Expiration Date: 5/23/1997

PERMIT HISTORY

01-22-2020 CHANGE IN OWNER NAME/MAILING ADDRESS. CHANGED TO JOHN WILLIAM CRAIG

FORM, NO. GWS-32 11/90

PUMP INSTALLATION AND TEST REPORT

STATE OF COLORADO, OFFICE OF THE STATE ENGINEER

For Office Use only

RECEIVED

AUG 1 0 '95

WATER RESOURCES STATE ENGINEER COLO

1. WELL PERMIT NUMBER 187207

2. OWNER NAME(S) John Craig III
Mailing Address Box 902
City, St. Zip Limon Co 80828-0902
Phone (719) 775-2140

3. WELL LOCATION AS DRILLED: NE 1/4 NW 1/4, Sec. 28 Twp. 9 S, Range 56 W.
DISTANCES FROM SEC. LINES:
200 ft. from North (north or south) Sec. line. and 1500 ft. from west (east or west) Sec. line.
SUBDIVISION: _____ LOT ____ BLOCK ____ FILING(UNIT) ____
STREET ADDRESS AT WELL LOCATION: _____

4. PUMP DATA: Type Windmill Installation Completed 7-19-95
Pump Manufacturer dempster Pump Model No. _____
Design GPM 3 at RPM _____, HP _____, Volts _____, Full Load Amps _____
Pump Intake Depth 28 Feet, Drop/Column Pipe Size 1 1/4 Inches, Kind galv

ADDITIONAL INFORMATION FOR PUMPS GREATER THAT 50 GPM:
TURBINE DRIVER TYPE: ☐ Electric ☐ Engine ☐ Other _____
Design Head _____ feet, Number of Stages _____, Shaft size _____ inches.

5. OTHER EQUIPMENT:
Airline Installed ☐ Yes ☒ No, Orifice Depth ft. _____. Monitor Tube Installed ☐ Yes ☒ No, Depth ft. _____
Flow Meter Mfg. _____ Meter Serial No. _____
Meter Readout ☐ Gallons, ☐ Thousand Gallons, ☐ Acre feet, ☐ Beginning Reading _____

6. TEST DATA: ☐ Check box if Test data is submitted on Supplemental Form.

		Date				
Total Well Depth	30	Time	7-19-95			
Static Level	10	Rate (GPM)	7-19-95			
Date Measured	7-19-95	Pumping Lvl.	3			
			13			

7. DISINFECTION: Type Chlorine Amt. Used 1/4 cup

8. Water Quality analysis available. ☐ Yes ☒ No

9. Remarks _____

10. I have read the statements made herein and know the contents thereof, and that they are true to my knowledge. [Pursuant to Section 24-4-104 (13)(a) C.R.S., the making of false statements herein constitutes perjury in the second degree and is punishable as a class 1 misdemeanor.]

CONTRACTOR Eastwood Drilling Phone (719) 775-2834 Lic. No. 801
Mailing Address PO Box 1029 Limon Co 80828-1029

Name/Title (Please type or print)	Signature	Date
Francis Eastwood owner	Francis Eastwood	8/9/95

...CTIONS FOR PUMP INSTALLATION REPORT

The report must be typed or printed in BLACK INK. All changes on the form must be initialed and dated. Attach additional sheets if more space is required. Each additional sheet must be identified at the top by the well owner's name, the permit number, form name/number and a sequential page number. Report depths in feet below ground surface.

This form may be reproduced by photoc... ...ds, or ...computer generation with prior approval by the State Engineer.

The original and one copy of this form must be sub... ...d to the State Engineer's Office within 60 days after completing the well or 7 days after the permit expiration date, whichever is earlier. Another copy of the form must be provided to the well owner.

If this form is submitted in conjunction with the Well Completion and Test Report, form number GWS-31, ONLY THE PERMIT NUMBER AND OWNER NAME NEED TO BE COMPLETED in items 1 and 2.

1. Complete the **Permit Number** in full.

2. Fill in **Name and Mailing Address of Well Owner** where correspondence should be sent.

3. Complete the blocks for the **actual** location of the well. For wells located in subdivisions the lot, block and subdivision information must also be provided.

4. Indicate the type of pump installed and complete the requested information. When installing pumps greater than 50 gpm, complete the additional information in this area.

5. Provide the information on other equipment which may be installed in the well.

6. Report test data as required by Rule 13.9. Spaces are provided to report all measurements made during the test. The report should show that the test complied with the provisions of the rules. If a test was not performed explain when it will be done. If available, report clock time when measurements were taken.

7. Record the type and the amount of disinfection used, how placed and the length of time left in the hole.

8. Indicate if a water quality analysis was performed and submit a copy of the report if available.

9. Use the remarks area to note any additional information including additional equipment installed, water supply construction problems.

10. Fill in **Company Name and Address of Contractor** who constructed the well. The report must be signed by the licensed contractor responsible for the installation of pumping equipment.

FORM NO. GWS-31 01/93

WELL CONSTRUCTION AND TEST REPORT
STATE OF COLORADO, OFFICE OF THE STATE ENGINEER

For Office Use only
RECEIVED
JUL 17 95
WATER RESOURCES STATE ENGINEER COLO

1. **WELL PERMIT NUMBER** 187207 ~~M#-25443~~

2. OWNER NAME(S) John Craig III William Craig
Mailing Address PO Box 902
City, St. Zip Limon Co 80828
Phone (719) 775-2140

3. WELL LOCATION AS DRILLED: NE 1/4 NW 1/4, Sec. 28 Twp. 9 S, Range 56 W.
DISTANCES FROM SEC. LINES:
200 ft. from North (north or south) Sec. line. and 1500 ft. from West (east or west) Sec. line. OR
SUBDIVISION: LOT BLOCK FILING(UNIT)
STREET ADDRESS AT WELL LOCATION:

4. GROUND SURFACE ELEVATION ft. DRILLING METHOD Rotary
DATE COMPLETED 5/19/95 TOTAL DEPTH 30 ft. DEPTH COMPLETED 30 ft.

5. GEOLOGIC LOG:

Depth	Description of Material (Type, Size, Color, Water Location)
0-14	Sand X
14-15	Clay
15-17	gravel
17-30	Shale

6. HOLE DIAM.

(in.)	From (ft)	To (ft)
9	0	9
8	0	30

7. PLAIN CASING

OD (in)	Kind	Wall Size	From(ft)	To(ft)
4	plastic	Sch 40	0	10
6 5/8	steel	Sch 40	0	9

PERF. CASING: Screen Slot Size:

4	plastic	Sch 40	10	30

8. FILTER PACK:
Material gravel
Size 1/4
Interval 10-30

9. PACKER PLACEMENT:
Type
Depth N/A

10. GROUTING RECORD:

Material	Amount	Density	Interval	Placement
Cement	3.2 ft³	15.6	0-9	poured
Cement Bentonite	3 ft³	Lbs	9-10	poured

REMARKS:

11. DISINFECTION: Type Chlorine Amt. Used 1/4 cup

12. WELL TEST DATA: ☐ Check box if Test Data is submitted on Form No. GWS 39 Supplemental Well Test.
TESTING METHOD Bailer
Static Level 10 ft. Date/Time measured 5/19/95, Production Rate 10 gpm.
Pumping level 16 ft. Date/Time measured 5/19/95, Test length (hrs.) 2
Remarks

13. I have read the statements made herein and know the contents thereof, and that they are true to my knowledge. [Pursuant to Section 24-4-104 (13)(a) C.R.S., the making of false statements herein constitutes perjury in the second degree and is punishable as a class 1 misdemeanor.]

CONTRACTOR Eastwood Drilling Phone (719) 775-2834 Lic. No. 801
Mailing Address PO Box 1029 Limon Co 80828

Name/Title (Please type or print)	Signature	Date
Francis Eastwood	Francis Eastwood	6/16/95

INSTRUCTIONS FOR WELL CONSTRUCTION AND TEST REPORT

The report must be typed or printed in **BLACK INK**. All changes on the form must be initialed and dated. Attach additional sheets if more space is required. Each additional sheet must be identified at the top by the well owner's name, the permit number, form name/number and a sequential page number. Report depths in feet below ground surface.

This form may be reproduced by photocopy methods, or by computer generation with prior approval by the State Engineer.

The original and one copy of this form must be submitted to the State Engineer's Office within 60 days after completing the well or 7 days after the permit expiration date, whichever is earlier. Another copy of the form must be provided to the well owner.

1. Complete the **Well Permit Number** in full.

2. Fill in **Name and Mailing Address of Well Owner** where correspondence should be sent.

3. Complete the blocks for the **actual** location of the well where drilled. If the owner has more than one well serving this property, provide the identification (**Owner's Designation**) for this well. **DO NOT USE THE OWNER SUPPLIED LOCATION** unless a survey has been provided. For wells located in subdivisions the lot, block and subdivision information must also be provided.

4. Report the ground surface elevation in feet above sea level if available. This value may be obtained from a topographic map. Describe the drilling method used to construct the well and the date completed. Indicate the total depth drilled and the actual completed depth of the well.

5. Fully describe the materials encountered in drilling. Do not use formation names unless they are in conjunction with a description of materials.
   Examples of descriptive terms include:
   Grain size--Boulders, gravel, sand, silt, clay.
   Hardness--Loose, soft, tight, hard, very hard.
   Color--All materials. Most critical in sedimentary rock.
   Depth when water is encountered (if it can be determined).

6. Provide the diameters of the drilled bore hole.

7. The outside diameter, kind, wall thickness and interval of casing lengths must be indicated.

8. Indicate the type and size of filter (gravel) pack and the interval where placed.

9. Indicate the type and setting depth for any packers installed.

10. The density of the grout slurry must be reported and may be indicated as pounds per gallon, gallons of water per sack, total gallons of water and number of sacks used, etc. Specify the grout placement method, i.e. tremie pipe or positive displacement. The percentage of additives mixed with the grout should be reported under remarks.

11. Record the type and the amount of disinfection used, how placed and the length of time left in the hole.

12. Report well test data as required by Rule 10.7. Spaces are provided to report all measurements made during the test. The report should show that the test complied with the provisions of the rules. If a test was not performed explain when it will be done. If available, report clock time when measurements were taken.

13. Fill in **Company Name and Address of Contractor** who constructed the well. The report must be signed by the licensed contractor responsible for the construction of the well.

Form No.
GWS-25.

OFFICE OF THE STATE ENGINEER
COLORADO DIVISION OF WATER RESOURCES

818 Centennial Bldg., 1313 Sherman St., Denver, Colorado 80203
(303) 866-3581

801

WELL PERMIT NUMBER 187207 - ____ - __

DIV. 8 CNTY. 37 WD 67 DES. BASIN 7 MD 13

Lot: Block: Filing: Subdiv:

APPLICANT

JOHN CRAIG III
BOX 902
LIMON CO 80828-

(719)775-2140

APPROVED WELL LOCATION
LINCOLN COUNTY

NE 1/4 NW 1/4 Section 28
Twp 9 S RANGE 56 W 6th P.M.

DISTANCES FROM SECTION LINES
200 Ft. from North Section Line
1500 Ft. from West Section Line

PERMIT TO CONSTRUCT A WELL

CONDITIONS OF APPROVAL

1) This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of the permit does not assure the applicant that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking relief in a civil court action.

2) The construction of this well shall be in compliance with the Water Well Construction Rules 2 CCR 402-2, unless approval of a variance has been granted by the State Board of Examiners of Water Well Construction and Pump Installation Contractors in accordance with Rule 18.

3) Approved pursuant to CRS 37-90-105.

4) Water from this well shall be used for the watering of livestock on range and pasture. This well cannot be used for any other purpose without first obtaining a new permit for said use from the state engineer.

5) The maximum pumping rate shall not exceed 15 GPM.

6) The annual appropriation shall not exceed 1 acre-foot.

7) Production is limited to the alluvium of Big Sandy Creek or its tributaries. The depth of this well shall not exceed 30 feet or the depth at which sandstone or shale is first encountered, whichever comes first.

8) The well shall be constructed in accordance with the variance granted by the State Board of Examiners of Water Well Construction and Pump Installation Contractors on April 19, 1995.

9) This well must be constructed within 300 feet of the location specified on this permit.

Note: Monitoring and Observation Hole Notice MH-25443 was acknowledged on April 7, 1995, for the purpose of constructing a monitoring and observation hole in the vicinity of this proposed well site. 5/11/95

APPROVED
JSG

Hal D. Simpson
State Engineer

By

Receipt No. 0383745

DATE ISSUED MAY 23 1995

EXPIRATION DATE MAY 23 1997

WRJ-5-Rev. 76

12

COLORADO DIVISION OF WATER RESOURCES

818 Centennial Bldg., 1313 Sherman St., Denver, Colorado 80203

RECEIVED APR 11 '95 WATER RESOURCES STATE ENGINEER COLO

53-J

PERMIT APPLICATION FORM

Application must be complete where applicable. Type or print in BLACK INK. No overstrikes or erasures unless initialed.

Best Copy Available

FOR:
(X) A PERMIT TO USE GROUND WATER
(X) A PERMIT TO CONSTRUCT A WELL
(X) A PERMIT TO INSTALL A PUMP

( ) REPLACEMENT FOR NO. 187207
( ) OTHER
WATER COURT CASE NO.

5320'

(1) APPLICANT - mailing address

NAME John Craig III
STREET PO Box 902
CITY Limon CO (State) 80828 (Zip)
TELEPHONE NO (719) 775-2140

(2) LOCATION OF PROPOSED WELL

County Lincoln
NE ¼ of the NW ¼, Section 28
Twp. 9 S (N,S), Rng. 56 W (E,W), 6 P.M.

(3) WATER USE AND WELL DATA

Proposed maximum pumping rate (gpm) 15
Average annual amount of ground water to be appropriated (acre-feet): 1
Number of acres to be irrigated: 0
Proposed total depth (feet): 30
Aquifer ground water is to be obtained from:
Owner's well designation

GROUND WATER TO BE USED FOR:

( ) HOUSEHOLD USE ONLY - no irrigation (0)
( ) DOMESTIC (1)
(X) LIVESTOCK (2)
( ) COMMERCIAL (4)
( ) INDUSTRIAL (5)
( ) IRRIGATION (6)
( ) MUNICIPAL (8)
( ) OTHER (9)

DETAIL THE USE ON BACK IN (11)

(4) DRILLER

Name Eastwood Drilling
Street PO Box 1029
City Limon CO (State) 80828 (Zip)
Telephone No. (719) 775-2834 Lic. No. 801

FOR OFFICE USE ONLY: DO NOT WRITE IN THIS COLUMN

Receipt No. 383745 / JWB
Basin 07 Dist. 13

CN

CONDITIONS OF APPROVAL

This well shall be used in such a way as to cause no material injury to existing water rights. The issuance of the permit does not assure the applicant that no injury will occur to another vested water right or preclude another owner of a vested water right from seeking relief in a civil court action.

WC-25443MH
WR-✓
CWCB-✓
Cannot Run SBSA (outside Basin)

A
F
J3 (T.D. 30'; Big Sandy Creek)

5290' (30') top of bedrock per study map; K6

← special conditions #8 + #9

8) The well shall be constructed in accordance with the variance granted by the St. Bd. of Exam. of Water Well Contractors on April 19, 1995.

NOTE: Mon. & Obs. Hole Notice MH-25443 was acknowledged on April 7, 1995 for the purpose of constructing a mon. & obser. hole, in the vicinity of this proposed well site.

APPLICATION APPROVED

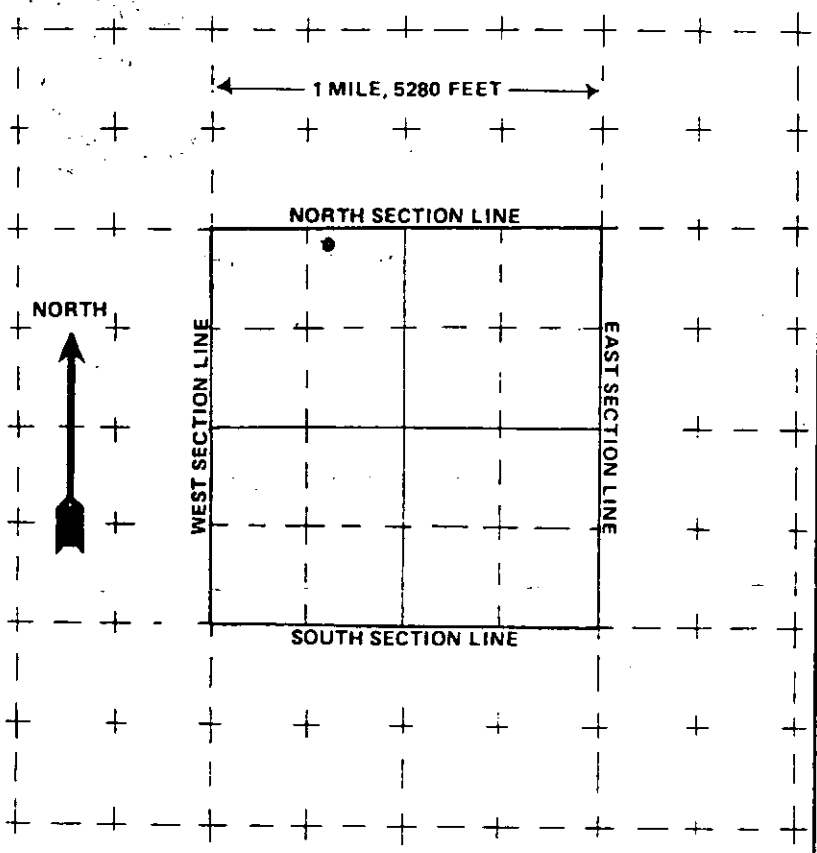
TR#383745 041195 60.00 DIV OF WATER RESOURCES

PERMIT NUMBER
DATE ISSUED
EXPIRATION DATE

(STATE ENGINEER)

BY
I.D. 8 COUNTY 37-67

(5) THE LOCATION OF THE PROPOSED WELL and the area on which the water will be used must be indicated on the diagram below. Use the CENTER SECTION (1 section, 640 acres) for the well location.



The scale of the diagram is 2 inches = 1 mile
Each small square represents 40 acres.

WATER EQUIVALENTS TABLE (Rounded Figures)
An acre-foot covers 1 acre of land 1 foot deep
1 cubic foot per second (cfs) . . . 449 gallons per minute (gpm)
A family of 5 will require approximately 1 acre-foot of water per year.
1 acre-foot . . . 43,560 cubic feet . . . 325,900 gallons.
1,000 gpm pumped continuously for one day produces 4.42 acre-feet.

(6) THE WELL MUST BE LOCATED BELOW by distances from section lines.

200 ft. from North (north or south) sec. line

1500 ft. from west (east or west) sec. line

LOT _____ BLOCK _____ FILING # _____

SUBDIVISION _____

(7) TRACT ON WHICH WELL WILL BE LOCATED Owner: William H. Craig

No. of acres 40. Will this be the only well on this tract? yes

(8) PROPOSED CASING PROGRAM

Plain Casing

4 in. from 0 ft. to 10 ft.

_____ in. from _____ ft. to _____ ft.

Perforated casing

4 in. from 10 ft. to 30 ft.

_____ in. from _____ ft. to _____ ft.

(9) FOR REPLACEMENT WELLS give distance and direction from old well and plans for plugging it:

N/A

(10) LAND ON WHICH GROUND WATER WILL BE USED:

Owner(s): William H. Craig No. of acres: 640

Legal description: NE¼ NW¼ Sec 28 Twp 9s Rng 56w 6th

(11) DETAILED DESCRIPTION of the use of ground water: **Household use and domestic wells must indicate type of disposal system to be used.** Livestock water

(12) OTHER WATER RIGHTS used on this land, including wells. Give Registration and Water Court Case Numbers.

Type or right	Used for (purpose)	Description of land on which used
N/A		

(13) THE APPLICANT(S) STATE(S) THAT THE INFORMATION SET FORTH HEREON IS TRUE TO THE BEST OF HIS KNOWLEDGE.

John Craig III

SIGNATURE OF APPLICANT(S)

Use additional sheets of paper if more space is required.

COLORADO
Division of Water Resources
Department of Natural Resources

WELL PERMIT NUMBER 62846-
RECEIPT NUMBER 9090625

ORIGINAL PERMIT APPLICANT(S)

WILLIAM H CRAIG

APPROVED WELL LOCATION

Water Division: 2 Water District: 67
Designated Basin: UPPER BIG SANDY
Management District: UPPER BIG SANDY
County: LINCOLN
Parcel Name: N/A
Physical Address: N/A

NE 1/4 SW 1/4 Section 28 Township 9.0 S Range 56.0 W Sixth P.M.

UTM COORDINATES (Meters, Zone: 13, NAD83)

Easting: 615536.9 Northing: 4344611.9

REGISTRATION OF EXISTING WELL

See the original well permit file for permit conditions of approval and additional details. The original permit file can be viewed using the Well Permit Search Tool at www.water.state.co.us

Date Issued: 8/3/1972

Expiration Date: N/A

Issued By

PERMIT HISTORY

01-22-2020 CHANGE IN OWNER NAME/MAILING ADDRESS. CHANGED TO JOHN WILLIAM CRAIG

WRJ-25-72

THIS FORM MUST BE SUBMITTED PRIOR TO THE EXPIRATION OF THE PERMIT. TYPE OR PRINT IN BLACK INK.

COLORADO DIVISION OF WATER RESOURCES

101 Columbine Bldg., 1845 Sherman St.
Denver, Colorado 80203

RECEIVED
APR 19 '72
WATER RESOURCES
STATE ENGINEER
COLO.

X STATEMENT OF BENEFICIAL USE OF GROUND WATER
____ AMENDMENT OF EXISTING RECORD

PERMIT NUMBER 62846

STATE OF COLORADO
COUNTY OF Lincoln } SS.

THE AFFIANT(S) William H. Craig

whose address is Box 116 Limon, Colorado 80828

being duly sworn upon oath, deposes and says that he (they) is (are) the owner(s) of the well described hereon; the well is located in the NE ¼ of the SW ¼ of Section 28, Township 9 5 (N. or S.), Range 56 W (E. or W.), 6 P.M. at distances of 200 feet from the North (North or South) section line and 700 feet from the East (East or West) section line; the total depth of the well is 33 feet; water from this well was first applied to a beneficial use for the purpose(s) described herein on the 22 day of Dec., 19 61; the maximum sustained pumping rate of the well is 7 gallons per minute, the pumping rate claimed hereby is 6 gallons per minute; the average annual amount of water to be diverted is ____ acre-feet; for which claim is hereby made for Stock Water purpose(s); the legal description of the land on which the water from this well is to be used is Sec 28 T9S R56W 6PM

which totals 640 acres and which is illustrated on the map on the reverse side of this form; that this well was completed in compliance with the permit approved therefor; this statement of beneficial use of ground water is filed in compliance with law; he (they) has (have) read the statements made hereon; knows the content thereof; and that the same are true of his (their) knowledge.

Signature(s) William H. Craig

Subscribed and sworn to before me on this 12 day of April, 1972

My Commission expires: Jan 10 - 1976
(Seal)

Louise Hamacher
Notary Public

ACCEPTED FOR FILING IN THE OFFICE OF THE STATE ENGINEER OF COLORADO ON THIS 3 DAY OF May, 1972

STATE ENGINEER

WHITE COPY FOR DIVISION OF WATER RESOURCES
PINK COPY FOR WELL OWNER

FOR OFFICE USE ONLY

Prior. Date ____, ____, 19____

Well Use 2

____ ¼, ____ ¼, ____ ¼, Sec. ____,

T. ____, R. ____, ____ P.M.

Yield ____ W.D. 2-67

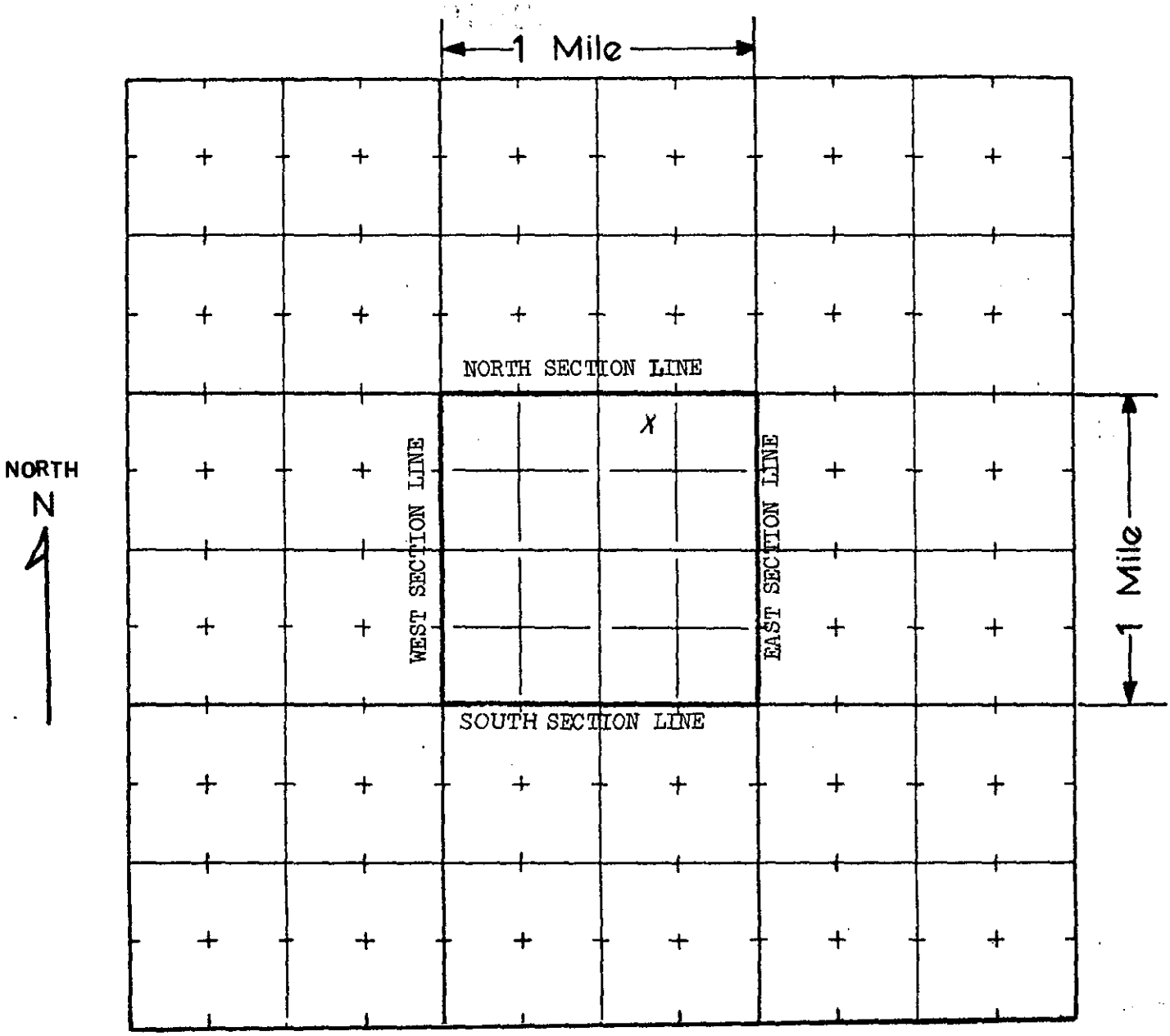
Co. 37

Index ____

30521

THE LOCATION OF THE WELL MUST BE SHOWN AND THE AREA ON WHICH THE WATER IS USED MUST BE SHADED OR CROSS-HATCHED ON THE DIAGRAM BELOW.

This diagram represents nine (9) sections. Use the **CENTER SQUARE** (one section) to indicate the location of the well, if possible.



THE SCALE OF THE DIAGRAM IS TWO INCHES EQUALS ONE-MILE

Meter Serial No._____ ☐ Flow Meter ☐ Electric Meter ☐ Fuel Meter

Owner of land on which
*water is being used*_____

WATER EQUIVALENTS TABLE (Rounded Figures)

An acre-foot covers 1 acre of land 1 foot deep.
1 cubic foot per second (cfs) . . . 449 gallons per minute (gpm).
1 acre-foot . . . 43,560 cubic feet . . . 325,900 gallons.
1,000 gpm pumped continuously for one day produces 4.42 acre-feet.
100 gpm pumped continuously for one year produces 160 acre-feet.

WRJ-26-72

RECEIVED

APR 19 '72

WATER RESOURCES
STATE ENGINEER
COLO.

THIS FORM MUST BE SUBMITTED WITHIN 60 DAYS OF COMPLETION OF THE WORK DESCRIBED HEREON. TYPE OR PRINT IN BLACK INK.

COLORADO DIVISION OF WATER RESOURCES

101 Columbine Bldg., 1845 Sherman St.
Denver, Colorado 80203

WELL COMPLETION AND PUMP INSTALLATION REPORT

PERMIT NUMBER Late Reg - 62846

WELL OWNER Bill Craig

ADDRESS Lemon, Colo.

DATE COMPLETED Dec 22, 1961

NE ¼ of the SW ¼ of Sec. 28

T. 9, R. 56 W, 6th P.

WELL LOG

From	To	Type and Color of Material	Water Loc.
0	3	top soil	
3	12	clay & sand.	
12	22	sand.	
22	33	blue shale.	

TOTAL DEPTH 33 ft

Use additional pages necessary to complete log.

HOLE DIAMETER

9 in. from 0 to 33 ft.

___ in. from ___ to ___ ft.

___ in. from ___ to ___ ft.

CASING RECORD:

Plain Casing

Size 6 in & kind plastic from 0 to 13 ft

Size ___ & kind ___ from ___ to ___ ft

Size ___ & kind ___ from ___ to ___ ft

Perforated Casing

Size 6 in & kind plastic from 13 to 33 ft

Size ___ & kind ___ from ___ to ___ ft

Size ___ & kind ___ from ___ to ___ ft

GROUTING RECORD

Material Cement

Intervals ___

Placement Method ___

GRAVEL PACK: Size 3/8 in

Interval ___

TEST DATA

Date Tested Dec 22, 1961

Static Water Level Prior to Test 12 ft

Type of Test Pump bailed

Length of Test 1 hr.

Sustained Yield (Metered) 7 gal.

Final Pumping Water Level 13 ft.

PUMP INSTALLATION REPORT

ımp Make _____

ype _____

owered by _____ HP _____

ump Serial No. _____

lotor Serial No. _____

ate Installed _____

ump Intake Depth _____

emarks _____

_____

ELL TEST DATA WITH PERMANENT PUMP

ate Tested _____

tatic Water Level Prior to Test _____

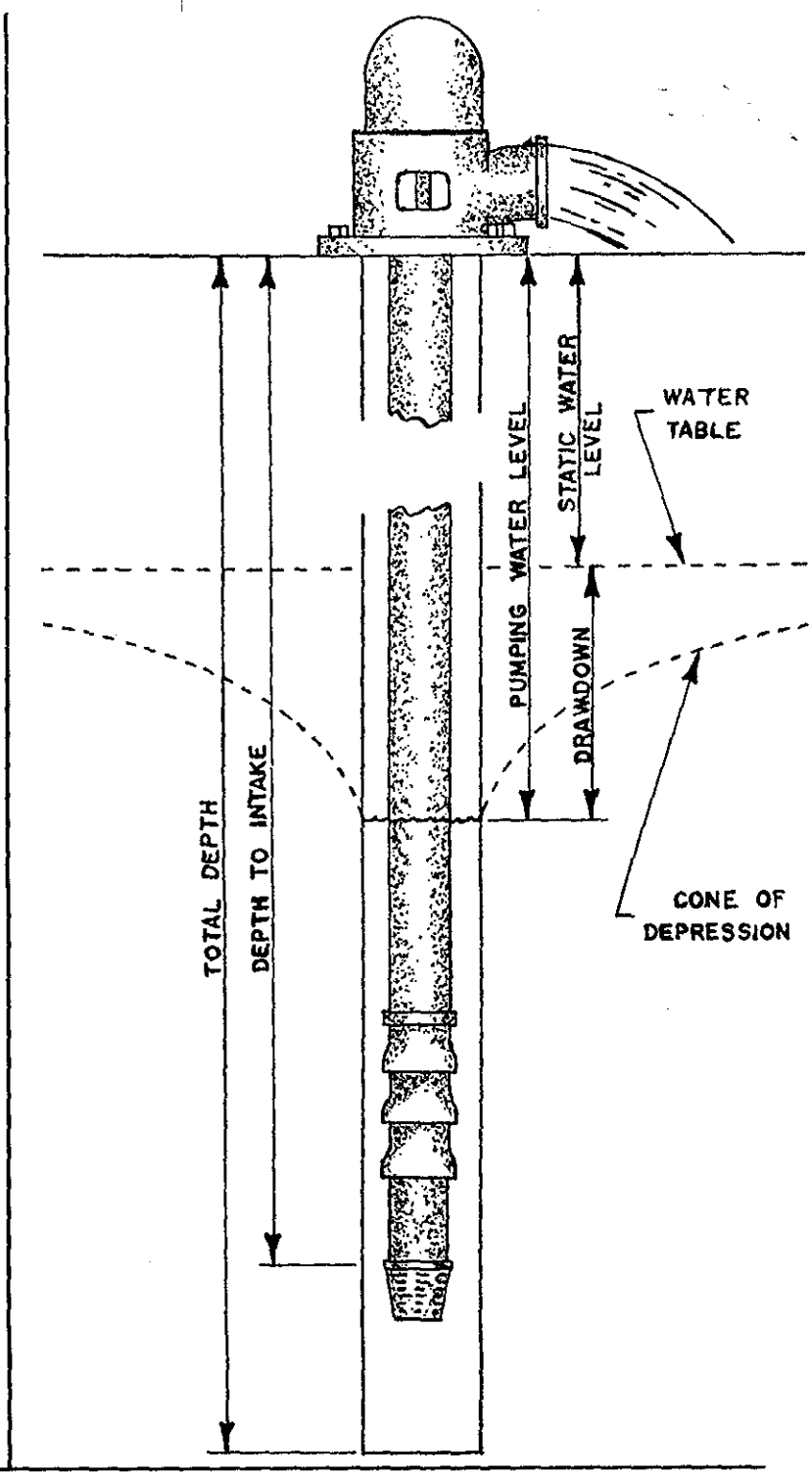
ength of Test _____ Hours

ustained yield (Metered) _____ GPM

umping Water Level _____

Remarks _____

_____



CONTRACTORS STATEMENT

The undersigned, being duly sworn upon oath, deposes and says that he is the contractor of the well or pump installation described hereon; that he has read the statement made hereon; knows the content thereof, and that the same is true of his own knowledge.

Signature O. K. Hamacher License No. 270

State of Colorado, County of Elbert SS

Subscribed and sworn to before me this 12 day of April, 1972.

My Commission expires: Jan 10, 1976.

Notary Public Louise Hamacher

FORM TO BE MADE OUT IN QUADRUPLICATE: WHITE FORM must be an original copy on both sides and signed. WHITE AND GREEN copies must be filed with the State Engineer. PINK COPY is for the Owner and YELLOW COPY is for the Driller.

COLORADO
Division of Water Resources
Department of Natural Resources

WELL PERMIT NUMBER 19131-
RECEIPT NUMBER 9090175

ORIGINAL PERMIT APPLICANT(S)

WILLIAM H CRAIG

APPROVED WELL LOCATION

Water Division: 2 Water District: 67
Designated Basin: UPPER BIG SANDY
Management District: UPPER BIG SANDY
County: LINCOLN
Parcel Name: N/A
Physical Address: N/A

NE 1/4 NE 1/4 Section 33 Township 9.0 S Range 56.0 W Sixth P.M.

UTM COORDINATES (Meters, Zone: 13, NAD83)

Easting: 614990.3 Northing: 4342272.5

See the original well permit file for permit conditions of approval and additional details. The original permit file can be viewed using the Well Permit Search Tool at www.water.state.co.us

Date Issued:

Issued By

Expiration Date: N/A

PERMIT HISTORY

01-22-2020 CHANGE IN OWNER NAME/MAILING ADDRESS. CHANGED TO JOHN WILLIAM CRAIG

Form 2 (Rev.)
10-63

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF THE STATE ENGINEER
GROUND WATER SECTION

Index No. 1309
IDWD 2-67
Use Stock
Registered 1-4-65
(For State Engineer's Use)

RECEIVED
JAN 4 - 1965
GROUND WATER SECT.
COLORADO
STATE ENGINEER

LOG AND HISTORY OF WELL

PERMIT NO. 19131

Driller U.R. Buemacher Lic. No. 270

Owner William H. Craig

Street Limon, Colo. City

Tenant

Use of Water Stock

On or By No. Acres
(description of site or land)

Date Started April 7, 1964

Date Completed April 7, 1964

Yield ~~1 gal~~ GPM or CFS

WELL DESCRIPTION:

Depth to Water 28 ft. Total Depth 67 ft.
(measured from ground surface)

Hole Diameter:
from 0 ft. to 67 ft., 9 in.
from ft. to ft., in.
from ft. to ft., in.

TEST DATA:

How Tested Pump or X Bailed

Date Tested Same, 19 Length 1 hrs.

Rate GPM Drawn Down about 2 ft.

PUMP DATA:

Pump Type mill Outlet Size 1½ in.

Driven by HP

CASING RECORD:

Plain Casing

Size 6in, Kind plastic from 0 ft. to 39 ft.

Size , Kind from ft. to ft.

Size , Kind from ft. to ft.

Perforated Casing

Size 6in, Kind self from 39 ft. to 67 ft.

Size , Kind from ft. to ft.

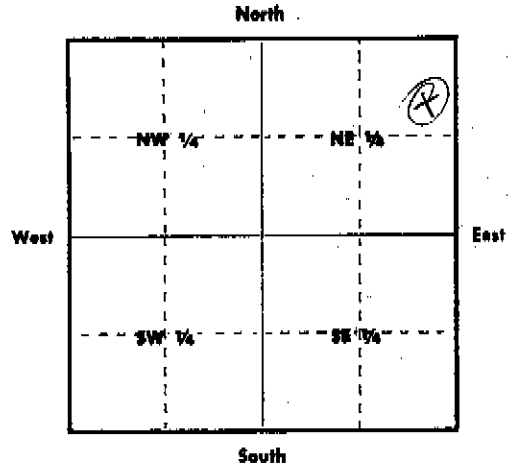
Size , Kind from ft. to ft.

WELL LOCATION

Lincoln County

NE ¼ of NE ¼ of Sect. 33

Twp. 9 So, Rge. 56W, 6 PM



ABOVE DIAGRAM REPRESENTS ONE FULL SECTION. LOCATE WELL ACCURATELY IN SMALL SQUARE REPRESENTING 40 ACRES.

or

If the above is not applicable fill in:

No. Street

City or Town

or

Lot , Block

Subdivision
(include filing or number)

TO BE MADE OUT IN QUADRUPLICATE:

Original Blue and Duplicate Green Copy must be filed with the State Engineer within 30 days after well is completed. White copy is for the Owner and Yellow copy for the Driller. **SIGN BLUE COPY**

FOR WELL LOG USE REVERSE SIDE

WELL LOG

Ground Elevation _____ (if known) How Drilled Rotary

FROM FEET	TO FEET	TYPE OF MATERIAL	REMARKS (such as Cementing, Packing, Shut off, etc.)	Indicate Water Bearing Formation	Indicate Perforated Casing Location
0	2	top soil	Gravel Packed		
2	27	fine sand			
27	55	water sand			
55	67	shale			

(if more space is required use additional sheet)

WELL DRILLER'S STATEMENT

This well was drilled under my supervision and the above information is true and correct to the best of my knowledge and belief.

Signed U.S. Bangalter well works

By Don Shetts

Dated April 8, 1964

Form C Rev.
9-62/10M

STATE OF COLORADO

APPLICATION FOR: ☐ A PERMIT TO USE GROUND WATER
☒ A PERMIT TO CONSTRUCT A WELL

RECEIVED
APR 2 1964
GROUND WATER SECT.
COLORADO
STATE ENGINEER

Applicant William H. Craig

P.O. Address Limon Colo

Quantity applied for 12 gpm or
_____ AF Storage

Used for Stock Purposes

on/at _____
(legal description of land site)

Total acreage irrigated and other rts.

ESTIMATED DATA OF WELL

Hole size: 9 in. to 70 ft.
____ in. to ____ ft.

Casing Plain 6 in. from 0 to 40 ft.
____ in. from ____ to ____ ft.
Open or Perf. 6 in. from 40 to 70 ft.
____ in. from ____ to ____ ft.

PUMP DATA: Type Mill, HP ____ Outlet Size 2

Use initiation date March 19 64
(Use Supplemental pages for additional data)

Driller to furnish Log and History (Form E) within 30 days after completion of well.

THIS APPLICATION APPROVED

PERMIT NO. 19131

ISSUED: DATE APR 2 1964 19____

LOCATION OF WELL

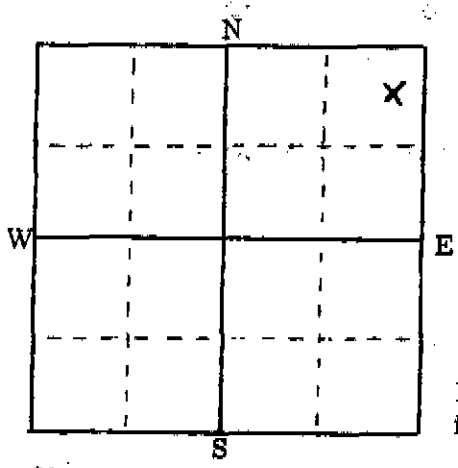
County Lincon

NE ¼ of NE ¼ of Sect. 33, Twp. 9,

Rge. 56, 6 P.M. OR

Street Address or Lot & Block No.

Town or Subdivision



Locate well in 40 acre (small) square as near as possible. Large square is one section.

$25.00 fee required for uses other than Domestic or Livestock.

Applicant William H. Craig
Agent or
Driller O.K. Hamacher No. 270

Address Simla, Colo.

NOTE — SATISFACTORY COMPLETION REQUIRED FOR APPROVAL OF APPLICATION

FEB 27 1969

WR 1-25-68

Index No. 2305
IDWD 2-67
Use 2
Registered

STATE OF COLORADO
DIVISION OF WATER RESOURCES
OFFICE OF THE STATE ENGINEER

DEC 10 1968
GROUND WATER PROJECT.
COLORADO
STATE ENGINEER

MAP AND STATEMENT FOR WATER WELL FILING

PERMIT NUMBER 34455

STATE OF COLORADO)
SS
COUNTY OF _____)

Know all men by these presents: That the undersigned

William H. Craig,

claimant(s), whose address is _____,

City Limon, Colo., states:

Claimant(s) is (are) the owner(s) of the well described hereon; the total number of acres of land to be irrigated from this well is _____; work was commenced on this well by actual construction _____ day of July, 1968; the yield to be used from said well is 15 (gpm), for which claim is hereby made for Stock purposes; that the average annual amount of water to be diverted is _____ acre-feet; and that the aforementioned statements are made and this map and statement are filed in compliance with the law.

X _____
Claimant(s)

Subscribed before me on this _____ day of _____, 19____.

My commission expires _____

_____
Notary Public

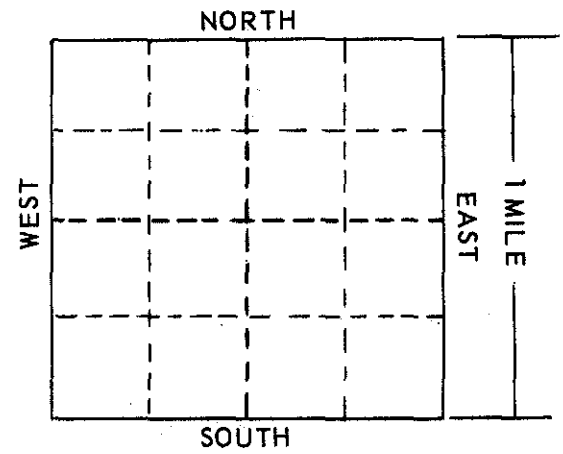
WELL LOCATION

Lincoln 37 County

NW. ¼ of SE ¼, sec. 29

T. 9 S. R. 56 W., 6th P.M.

INDICATE WELL LOCATION ON DIAGRAM



WELL SHALL BE LOCATED WITH REFERENCE TO GOVERNMENT SURVEY CORNERS OR MONUMENTS, OR SECTION LINES BY DISTANCE AND BEARING.

_____ ft. from _____ section line.
(North or South)

_____ ft. from _____ section line.
(East or West)

Ground Water Basin _____

Water Management District _____

Domestic wells may be located by the following:

LOT 1, BLOCK _____

SUBDIVISION _____

FILING # _____

WELL DATA

Date Completed July 1968

Static Water Level 52 ft

Total Depth 110 ft

ACCEPTED FOR FILING IN THE OFFICE OF THE STATE ENGINEER OF COLORADO ON THIS _____ DAY OF _____, 19____.

_____
State Engineer

FORM TO BE MADE OUT IN QUADRUPLICATE: WHITE FORM MUST BE AN ORIGINAL COPY ON BOTH SIDES AND SIGNED.

WHITE copy & GREEN copy must be filed with the State Engineer within 30 days after well is completed. PINK copy is for the Owner & YELLOW copy is for the Driller.

WELL LOG

From	To	Type of Material	Water Loc.
0 -	2.	Top soil	
2.	20	fine sand	
20.	28.	sand	
28.	52	Sand + Clay -	
52 -	56	Sand	
56.	68	Sand + clay -	
68.	72	clay.	
72.	74.	sand.	
74 -	76.	Clay.	
76 -	83	Sand	
83.	84 -	Coal	
84 -	85	rock.	
85.	94	Gravel	
94 -	96 -	Clay.	
96 -	110	blue shale -	

Use additional paper if necessary to complete log.

WELL DATA

Type Drilling Rotary

HOLE DIAMETER:

9 in. from 0 ft. to 110 ft

____ in. from ____ ft. to ____ ft

____ in. from ____ ft. to ____ ft

CASING RECORD

Cemented from ____

Plain Casing

Size 6, kind plastic from 0 ft. to 90 ft.

Size ___, kind ____ from ____ ft. to ____ ft.

Size ___, kind ____ from ____ ft. to ____ ft.

Perforated Casing

Size 6in kind self. from 90 ft. to 110 ft.

Size ___, kind ____ from ____ ft. to ____ ft.

Size ___, kind ____ from ____ ft. to ____ ft.

TEST DATA

Date Tested July - 1968

Type of Pump Bailed

Length of Test 3 hrs.

Constant Yield 15 gal

Drawdown 70 ft -

WELL DRILLERS STATEMENT

O.K. Hamacher Well Works -

being duly sworn, deposes and says:
he is the driller of the well hereon described; he has read the statement made hereon; knows the content thereof, and the same is true of his own knowledge.

X Henry A Schuler by mrs ok

License No. 270.

State of Colorado, County of ____) ss

Subscribed and sworn to before me this ____ day of ____, 19___

My Commission expires ____, 19____

Notary Public

WRJ-5-67

STATE OF COLORADO DIVISION OF WATER RESOURCES

RECEIVED
JUL 8 1968
GROUND WATER SECT.
COLORADO
STATE ENGINEER

APPLICATION FOR:
- ☐ A PERMIT TO USE GROUND WATER
- ☑ A PERMIT TO CONSTRUCT A WELL
- ☐ REPLACEMENT FOR NO._____ (Reason)
- ☐ OTHER

PRINT OR TYPE

APPLICANT + William H. Craig

Street Address Box 116

City & State Limon, Colorado 80828

Use of ground water Stock.

Owner of land on which well is located

Number of acres to be irrigated

Legal description of irrigated land

Other water rights on this land

Owner of irrigated land

Aquifer(s) ground water is to be obtained from

LOCATION OF WELL

COUNTY Lincoln

NW ¼, SE ¼, sec. 29

T. 9 S, R. 56 W, 6th P.M.

Street or Lot & Block

City or Subdivision

Ground Water Basin

Water Management District

LOCATE WELL ON THE BACK OF THIS SHEET

Driller O.K. Hamacher No. 270

Driller's Address P.O. Box 27 Limon, Colo 80828

+ William H. Craig
Signature of Applicant

ESTIMATED WELL DATA

Est. quantity of ground water to be claimed:
Est. Max. Yield 15 GPM or CFS
Est. average annual amount to be used in acre-feet
Storage capacity AF

Anticipated start of drilling July 1968

Hole Diameter:
<4 in. from 0 ft. to 120 ft.
in. from ft. to ft.

Casing:
Plain 6 in. from 0 ft. to 80 ft. RL
in. from ft. to ft.
Perf. 6 in. from 80 ft. to 120 ft. RL
in. from ft. to ft.

PUMP DATA:
Type Mill HP Outlet Size 1¼

CONDITIONS OF APPROVAL

APPLICATION APPROVED:
VALID FOR ONE (1) YEAR AFTER DATE ISSUED UNLESS EXTENDED FOR GOOD CAUSE SHOWN TO THE ISSUING AGENCY

PERMIT NO. 34455 CONDITIONAL ☐

DATE ISSUED JUL 8 1968

Ralph Cuenod
STATE ENGINEER or CHAIRMAN GROUND WATER COMMISSION

By Dorlan W. Ekker

FOR STATE ENGINEER OR COMMISSION USE

APPLICATION MUST BE COMPLETED SATISFACTORILY BEFORE ACCEPTANCE

(OVER)

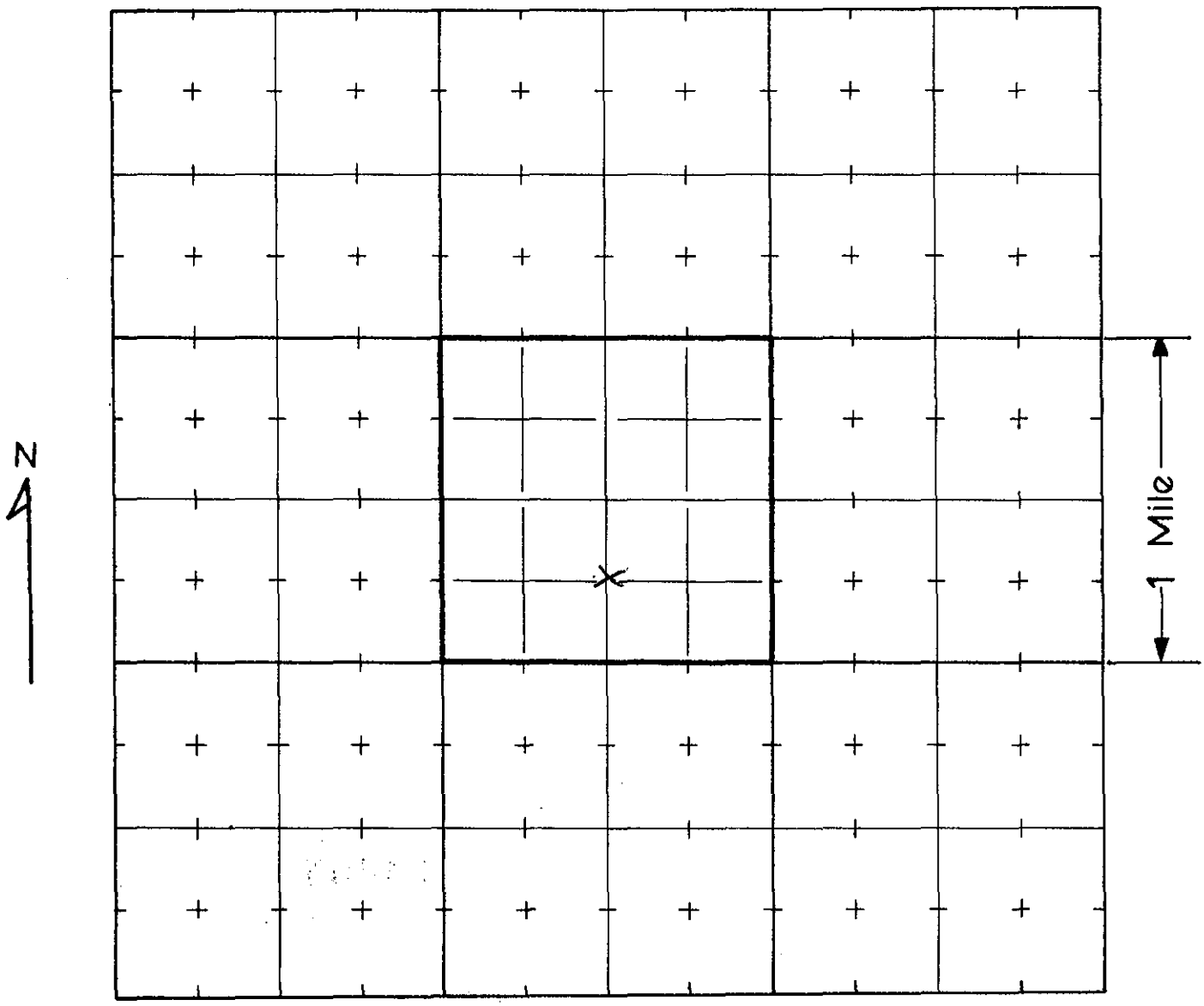
THE LOCATION OF THE PROPOSED WELL SHALL BE SHOWN ON THE DIAGRAM BELOW WITH REFERENCE TO SECTION LINES OR GOVERNMENT SURVEY CORNERS OR MONUMENTS.

_____ feet from _____ (North or South) section line

_____ feet from _____ (East or West) section line

IF WELL IS FOR IRRIGATION, THE AREA TO BE IRRIGATED MUST BE SHADED OR CROSS-HATCHED.

This diagram represents nine (9) sections. Use the CENTER SQUARE (one section) to indicate the location of the well.



THE SCALE OF THE DIAGRAM IS TWO INCHES EQUALS ONE-MILE

COLORADO
Division of Water Resources
Department of Natural Resources

WELL PERMIT NUMBER 62844-
RECEIPT NUMBER 9090623

ORIGINAL PERMIT APPLICANT(S)

JOHN WILLIAM CRAIG

APPROVED WELL LOCATION

Water Division: 2 Water District: 67
Designated Basin: UPPER BIG SANDY
Management District: UPPER BIG SANDY
County: LINCOLN
Parcel Name: N/A
Physical Address: N/A

SE 1/4 NE 1/4 Section 27 Township 9.0 S Range 56.0 W Sixth P.M.

UTM COORDINATES (Meters, Zone: 13, NAD83)

Easting: 616989.1 Northing: 4344312.4

REGISTRATION OF EXISTING WELL

See the original well permit file for permit conditions of approval and additional details. The original permit file can be viewed using the Well Permit Search Tool at www.water.state.co.us

Issued By

Date Issued: 8/3/1972
Expiration Date: N/A

PERMIT HISTORY

01-22-2020	CHANGE IN OWNER NAME/MAILING ADDRESS. CHANGED TO JOHN WILLIAM CRAIG
04-10-2009	CHANGE IN OWNER NAME/MAILING ADDRESS

WRJ-25-72

THIS FORM MUST BE SUBMITTED PRIOR TO THE EXPIRATION OF THE PERMIT. TYPE OR PRINT IN BLACK INK.

COLORADO DIVISION OF WATER RESOURCES

101 Columbine Bldg., 1845 Sherman St.
Denver, Colorado 80203

RECEIVED
APR 19 '72
WATER RESOURCES
STATE ENGINEER
COLO.

X STATEMENT OF BENEFICIAL USE OF GROUND WATER
____ AMENDMENT OF EXISTING RECORD

PERMIT NUMBER 62844

STATE OF COLORADO
COUNTY OF Lincoln } SS.

THE AFFIANT(S) William H. Craig

whose address is Box 116 Limon, Colorado 80828

being duly sworn upon oath, deposes and says that he (they) is (are) the owner(s) of the well described hereon; the well is located in the SE ¼ of the NE ¼ of Section 27, Township 9 5 (N. or S.), Range 56 W (E. or W.), 6 P.M. at distances of 1300 feet from the North (North or South) section line and 1300 feet from the East (East or West) section line; the total depth of the well is 40 feet; water from this well was first applied to a beneficial use for the purpose(s) described herein on the 1 day of July, 19 65; the maximum sustained pumping rate of the well is 15 gallons per minute, the pumping rate claimed hereby is 13 gallons per minute; the average annual amount of water to be diverted is ____ acre-feet; for which claim is hereby made for Stock Water purpose(s); the legal description of the land on which the water from this well is to be used is Sec 27 T9S R56W 6PM.

which totals 640 acres and which is illustrated on the map on the reverse side of this form; that this well was completed in compliance with the permit approved therefor; this statement of beneficial use of ground water is filed in compliance with law; he (they) has (have) read the statements made hereon; knows the content thereof; and that the same are true of his (their) knowledge.

Signature(s) William H. Craig

Subscribed and sworn to before me on this 12 day of April, 1972

My Commission expires: Jan 10 - 1976
(Seal)

Louise Hamacher
Notary Public

ACCEPTED FOR FILING IN THE OFFICE OF THE STATE ENGINEER OF COLORADO ON THIS 3 DAY OF Aug, 1972.

STATE ENGINEER

WHITE COPY FOR DIVISION OF WATER RESOURCES
PINK COPY FOR WELL OWNER

FOR OFFICE USE ONLY

Prior. Date ____, ____, 19____

Well Use 2

____ ¼, ____ ¼, ____ ¼, Sec. ____,

T. ____ ____, R. ____ ____, ____ P.M.

Yield ____ W.D. 2-67

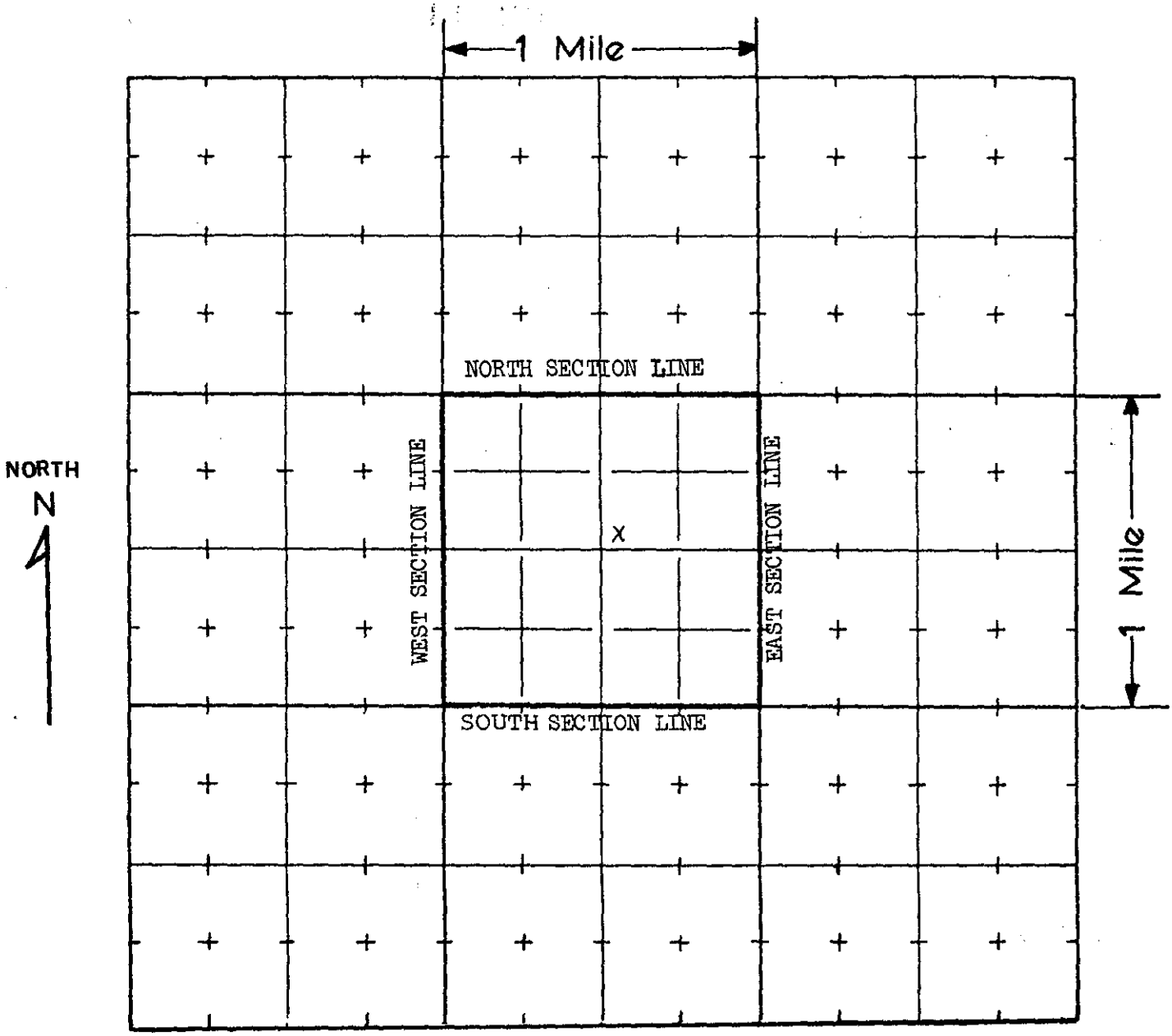
Co. 37

Index ____

30519

THE LOCATION OF THE WELL MUST BE SHOWN AND THE AREA ON WHICH THE WATER IS USED MUST BE SHADED OR CROSS-HATCHED ON THE DIAGRAM BELOW.

This diagram represents nine (9) sections. Use the **CENTER SQUARE** (one section) to indicate the location of the well, if possible.



THE SCALE OF THE DIAGRAM IS TWO INCHES EQUALS ONE-MILE

Meter Serial No._____ ☐ Flow Meter ☐ Electric Meter ☐ Fuel Meter

Owner of land on which water is being used_____

WATER EQUIVALENTS TABLE (Rounded Figures)

An acre-foot covers 1 acre of land 1 foot deep.
1 cubic foot per second (cfs) . . . 449 gallons per minute (gpm).
1 acre-foot . . . 43,560 cubic feet . . . 325,900 gallons.
1,000 gpm pumped continuously for one day produces 4.42 acre-feet.
100 gpm pumped continuously for one year produces 160 acre-feet.

WRJ-26-72

RECEIVED
APR 19 '72
WATER RESOURCES STATE ENGINEER COLO.

THIS FORM MUST BE SUBMITTED WITHIN 60 DAYS OF COMPLETION OF THE WORK DESCRIBED HEREON. TYPE OR PRINT IN BLACK INK.

COLORADO DIVISION OF WATER RESOURCES

101 Columbine Bldg., 1845 Sherman St.
Denver, Colorado 80203

WELL COMPLETION AND PUMP INSTALLATION REPORT

PERMIT NUMBER Late R. 62844

WELL OWNER Bill Craig
ADDRESS Limon, Colo.
DATE COMPLETED July 1 - , 1965

SE ¼ of the NE ¼ of Sec. 27
T. 9 , R. 56 W , 6th P.M.

WELL LOG

From	To	Type and Color of Material	Water Loc.
0 -	2 -	top soil	
2 -	10	sand + clay.	
10 -	28	Gravel	
28.	40	Blue shale.	

TOTAL DEPTH 40 ft -

Use additional pages necessary to complete log.

HOLE DIAMETER

9 in. from 0 to 40 ft.
_____ in. from _____ to _____ ft.
_____ in. from _____ to _____ ft.

CASING RECORD:

Plain Casing

Size 6 in & kind plastic from 0 to 20 ft
Size _____ & kind _____ from _____ to _____ ft
Size _____ & kind _____ from _____ to _____ ft

Perforated Casing

Size 6 in & kind plastic from 20 to 40 ft
Size _____ & kind _____ from _____ to _____ ft
Size _____ & kind _____ from _____ to _____ ft

GROUTING RECORD

Material Cement -
Intervals _____
Placement Method _____

GRAVEL PACK: Size 3/8 in.
Interval _____

TEST DATA

Date Tested July 1 - , 1965
Static Water Level Prior to Test 10 ft.
Type of Test Pump Bailed
Length of Test 1/2 hr.
Sustained Yield (Metered) 15 gal
Final Pumping Water Level 12 ft -

PUMP INSTALLATION REPORT

ump Make _____

ype _____

owered by _____ HP _____

ump Serial No. _____

lotor Serial No. _____

ate Installed _____

ump Intake Depth _____

emarks _____

_____

ELL TEST DATA WITH PERMANENT PUMP

ate Tested _____

tatic Water Level Prior to Test _____

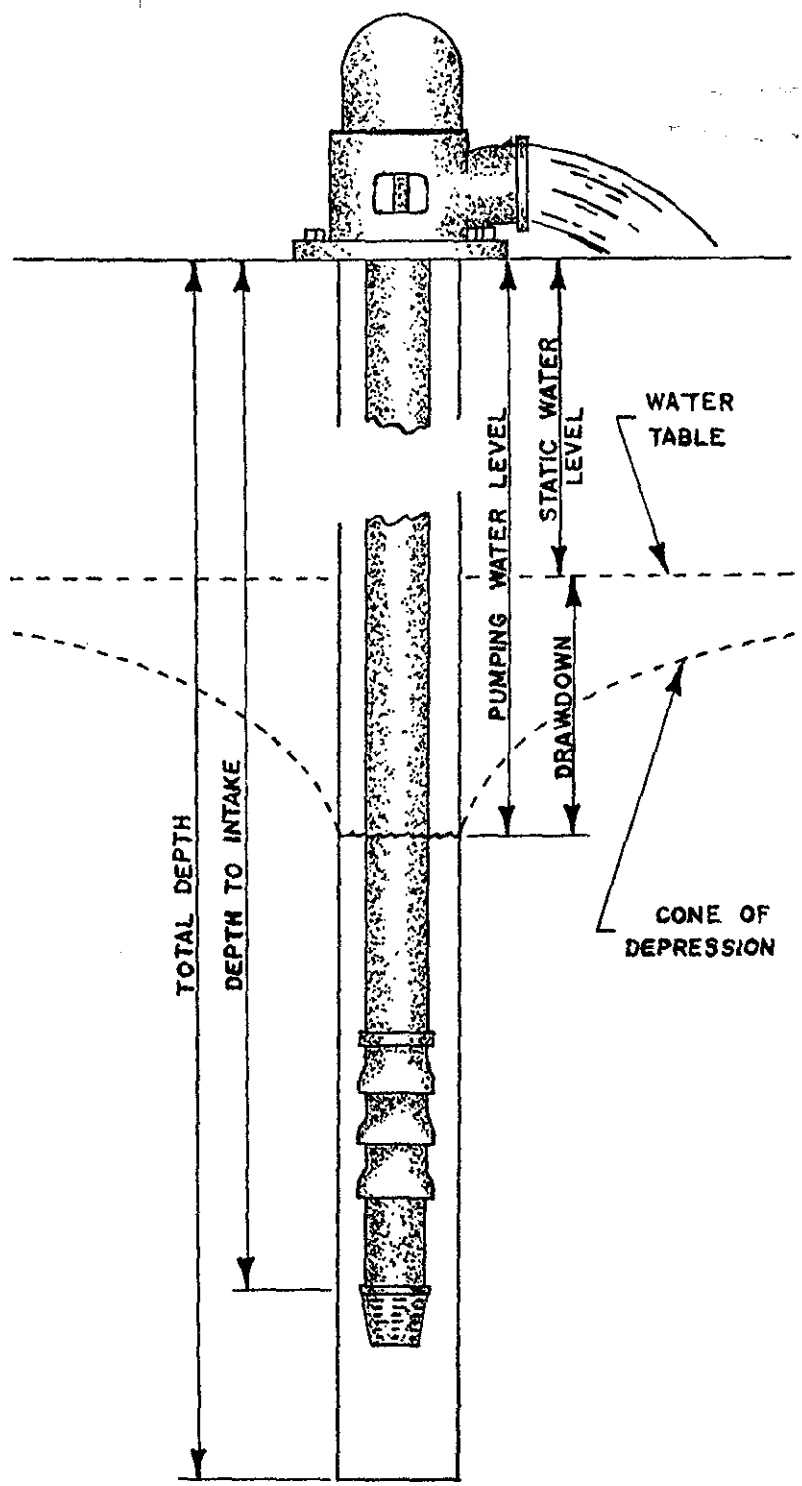
ength of Test _____ Hours

ustained yield (Metered) _____ GPM

umping Water Level _____

emarks _____

_____



CONTRACTORS STATEMENT

The undersigned, being duly sworn upon oath, deposes and says that he is the contractor of the well or pump installation described hereon; that he has read the statement made hereon; knows the content thereof, and that the same is true of his own knowledge.

Signature O.K. Hamacher License No. 270

State of Colorado, County of Elbert SS

Subscribed and sworn to before me this 12 day of April, 19 72

My Commission expires: Jan 10, 19 76.

Notary Public Louise Hamacher

FORM TO BE MADE OUT IN QUADRUPLICATE: WHITE FORM must be an original copy on both sides and signed. WHITE AND GREEN copies must be filed with the State Engineer. PINK COPY is for the Owner and YELLOW COPY is for the Driller.

EXHIBIT H WILDLIFE INFORMATION

1. Introduction

Colorado Parks and Wildlife (CPW) habitat and range mapping has been used to develop this wildlife analysis, and shows no significant impact to wildlife within the permit area. The CPW will be consulted as part of the mine permitting process.

2. Description of Significant Wildlife Resources on the Affected Land

The affected land is within seasonal and general range of a few non-endangered species.

There are no bald eagle nests near the site. The site is within the breeding ranges of the ferruginous hawk, golden eagle, and prairie falcon. There are no known raptor nests near the site based on CPW mapping. Pre-construction surveys will be conducted to identify the presence of active nests. If they are identified, proper measures will be taken to mitigate impacts at the guidance of the CPW and U.S. Fish and Wildlife Service (USFWS).

The affected area is within the mule overall range, concentration area, winter range, and severe winter range. The site is not near any mule deer migration corridors or highway crossings. The site is also within the white-tailed deer overall range, concentration area, and winter range.

CPW High Priority Habitat mapping identifies the site to be within Aquatic Native Species Conservation Waters, Mule Deer Severe Winter Range, and Mule Deer Winter Concentration.

3. Seasonal Use of the Area

Mule deer and white-tailed deer use the site as winter range. All other significant wildlife resources are year-round in their usage.

CPW mapping identifies almost the entire site as mule deer severe winter range and mule deer winter concentration area. The mapping identifies a large, almost 2 mile wide, corridor surrounding the Big Sandy Creek as severe winter range for mule deer. As this encompasses almost the entire site, except for a small portion in the southwest corner, some effects from mining are inevitable. However, the creek corridor and trees where the presence of mule deer is more likely will not be disturbed which provides a buffer for these important habitats. New ground disturbances will be limited to occur outside of the December 1 – April 30th window to protect the mule deer winter habitat.

4. Presence and Estimated Population of Threatened or Endangered Species

No federally listed threatened and endangered species and/or habitat were identified on the or immediately surrounding the affected land.

5. Effect of Proposed Operation on Existing Wildlife

Impacts on wildlife use from the proposed project would include direct temporary elimination of potential habitat within the affected area during mining, and temporary localized displacement associated with additional noise and lighting from the proposed project. This localized loss of habitat would not disrupt regional migration or significant movement patterns and would not threaten the overall health and viability of any species. Nearby lands are also disturbed for similar uses, and as such, the Limon Sand and Gravel Resource will not cause a significant impact on the local area's wildlife habitat.

The affected area will be fully reclaimed at the conclusion of mining which will restore some degree of wildlife habitat over time. Concurrent reclamation and phased mining will also help to reduce the total impact on wildlife.

6. Impacts to Fish

Mining will not take place in any water ways or natural lakes. Surface water controls will protect offsite drainages and fish habitats from sediment discharges. Aquatic Native Species Conservation waters exist on the site within the Big Sandy Creek. These species will be protected by not mining within this habitat, and surface water controls on the creek crossings.

RULE 6.5: GEOTECHNICAL STABILITY EXHIBIT

There are no known geologic hazards on the proposed site. Based on a slope stability analysis, buildings or other structures within 200' of the Limon affected area will not be affected by mining excavation. Sufficient setbacks will be maintained to structures. Exhibit C and F maps show these setbacks. Map C-3 shows the mining and reclamation slopes of the mine. A standard slope was analyzed for stability as it is a good example of the nearest structure: a power pole.

The material properties are derived from Table 2.5 in the SME Mining Reference Handbook[1], as there is no site-specific strength data of the material available. Therefore, all materials are matched to a classification from this table that best matches the materials in terms of description. The native alluvial material is best classified as sand and gravel with a mixed grain size. The bedrock is a soft sedimentary rock (shale) according to the SME Table 2.5. A summary of the material properties can be seen in Table GS-1.

Table GS-1. Material Properties

Material	Unit Weight (lbs/ft)	Cohesion	Friction Angle
Sand and gravel, mixed grain size	110	0	45
Bedrock	110	20,000	25.0

Active Mining (near vertical) and Final Reclaimed (3H:1V) slopes were analyzed. Mining will be conducted at a near active highwall angle until the highwall has reached the half-way point of the final mining slope. Then the vertical active highwall slope will be knocked down to the Final Reclaimed slope. The final mining and reclaimed slope crests will be the closest excavation comes to the any structures.

Groundwater is expected to be reached at a depth of 10-20 feet depending on location, as the top of the gravel deposit varies. The groundwater table has been input into the analysis as a phreatic surface at a fixed elevation of 5244-ft.

1. Mining and Reclamation Slopes

Factor of Safety is expressed in terms of strength divided by stress as a ratio. It is arrived at by an iterative computer process where a slope failure is assumed, the strength and stress of that slope failure are calculated, and those values are compared to determine a lowest factor of safety. In the case of the Limon slope stability analysis, the Bishop's Method of Slices was the iterative calculation used, and the software GALENA was used to model slopes and calculate

[1] Original source: Hoek and Bray 1977

the factor of safety. The Bishop's Method of Slices is a fundamental geotechnical engineering approach for analyzing slope stability by dividing a potential sliding mass into vertical slices and calculating the factor of safety against failure. The method identifies a circular failure surface intersecting the slope, then considers the weight of soil, pore water pressures, and forces acting on each slice while making the simplifying assumption that horizontal forces between slices cancel each other out. This iterative method calculates a factor of safety by comparing driving forces that promote failure to resisting forces that maintain stability.

One slope closest to major structures (see Figure GS-1) was analyzed to look at the factor of safety. Table GS-2 lists the analysis conducted and their respective factors of safety.

GALENA data tables and analysis result figures are attached as Appendix GS-1. Note that the rendering of the top of the material profile is incorrect in the images but correct in the model due to a GALENA bug. The starting point of the slope profile is at the minimum setback from the power pole of 100-ft and the distances shown on the GALENA profiles do not include the setback (i.e., a distance of 100-ft from the origin in a GALENA profile is 200-ft from the power pole).

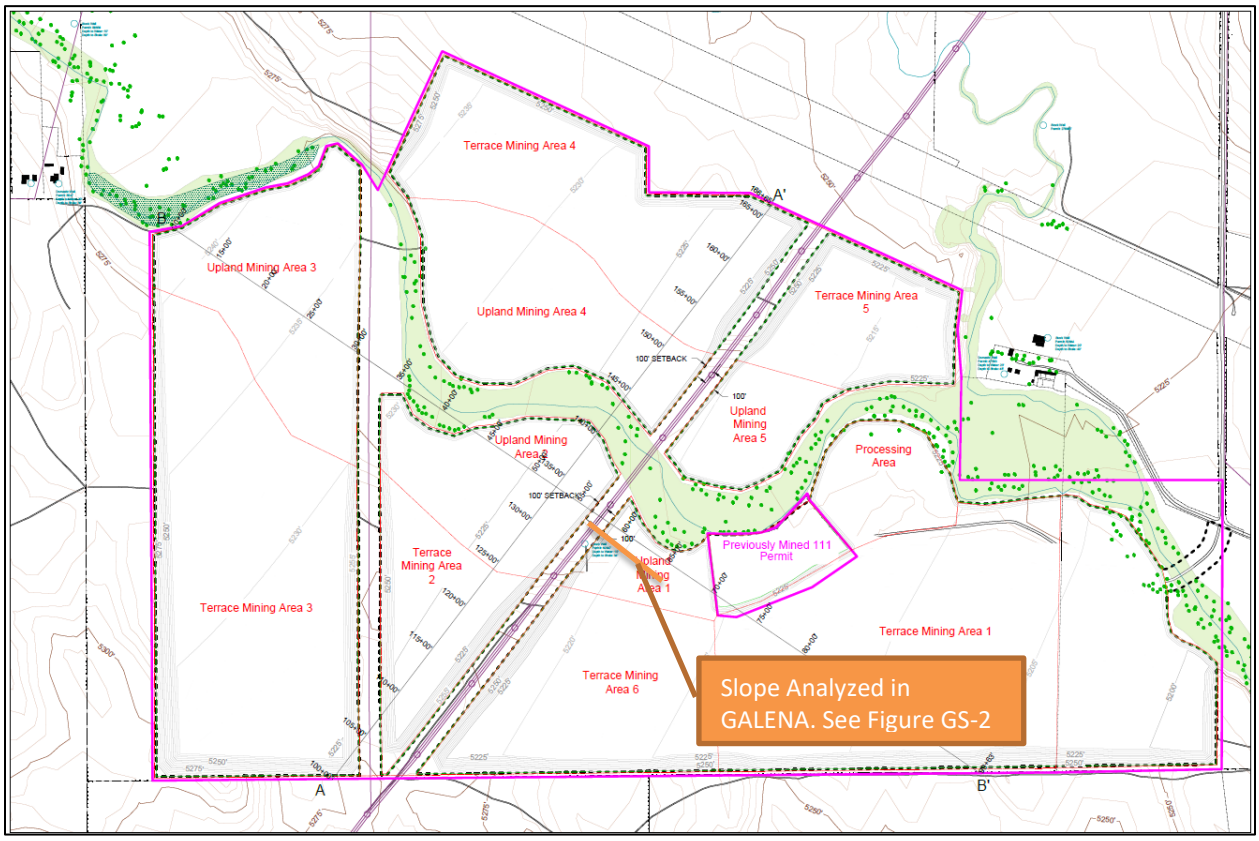


Figure GS-1. Locations of Slope Stability Analysis from Map F-1

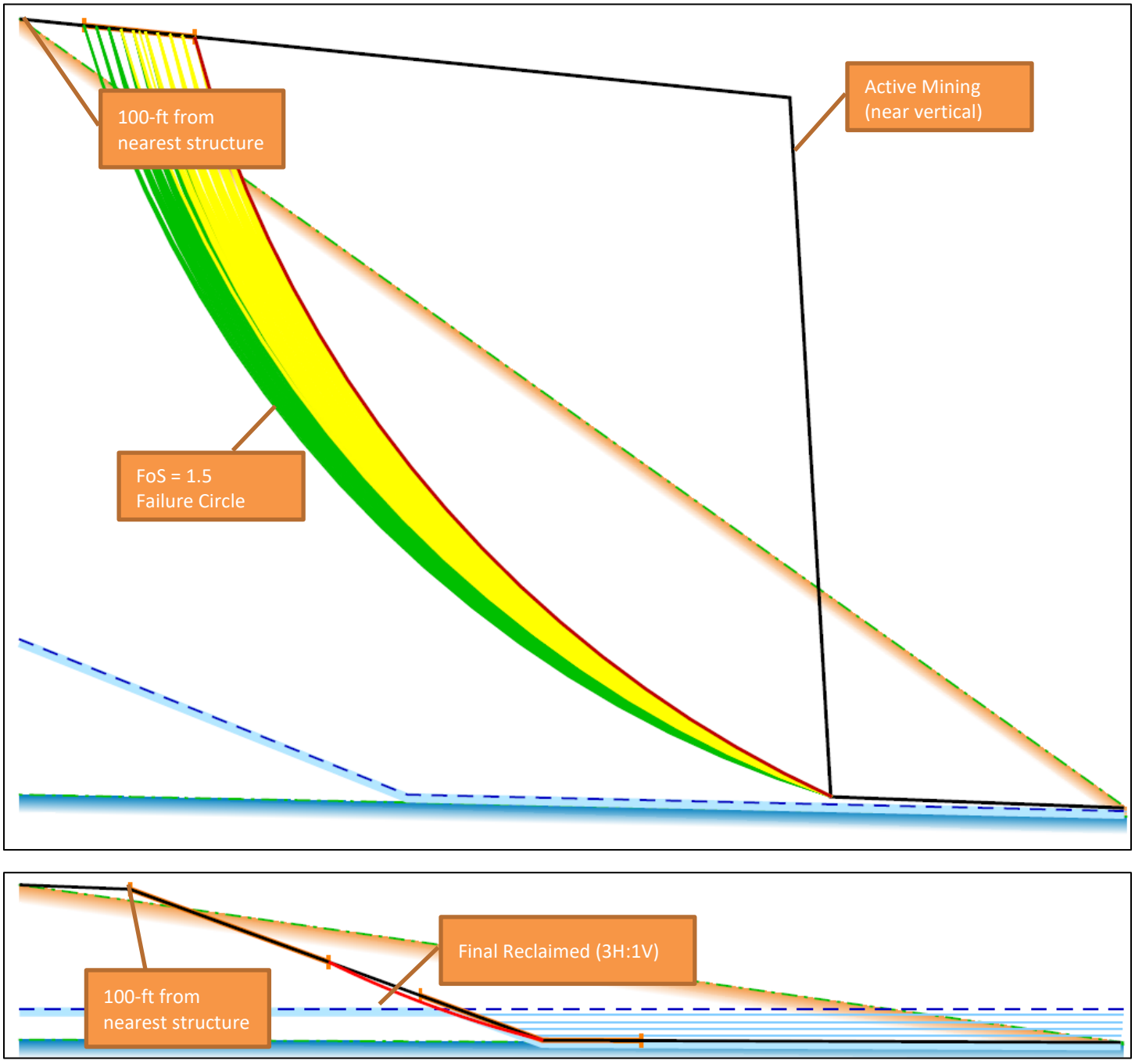


Figure GS-2. GALENA Cross Sections (Mining and Reclamation)

Table GS-2. Factors of Safety for Slope Stability

Slope Condition	Lowest Factor of Safety (static)	Nearest Structure and Distance Away from Failure Circle
Active Mining	<1.2	Power poles (120-ft)
Active Mining (FOS=1.5)	*1.50*	*Power poles (110-ft)*
Final Reclamation	2.64	Power poles (100-ft)

Note: Structure distance is not the setbacks required by the permits, but a measurement of the distance of the nearest structure to the failure circle for the given slope stability analysis.

2. Conclusion

The Active Mining slopes have a maximum slope of near vertical and Final Reclaimed slopes are proposed to be 3H:1V. An analysis of these slopes resulted in factors of safety as outlined in Table GS-2.

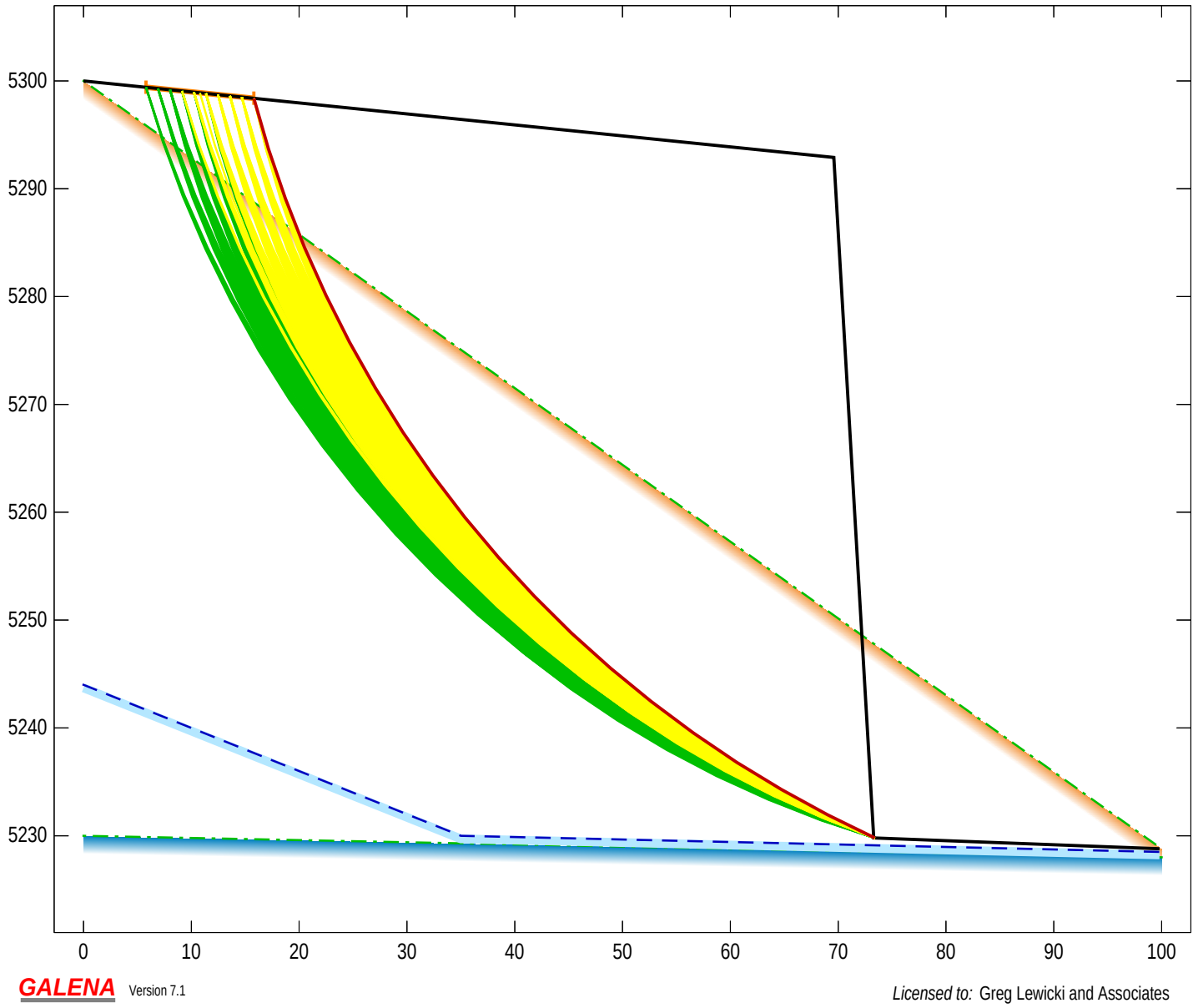
The Active Mining slope analysis produces a final factor of safety of <1.2, which is less than the 1.5 required by CDRMS for slope stability near critical structures using general material properties. This is expected in a vertical slope in cohesionless sand and gravel. Therefore, a secondary analysis was conducted to find the factor of safety failure circle where the factor of safety was 1.5. The failure circles iterated by the software in Analysis 1 were plotted and reviewed until a FoS > 1.5 failure circle was found. This failure circles geometry is visible in the top part of Figure GS-2 as the left most green arc. It is listed as circle #94 in the Analysis 1 results in Appendix GS-1, page 3. Distances from this circle were measured and it is shown to be within the setbacks and boundaries as proposed.

The failure circle at the Factor of Safety of 1.5 daylights roughly 110 feet from the nearest structure, which is a power pole. The distance from the failure circle to the structure shows that the structure will not be damaged during mining. The 100-ft setback from the crest of the pit slope to the nearest structure is more than sufficient.

The Final Reclaimed slope generates a factor of safety more than sufficient to meet CDRMS standards regarding slope stability using general material properties (1.5). Additionally, this circular failure scenario was contained entirely on the reclaimed slope face. Therefore, the permanent slope conditions following mine reclamation pose no risk of failure outside the property or to any nearby structures.

Ben Langenfeld, P.E. #47151

APPENDIX GS-1 GALENA INFORMATION



GALENA Version 7.1

Licensed to: Greg Lewicki and Associates

Material Keys

1: Sand and gravel, mixed grain size

3: Bedrock (shale)

Analysis 1

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular

Results

Critical Factor of Safety: 1.23

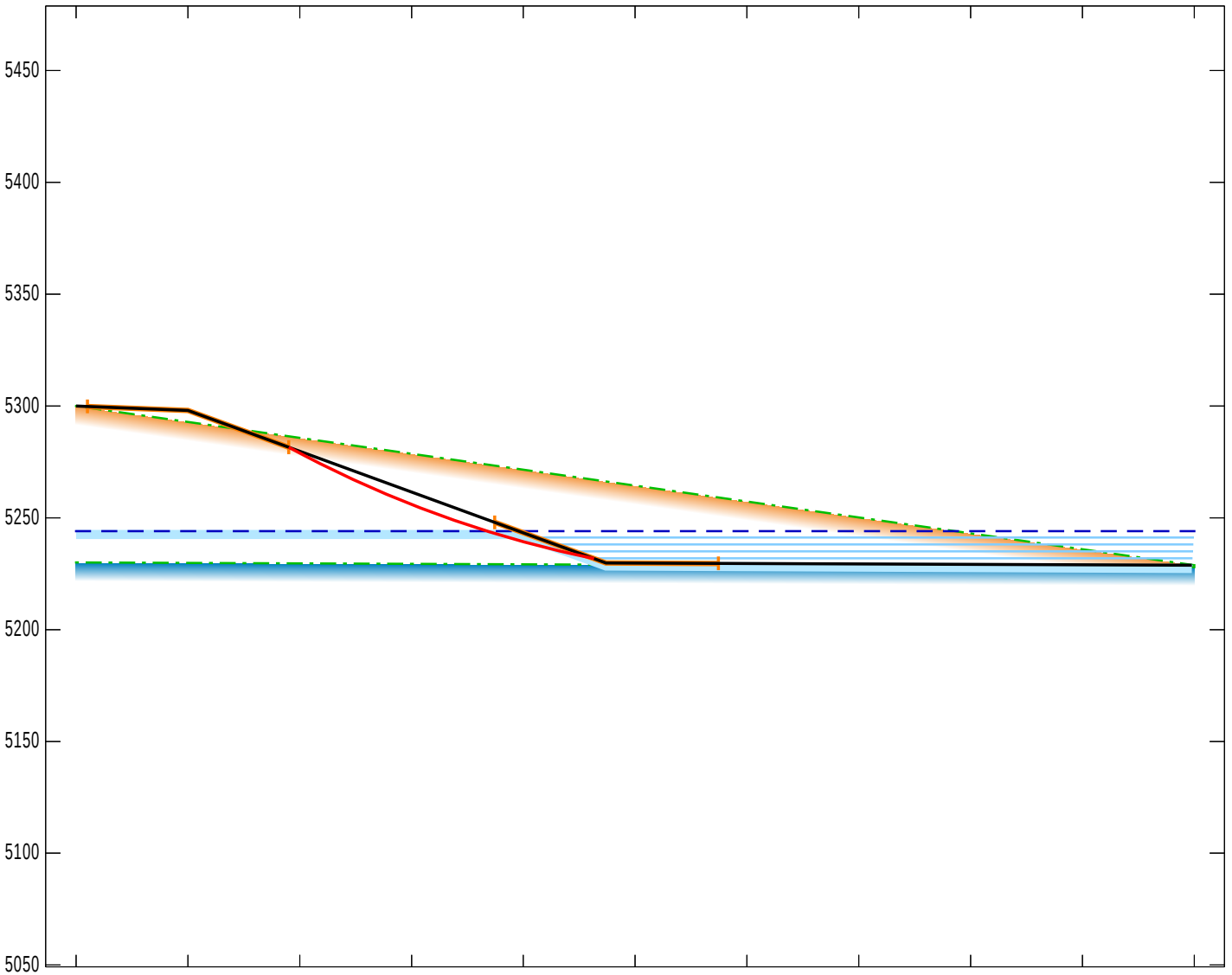
Edited: 18 Jul 2024

Processed: 18 Jul 2024

Project Limon Sand & Gravel
Active Mining

File: E:\Work\GLA Dropbox\Ben Langenfeld\Bettis Companies\Slope Stability\Limon S&G.gmf

Lewicki & Associates



GALENA Version 7.1

Licensed to: Greg Lewicki and Associates

Material Keys

1: Sand and gravel, mixed grain size

3: Bedrock (shale)

Analysis 2

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular

Results

Critical Factor of Safety: 2.67

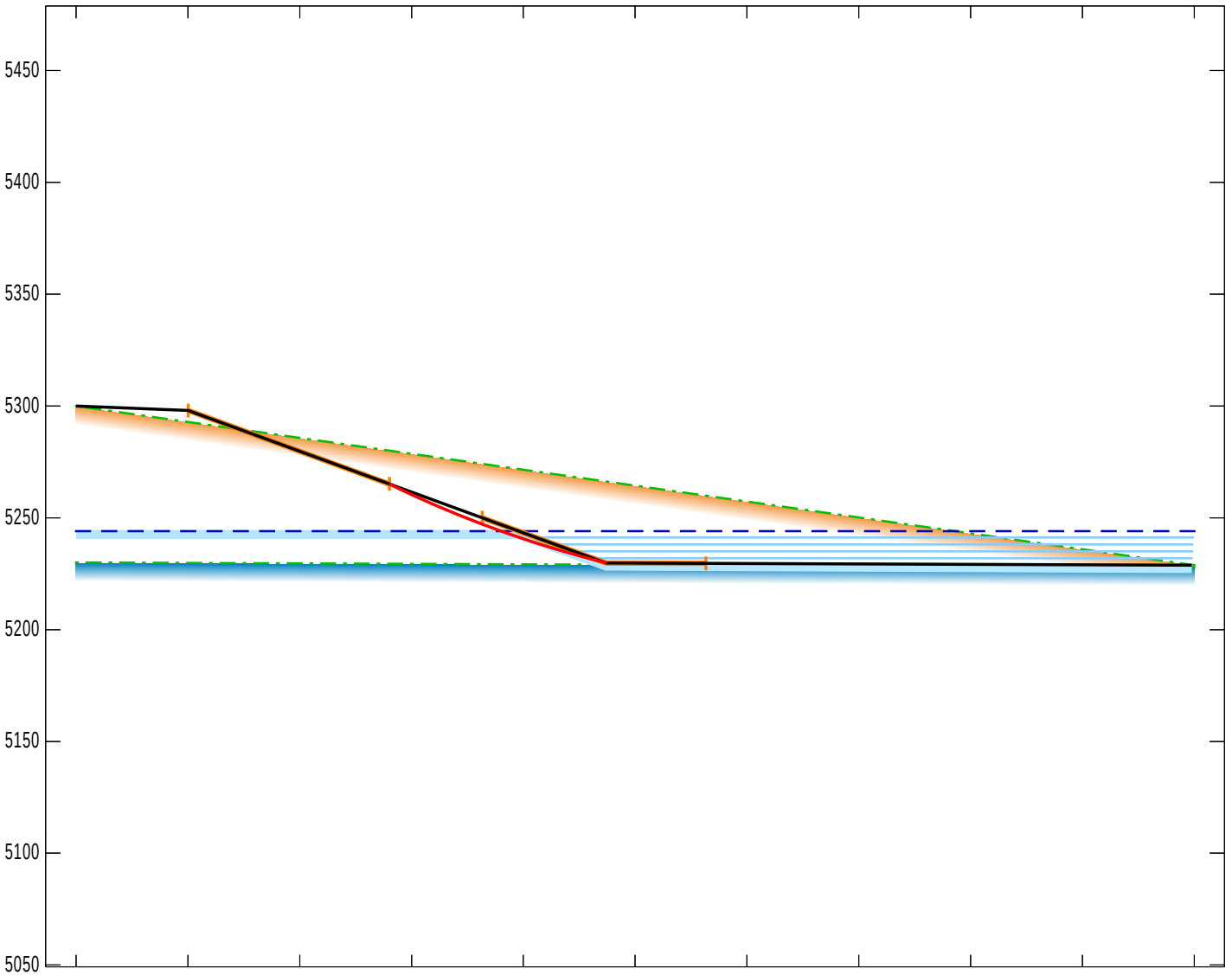
Edited: 18 Jul 2024

Processed: 18 Jul 2024

Project Limon Sand & Gravel
Final Reclaimed 1

File: E:\Work\GLA Dropbox\Ben Langenfeld\Bettis Companies\Slope Stability\Limon S&G.gmf

Lewicki & Associates



GALENA Version 7.1

Licensed to: Greg Lewicki and Associates

Material Keys

1: Sand and gravel, mixed grain size

3: Bedrock (shale)

Analysis 3

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular (Critical Seed)

Results

Critical Factor of Safety: 2.64

Edited: 18 Jul 2024

Processed: 18 Jul 2024

Project Limon Sand & Gravel
Final Reclaimed 2

File: E:\Work\GLA Dropbox\Ben Langenfeld\Bettis Companies\Slope Stability\Limon S&G.gmf

Lewicki & Associates

GALENA 7.1 Analysis Results Version: 7.10.1.04 Licensee: Greg Lewicki and Associates

Project: Limon Sand & Gravel
File: E:\Work\GLA Dropbox\Ben Langenfeld\Bettis Companies\Slope Stability\Limon S&G.gmf
Processed: 18 Jul 2024 08:11:19

DATA: Analysis 1 - Active Mining

Material Properties (3 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Sand and gravel, mixed grain size
Cohesion Phi UnitWeight Ru
0.00 45.0 110.00 Auto
Material: 2 (Mohr-Coulomb Isotropic) - Loose sand, mixed grain size
Cohesion Phi UnitWeight Ru
0.00 34.0 99.00 Auto
Material: 3 (Mohr-Coulomb Isotropic) - Bedrock (shale)
Cohesion Phi UnitWeight Ru
20000.00 17.0 110.00 Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (2 profiles)

Profile: 1 (3 points) Material beneath: 1 - Sand and gravel, mixed grain size
0.00 5300.00 80.00 5292.00 100.00 5290.00
Profile: 2 (2 points) Material beneath: 3 - Bedrock (shale)
0.00 5230.00 100.00 5228.00

Slope Surface (4 points)

0.00 5300.00 69.60 5292.90 73.30 5229.80 99.80 5228.80

Phreatic Surface (3 points)

0.00 5244.00 35.00 5230.00 100.00 5228.50

Failure Surface

Initial circular surface for critical search defined by: XL,XR,R
Intersects: XL: 10.80 YL: 5298.90 XR: 73.40 YR: 5229.80
Centre: XC: 107.66 YC: 5323.74 Radius: R: 100.00

Variable Restraints

Parameter descriptor: XL XR R

Range of variation: 10.00 0.00 10.00
Trial positions within range: 10 1 10

- -

RESULTS: Analysis 1 - Active Mining

Bishop Simplified Method of Analysis - Circular Failure Surface
---
Critical Failure Surface Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure surface approximation: 1.383

There were: 101 successful analyses from a total of 101 trial surfaces

Critical (minimum) Factor of Safety: 1.23

Results Summary - Lowest 99 Factor of Safety circles

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	15.80	5298.39	73.40	5229.80	117.33	5325.17	105.00	1.232	<-- Critical Surface
2	15.80	5298.39	73.40	5229.80	116.39	5324.37	103.89	1.238	
3	15.80	5298.39	73.40	5229.80	115.44	5323.58	102.78	1.245	
4	15.80	5298.39	73.40	5229.80	114.50	5322.79	101.67	1.253	
5	14.69	5298.50	73.40	5229.80	116.10	5325.72	105.00	1.257	
6	15.80	5298.39	73.40	5229.80	113.55	5321.99	100.56	1.260	
7	14.69	5298.50	73.40	5229.80	115.16	5324.92	103.89	1.264	
8	15.80	5298.39	73.40	5229.80	112.59	5321.19	99.44	1.268	
9	14.69	5298.50	73.40	5229.80	114.22	5324.12	102.78	1.271	
10	15.80	5298.39	73.40	5229.80	111.64	5320.39	98.33	1.276	
11	14.69	5298.50	73.40	5229.80	113.28	5323.31	101.67	1.278	
12	13.58	5298.61	73.40	5229.80	114.87	5326.26	105.00	1.282	
13	15.80	5298.39	73.40	5229.80	110.68	5319.58	97.22	1.284	
14	14.69	5298.50	73.40	5229.80	112.34	5322.51	100.56	1.286	
15	13.58	5298.61	73.40	5229.80	113.94	5325.45	103.89	1.289	
16	15.80	5298.39	73.40	5229.80	109.72	5318.78	96.11	1.293	
17	14.69	5298.50	73.40	5229.80	111.39	5321.70	99.44	1.294	
18	13.58	5298.61	73.40	5229.80	113.01	5324.64	102.78	1.296	
19	15.80	5298.39	73.40	5229.80	108.76	5317.97	95.00	1.302	
20	14.69	5298.50	73.40	5229.80	110.44	5320.89	98.33	1.302	
21	13.58	5298.61	73.40	5229.80	112.07	5323.82	101.67	1.304	
22	12.47	5298.73	73.40	5229.80	113.65	5326.77	105.00	1.307	
23	14.69	5298.50	73.40	5229.80	109.49	5320.07	97.22	1.311	
24	13.58	5298.61	73.40	5229.80	111.13	5323.00	100.56	1.312	
25	12.47	5298.73	73.40	5229.80	112.72	5325.95	103.89	1.314	
26	14.69	5298.50	73.40	5229.80	108.53	5319.26	96.11	1.320	
27	13.58	5298.61	73.40	5229.80	110.19	5322.19	99.44	1.320	
28	12.47	5298.73	73.40	5229.80	111.79	5325.13	102.78	1.322	
29	13.58	5298.61	73.40	5229.80	109.24	5321.36	98.33	1.329	
30	14.69	5298.50	73.40	5229.80	107.57	5318.44	95.00	1.329	
31	12.47	5298.73	73.40	5229.80	110.86	5324.31	101.67	1.330	
32	11.36	5298.84	73.40	5229.80	112.43	5327.27	105.00	1.333	

33	13.58	5298.61	73.40	5229.80	108.30	5320.54	97.22	1.337
34	12.47	5298.73	73.40	5229.80	109.93	5323.48	100.56	1.338
35	11.36	5298.84	73.40	5229.80	111.51	5326.44	103.89	1.340
36	13.58	5298.61	73.40	5229.80	107.34	5319.71	96.11	1.347
37	12.47	5298.73	73.40	5229.80	108.99	5322.65	99.44	1.347
38	11.36	5298.84	73.40	5229.80	110.59	5325.61	102.78	1.348
39	12.47	5298.73	73.40	5229.80	108.05	5321.82	98.33	1.355
40	13.58	5298.61	73.40	5229.80	106.39	5318.88	95.00	1.356
41	11.36	5298.84	73.40	5229.80	109.66	5324.78	101.67	1.356
42	10.24	5298.96	73.40	5229.80	111.22	5327.75	105.00	1.359
43	12.47	5298.73	73.40	5229.80	107.11	5320.99	97.22	1.365
44	11.36	5298.84	73.40	5229.80	108.73	5323.94	100.56	1.365
45	10.24	5298.96	73.40	5229.80	110.30	5326.91	103.89	1.366
46	11.36	5298.84	73.40	5229.80	107.80	5323.10	99.44	1.374
47	12.47	5298.73	73.40	5229.80	106.16	5320.15	96.11	1.374
48	10.24	5298.96	73.40	5229.80	109.38	5326.07	102.78	1.375
49	11.36	5298.84	73.40	5229.80	106.86	5322.26	98.33	1.383
50	10.80	5298.90	73.40	5229.80	107.66	5323.74	100.00	1.383
51	10.24	5298.96	73.40	5229.80	108.46	5325.23	101.67	1.383
52	12.47	5298.73	73.40	5229.80	105.21	5319.31	95.00	1.384
53	9.13	5299.07	73.40	5229.80	110.01	5328.21	105.00	1.385
54	10.24	5298.96	73.40	5229.80	107.53	5324.38	100.56	1.392
55	11.36	5298.84	73.40	5229.80	105.92	5321.42	97.22	1.392
56	9.13	5299.07	73.40	5229.80	109.10	5327.36	103.89	1.393
57	10.24	5298.96	73.40	5229.80	106.60	5323.53	99.44	1.401
58	9.13	5299.07	73.40	5229.80	108.18	5326.51	102.78	1.401
59	11.36	5298.84	73.40	5229.80	104.98	5320.57	96.11	1.402
60	9.13	5299.07	73.40	5229.80	107.26	5325.66	101.67	1.410
61	10.24	5298.96	73.40	5229.80	105.67	5322.68	98.33	1.410
62	8.02	5299.18	73.40	5229.80	108.80	5328.65	105.00	1.411
63	11.36	5298.84	73.40	5229.80	104.03	5319.72	95.00	1.412
64	9.13	5299.07	73.40	5229.80	106.34	5324.80	100.56	1.419
65	8.02	5299.18	73.40	5229.80	107.89	5327.79	103.89	1.420
66	10.24	5298.96	73.40	5229.80	104.74	5321.83	97.22	1.420
67	9.13	5299.07	73.40	5229.80	105.42	5323.95	99.44	1.428
68	8.02	5299.18	73.40	5229.80	106.98	5326.93	102.78	1.428
69	10.24	5298.96	73.40	5229.80	103.80	5320.97	96.11	1.430
70	8.02	5299.18	73.40	5229.80	106.07	5326.07	101.67	1.437
71	9.13	5299.07	73.40	5229.80	104.49	5323.09	98.33	1.438
72	6.91	5299.29	73.40	5229.80	107.60	5329.07	105.00	1.438
73	10.24	5298.96	73.40	5229.80	102.86	5320.11	95.00	1.440
74	8.02	5299.18	73.40	5229.80	105.15	5325.21	100.56	1.446
75	6.91	5299.29	73.40	5229.80	106.70	5328.20	103.89	1.447
76	9.13	5299.07	73.40	5229.80	103.56	5322.22	97.22	1.448
77	6.91	5299.29	73.40	5229.80	105.79	5327.34	102.78	1.456
78	8.02	5299.18	73.40	5229.80	104.23	5324.34	99.44	1.456
79	9.13	5299.07	73.40	5229.80	102.62	5321.36	96.11	1.458
80	6.91	5299.29	73.40	5229.80	104.88	5326.47	101.67	1.465
81	5.80	5299.41	73.40	5229.80	106.40	5329.47	105.00	1.465
82	8.02	5299.18	73.40	5229.80	103.31	5323.47	98.33	1.466
83	9.13	5299.07	73.40	5229.80	101.69	5320.49	95.00	1.469
84	5.80	5299.41	73.40	5229.80	105.50	5328.60	103.89	1.474
85	6.91	5299.29	73.40	5229.80	103.97	5325.59	100.56	1.474

86	8.02	5299.18	73.40	5229.80	102.38	5322.60	97.22	1.476
87	5.80	5299.41	73.40	5229.80	104.60	5327.72	102.78	1.483
88	6.91	5299.29	73.40	5229.80	103.05	5324.72	99.44	1.484
89	8.02	5299.18	73.40	5229.80	101.45	5321.72	96.11	1.487
90	5.80	5299.41	73.40	5229.80	103.69	5326.84	101.67	1.493
91	6.91	5299.29	73.40	5229.80	102.13	5323.84	98.33	1.495
92	8.02	5299.18	73.40	5229.80	100.52	5320.84	95.00	1.498
93	5.80	5299.41	73.40	5229.80	102.79	5325.96	100.56	1.503
94	6.91	5299.29	73.40	5229.80	101.21	5322.96	97.22	1.505
95	5.80	5299.41	73.40	5229.80	101.87	5325.08	99.44	1.513
96	6.91	5299.29	73.40	5229.80	100.28	5322.07	96.11	1.516
97	5.80	5299.41	73.40	5229.80	100.96	5324.19	98.33	1.523
98	6.91	5299.29	73.40	5229.80	99.36	5321.18	95.00	1.528
99	5.80	5299.41	73.40	5229.80	100.04	5323.30	97.22	1.534

Critical Failure Surface (circle 1)

Intersects: XL: 15.80 YL: 5298.39 XR: 73.40 YR: 5229.80

Centre: XC: 117.33 YC: 5325.17 Radius: R: 105.00

Generated failure surface: (20 points)

15.80	5298.39	17.15	5293.71	18.72	5289.10	20.50	5284.56	22.48	5280.12
24.67	5275.77	27.06	5271.53	29.65	5267.40	32.42	5263.40	35.37	5259.52
38.51	5255.80	41.81	5252.22	45.27	5248.79	48.89	5245.53	52.66	5242.45
56.56	5239.54	60.60	5236.81	64.75	5234.27	69.03	5231.94	73.40	5229.80

Slice Geometry and Properties - Critical Failure Surface (circle 1, 40 slices)

Slice	X-S	Base						PoreWater	Normal	Test
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	15.80	3.07	73.9	1.35	4.87	1	0.00	45.0	337.35	0.00	65.51	0.95
2	17.15	10.60	71.2	1.57	4.87	1	0.00	45.0	1165.79	0.00	219.54	0.92
3	18.72	19.86	68.6	1.78	4.87	1	0.00	45.0	2184.77	0.00	400.22	0.89
4	20.50	14.31	65.9	0.99	2.43	1	0.00	45.0	1574.00	0.00	562.48	0.87
5	21.49	16.42	65.9	0.99	2.43	1	0.00	45.0	1805.81	0.00	645.32	0.87
6	22.48	20.39	63.3	1.10	2.43	1	0.00	45.0	2243.42	0.00	784.22	0.85
7	23.58	22.65	63.3	1.10	2.44	1	0.00	45.0	2491.92	0.00	870.97	0.85
8	24.67	27.14	60.6	1.19	2.43	1	0.00	45.0	2985.65	0.00	1023.35	0.83
9	25.87	29.53	60.6	1.19	2.43	1	0.00	45.0	3248.55	0.00	1113.46	0.83
10	27.06	34.47	57.9	1.29	2.43	1	0.00	45.0	3791.77	0.00	1277.79	0.82
11	28.35	36.97	58.0	1.29	2.44	1	0.00	45.0	4066.38	0.00	1370.15	0.82
12	29.65	42.29	55.3	1.39	2.43	1	0.00	45.0	4652.33	0.00	1544.91	0.81
13	31.03	44.87	55.3	1.39	2.44	1	0.00	45.0	4936.04	0.00	1638.90	0.81
14	32.42	50.52	52.6	1.48	2.44	1	0.00	45.0	5557.35	0.00	1822.57	0.80
15	33.90	53.16	52.6	1.48	2.43	1	0.00	45.0	5847.44	0.00	1917.95	0.80
16	35.37	59.06	50.0	1.57	2.43	1	0.00	45.0	6496.77	0.00	2109.44	0.79
17	36.94	61.73	50.0	1.57	2.43	1	0.00	45.0	6790.55	0.00	2204.83	0.79
18	38.51	67.82	47.3	1.65	2.43	1	0.00	45.0	7460.11	0.00	2403.41	0.78
19	40.16	70.50	47.3	1.65	2.43	1	0.00	45.0	7754.54	0.00	2498.27	0.78
20	41.81	76.70	44.7	1.73	2.43	1	0.00	45.0	8436.85	0.00	2702.94	0.78
21	43.54	79.36	44.7	1.73	2.44	1	0.00	45.0	8729.20	0.00	2796.25	0.78
22	45.27	85.60	42.0	1.81	2.43	1	0.00	45.0	9416.41	0.00	3006.27	0.78
23	47.08	88.22	42.0	1.81	2.43	1	0.00	45.0	9703.97	0.00	3098.08	0.78
24	48.89	94.44	39.4	1.88	2.43	1	0.00	45.0	10388.32	0.00	3312.08	0.78

25	50.77	96.98	39.3	1.88	2.43	1	0.00	45.0	10668.26	0.00	3401.77	0.78
26	52.66	68.47	36.7	1.30	1.62	1	0.00	45.0	7531.64	0.00	3605.36	0.78
27	53.96	69.56	36.7	1.30	1.62	1	0.00	45.0	7651.47	0.00	3662.03	0.78
28	55.26	70.65	36.7	1.30	1.62	1	0.00	45.0	7771.37	0.00	3720.12	0.78
29	56.56	74.09	34.0	1.35	1.62	1	0.00	45.0	8150.44	0.00	3912.81	0.78
30	57.91	75.13	34.0	1.35	1.62	1	0.00	45.0	8264.58	0.00	3968.37	0.78
31	59.25	76.17	34.0	1.35	1.62	1	0.00	45.0	8378.76	0.00	4022.42	0.78
32	60.60	79.50	31.4	1.39	1.62	1	0.00	45.0	8744.47	0.00	4219.98	0.78
33	61.98	80.47	31.4	1.39	1.62	1	0.00	45.0	8851.78	0.00	4271.78	0.78
34	63.37	81.45	31.4	1.39	1.62	1	0.00	45.0	8959.15	0.00	4323.59	0.78
35	64.75	84.61	28.7	1.42	1.62	1	0.00	45.0	9307.64	0.00	4525.47	0.79
36	66.18	85.52	28.7	1.42	1.62	1	0.00	45.0	9406.92	0.00	4572.87	0.79
37	67.60	86.42	28.7	1.42	1.62	1	0.00	45.0	9506.37	0.00	4622.09	0.79
38	69.03	35.14	26.1	0.57	0.64	1	0.00	45.0	3865.16	0.00	4812.74	0.80
39	69.60	84.96	26.0	1.85	2.06	1	0.00	45.0	9345.39	0.00	3616.34	0.80
40	71.45	28.18	26.1	1.95	2.17	1	0.00	45.0	3099.47	0.00	1137.73	0.80

X-S Area: 2286.98 Path Length: 92.53 X-S Weight: 251568.17

DATA: Analysis 2 - Final Reclaimed 1

Material Properties (3 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Sand and gravel, mixed grain size
Cohesion Phi UnitWeight Ru
0.00 45.0 110.00 Auto
Material: 2 (Mohr-Coulomb Isotropic) - Loose sand, mixed grain size
Cohesion Phi UnitWeight Ru
0.00 34.0 99.00 Auto
Material: 3 (Mohr-Coulomb Isotropic) - Bedrock (shale)
Cohesion Phi UnitWeight Ru
20000.00 17.0 110.00 Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (2 profiles)

Profile: 1 (2 points) Material beneath: 1 - Sand and gravel, mixed grain size
0.00 5300.00 500.00 5290.00
Profile: 2 (2 points) Material beneath: 3 - Bedrock (shale)
0.00 5230.00 500.00 5228.00

Slope Surface (4 points)

0.00 5300.00 50.00 5298.00 237.00 5229.80 499.00 5228.80

Phreatic Surface (3 points)

0.00 5244.00 35.00 5244.00 500.00 5244.00

Failure Surface

Initial circular surface for critical search defined by: XL,XR,R
Intersects: XL: 50.10 YL: 5297.96 XR: 237.20 YR: 5229.80
Centre: XC: 311.38 YC: 5724.27 Radius: R: 500.00

Variable Restraints

Parameter descriptor: XL XR R
Range of variation: 90.00 100.00 10.00
Trial positions within range: 10 10 10

- -

RESULTS: Analysis 2 - Final Reclaimed 1

Bishop Simplified Method of Analysis - Circular Failure Surface
---
Critical Failure Surface Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure surface approximation: 2.671

There were: 511 successful analyses from a total of 1001 trial surfaces
490 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 2.67

Results Summary - Lowest 99 Factor of Safety circles

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	95.10	5281.55	231.64	5231.75	331.14	5716.65	495.00	2.668	<-- Critical Surface
2	95.10	5281.55	231.64	5231.75	331.52	5717.71	496.11	2.668	
3	95.10	5281.55	231.64	5231.75	331.91	5718.76	497.22	2.669	
4	95.10	5281.55	231.64	5231.75	332.29	5719.82	498.33	2.669	
5	95.10	5281.55	231.64	5231.75	332.68	5720.87	499.44	2.669	
6	95.10	5281.55	231.64	5231.75	333.06	5721.93	500.56	2.669	
7	95.10	5281.55	231.64	5231.75	333.45	5722.98	501.67	2.669	
8	95.10	5281.55	231.64	5231.75	333.83	5724.04	502.78	2.669	
9	95.10	5281.55	231.64	5231.75	334.22	5725.09	503.89	2.670	
10	95.10	5281.55	231.64	5231.75	334.60	5726.15	505.00	2.670	
11	50.10	5297.96	237.20	5229.80	311.38	5724.27	500.00	2.671	
12	85.10	5285.20	231.64	5231.75	325.86	5717.70	495.00	2.673	
13	85.10	5285.20	231.64	5231.75	326.24	5718.76	496.11	2.673	
14	85.10	5285.20	231.64	5231.75	326.63	5719.82	497.22	2.673	
15	85.10	5285.20	231.64	5231.75	327.01	5720.88	498.33	2.673	
16	85.10	5285.20	231.64	5231.75	327.40	5721.93	499.44	2.673	
17	85.10	5285.20	231.64	5231.75	327.78	5722.99	500.56	2.673	
18	85.10	5285.20	231.64	5231.75	328.17	5724.05	501.67	2.673	
19	85.10	5285.20	231.64	5231.75	328.55	5725.10	502.78	2.674	

20	85.10	5285.20	231.64	5231.75	328.94	5726.16	503.89	2.674
21	85.10	5285.20	231.64	5231.75	329.33	5727.22	505.00	2.674
22	75.10	5288.85	231.64	5231.75	320.55	5718.70	495.00	2.677
23	75.10	5288.85	231.64	5231.75	320.94	5719.76	496.11	2.677
24	75.10	5288.85	231.64	5231.75	321.33	5720.82	497.22	2.677
25	75.10	5288.85	231.64	5231.75	321.71	5721.88	498.33	2.677
26	75.10	5288.85	231.64	5231.75	322.10	5722.94	499.44	2.678
27	75.10	5288.85	231.64	5231.75	322.49	5724.00	500.56	2.678
28	75.10	5288.85	231.64	5231.75	322.87	5725.06	501.67	2.678
29	75.10	5288.85	231.64	5231.75	323.26	5726.11	502.78	2.678
30	75.10	5288.85	231.64	5231.75	323.64	5727.17	503.89	2.678
31	75.10	5288.85	231.64	5231.75	324.03	5728.23	505.00	2.678
32	65.10	5292.49	231.64	5231.75	315.23	5719.64	495.00	2.682
33	65.10	5292.49	231.64	5231.75	315.62	5720.71	496.11	2.682
34	65.10	5292.49	231.64	5231.75	316.01	5721.77	497.22	2.682
35	65.10	5292.49	231.64	5231.75	316.39	5722.83	498.33	2.682
36	65.10	5292.49	231.64	5231.75	316.78	5723.89	499.44	2.682
37	65.10	5292.49	231.64	5231.75	317.17	5724.95	500.56	2.682
38	65.10	5292.49	231.64	5231.75	317.56	5726.01	501.67	2.682
39	65.10	5292.49	231.64	5231.75	317.94	5727.07	502.78	2.683
40	65.10	5292.49	231.64	5231.75	318.33	5728.13	503.89	2.683
41	65.10	5292.49	231.64	5231.75	318.72	5729.19	505.00	2.683
42	55.10	5296.14	231.64	5231.75	309.89	5720.53	495.00	2.686
43	55.10	5296.14	231.64	5231.75	310.28	5721.59	496.11	2.687
44	55.10	5296.14	231.64	5231.75	310.67	5722.66	497.22	2.687
45	55.10	5296.14	231.64	5231.75	311.05	5723.72	498.33	2.687
46	55.10	5296.14	231.64	5231.75	311.44	5724.78	499.44	2.687
47	55.10	5296.14	231.64	5231.75	311.83	5725.84	500.56	2.687
48	55.10	5296.14	231.64	5231.75	312.22	5726.91	501.67	2.687
49	55.10	5296.14	231.64	5231.75	312.61	5727.97	502.78	2.687
50	55.10	5296.14	231.64	5231.75	312.99	5729.03	503.89	2.687
51	55.10	5296.14	231.64	5231.75	313.38	5730.09	505.00	2.687
52	45.10	5298.20	231.64	5231.75	301.10	5721.86	495.00	2.704
53	45.10	5298.20	231.64	5231.75	301.48	5722.92	496.11	2.704
54	45.10	5298.20	231.64	5231.75	301.86	5723.99	497.22	2.704
55	45.10	5298.20	231.64	5231.75	302.24	5725.06	498.33	2.704
56	45.10	5298.20	231.64	5231.75	302.62	5726.13	499.44	2.704
57	45.10	5298.20	231.64	5231.75	303.00	5727.20	500.56	2.704
58	45.10	5298.20	231.64	5231.75	303.39	5728.26	501.67	2.705
59	45.10	5298.20	231.64	5231.75	303.77	5729.33	502.78	2.705
60	45.10	5298.20	231.64	5231.75	304.15	5730.40	503.89	2.705
61	45.10	5298.20	231.64	5231.75	304.53	5731.47	505.00	2.705
62	95.10	5281.55	220.53	5235.81	325.87	5719.47	495.00	2.706
63	95.10	5281.55	220.53	5235.81	326.25	5720.52	496.11	2.706
64	95.10	5281.55	220.53	5235.81	326.64	5721.57	497.22	2.706
65	95.10	5281.55	220.53	5235.81	327.02	5722.63	498.33	2.706
66	95.10	5281.55	220.53	5235.81	327.41	5723.68	499.44	2.706
67	95.10	5281.55	220.53	5235.81	327.79	5724.73	500.56	2.706
68	95.10	5281.55	220.53	5235.81	328.18	5725.79	501.67	2.707
69	95.10	5281.55	220.53	5235.81	328.56	5726.84	502.78	2.707
70	95.10	5281.55	220.53	5235.81	328.94	5727.89	503.89	2.707
71	95.10	5281.55	220.53	5235.81	329.33	5728.95	505.00	2.707
72	85.10	5285.20	220.53	5235.81	320.61	5720.58	495.00	2.711

73	85.10	5285.20	220.53	5235.81	321.00	5721.64	496.11	2.711
74	85.10	5285.20	220.53	5235.81	321.38	5722.69	497.22	2.711
75	85.10	5285.20	220.53	5235.81	321.77	5723.75	498.33	2.711
76	85.10	5285.20	220.53	5235.81	322.15	5724.80	499.44	2.711
77	85.10	5285.20	220.53	5235.81	322.54	5725.86	500.56	2.711
78	85.10	5285.20	220.53	5235.81	322.92	5726.91	501.67	2.711
79	85.10	5285.20	220.53	5235.81	323.30	5727.97	502.78	2.711
80	85.10	5285.20	220.53	5235.81	323.69	5729.02	503.89	2.711
81	85.10	5285.20	220.53	5235.81	324.07	5730.08	505.00	2.711
82	75.10	5288.85	220.53	5235.81	315.33	5721.64	495.00	2.715
83	75.10	5288.85	220.53	5235.81	315.72	5722.70	496.11	2.715
84	75.10	5288.85	220.53	5235.81	316.10	5723.76	497.22	2.715
85	75.10	5288.85	220.53	5235.81	316.49	5724.81	498.33	2.715
86	75.10	5288.85	220.53	5235.81	316.87	5725.87	499.44	2.715
87	75.10	5288.85	220.53	5235.81	317.26	5726.93	500.56	2.715
88	75.10	5288.85	220.53	5235.81	317.65	5727.98	501.67	2.715
89	75.10	5288.85	220.53	5235.81	318.03	5729.04	502.78	2.715
90	75.10	5288.85	220.53	5235.81	318.42	5730.10	503.89	2.716
91	75.10	5288.85	220.53	5235.81	318.80	5731.15	505.00	2.716
92	65.10	5292.49	220.53	5235.81	310.03	5722.65	495.00	2.720
93	65.10	5292.49	220.53	5235.81	310.42	5723.71	496.11	2.720
94	65.10	5292.49	220.53	5235.81	310.81	5724.76	497.22	2.720
95	65.10	5292.49	220.53	5235.81	311.19	5725.82	498.33	2.720
96	65.10	5292.49	220.53	5235.81	311.58	5726.88	499.44	2.720
97	65.10	5292.49	220.53	5235.81	311.97	5727.94	500.56	2.720
98	65.10	5292.49	220.53	5235.81	312.35	5729.00	501.67	2.720
99	65.10	5292.49	220.53	5235.81	312.74	5730.06	502.78	2.720

Critical Failure Surface (circle 1)

Intersects: XL: 95.10 YL: 5281.55 XR: 231.64 YR: 5231.75

Centre: XC: 331.14 YC: 5716.65 Radius: R: 495.00

Generated failure surface: (20 points)

95.10	5281.55	101.88	5277.94	108.71	5274.44	115.59	5271.04	122.53	5267.75
129.52	5264.57	136.55	5261.50	143.64	5258.54	150.76	5255.68	157.93	5252.94
165.15	5250.31	172.40	5247.79	179.69	5245.39	187.02	5243.10	194.38	5240.92
201.77	5238.85	209.20	5236.91	216.65	5235.07	224.14	5233.35	231.64	5231.75

Slice Geometry and Properties - Critical Failure Surface (circle 1, 38 slices)

Slice	X-S	Base						PoreWater	Normal	Test	
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	95.10	0.96	28.0	3.39	3.84	1	0.00	45.0	105.92	0.00	26.06	0.94
2	98.49	2.89	28.0	3.39	3.84	1	0.00	45.0	317.75	0.00	78.18	0.94
3	101.88	4.75	27.1	3.42	3.84	1	0.00	45.0	522.15	0.00	128.22	0.94
4	105.29	6.47	27.1	3.42	3.84	1	0.00	45.0	712.04	0.00	174.85	0.94
5	108.71	8.16	26.3	3.44	3.84	1	0.00	45.0	897.32	0.00	219.99	0.94
6	112.15	9.68	26.3	3.44	3.84	1	0.00	45.0	1065.02	0.00	261.10	0.94
7	115.59	11.18	25.4	3.47	3.84	1	0.00	45.0	1229.90	0.00	301.10	0.94
8	119.06	12.50	25.4	3.47	3.84	1	0.00	45.0	1374.83	0.00	336.56	0.94
9	122.53	13.81	24.5	3.49	3.84	1	0.00	45.0	1518.62	0.00	371.33	0.94
10	126.02	14.91	24.5	3.49	3.84	1	0.00	45.0	1640.21	0.00	401.05	0.94
11	129.52	16.02	23.6	3.52	3.84	1	0.00	45.0	1761.70	0.00	430.35	0.94

12	133.04	16.91	23.6	3.52	3.84	1	0.00	45.0	1859.94	0.00	454.37	0.94
13	136.55	17.81	22.7	3.54	3.84	1	0.00	45.0	1958.67	0.00	478.15	0.94
14	140.09	18.48	22.7	3.54	3.84	1	0.00	45.0	2032.66	0.00	496.21	0.94
15	143.64	19.16	21.8	3.56	3.84	1	0.00	45.0	2107.69	0.00	514.28	0.94
16	147.20	19.61	21.8	3.56	3.84	1	0.00	45.0	2157.26	0.00	526.35	0.94
17	150.76	20.07	20.9	3.59	3.84	1	0.00	45.0	2207.88	0.00	538.61	0.94
18	154.35	20.30	20.9	3.59	3.84	1	0.00	45.0	2232.91	0.00	544.71	0.94
19	157.93	20.53	20.0	3.61	3.84	1	0.00	45.0	2258.67	0.00	551.03	0.94
20	161.54	20.53	20.0	3.61	3.84	1	0.00	45.0	2258.48	0.00	550.95	0.94
21	165.15	20.53	19.2	3.63	3.84	1	0.00	45.0	2258.32	0.00	551.06	0.94
22	168.77	20.30	19.1	3.63	3.84	1	0.00	45.0	2233.00	0.00	544.91	0.94
23	172.40	20.06	18.3	3.65	3.84	1	0.00	45.0	2206.84	0.00	538.74	0.94
24	176.04	19.60	18.3	3.65	3.84	1	0.00	45.0	2155.93	0.00	526.34	0.94
25	179.69	23.07	17.4	4.44	4.65	1	0.00	45.0	2537.53	0.00	511.81	0.94
26	184.13	14.47	17.4	2.89	3.03	1	0.00	45.0	1591.74	85.41	496.07	0.94
27	187.02	17.69	16.5	3.68	3.84	1	0.00	45.0	1945.97	346.89	484.93	0.94
28	190.70	16.76	16.5	3.68	3.84	1	0.00	45.0	1843.57	607.84	466.66	0.94
29	194.38	15.74	15.6	3.69	3.83	1	0.00	45.0	1731.00	858.91	446.38	0.94
30	198.06	14.66	15.6	3.71	3.85	1	0.00	45.0	1612.29	1112.05	459.12	0.94
31	201.77	13.38	14.7	3.71	3.84	1	0.00	45.0	1471.72	1349.30	507.69	0.94
32	205.49	11.97	14.7	3.71	3.84	1	0.00	45.0	1316.58	1582.69	552.01	0.94
33	209.20	10.48	13.8	3.73	3.84	1	0.00	45.0	1153.20	1809.18	593.90	0.94
34	212.93	8.83	13.8	3.73	3.84	1	0.00	45.0	971.61	2028.77	631.78	0.94
35	216.65	7.09	12.9	3.74	3.84	1	0.00	45.0	780.31	2241.56	667.03	0.94
36	220.39	5.20	12.9	3.74	3.84	1	0.00	45.0	572.12	2447.29	698.46	0.94
37	224.14	3.20	12.0	3.75	3.84	1	0.00	45.0	352.26	2645.81	726.89	0.95
38	227.89	1.07	12.0	3.75	3.84	1	0.00	45.0	117.35	2837.57	751.76	0.95

X-S Area: 518.83 Path Length: 145.87 X-S Weight: 57070.95

DATA: Analysis 3 - Final Reclaimed 2

Material Properties (3 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Sand and gravel, mixed grain size

Cohesion	Phi	UnitWeight	Ru
0.00	45.0	110.00	Auto

Material: 2 (Mohr-Coulomb Isotropic) - Loose sand, mixed grain size

Cohesion	Phi	UnitWeight	Ru
0.00	34.0	99.00	Auto

Material: 3 (Mohr-Coulomb Isotropic) - Bedrock (shale)

Cohesion	Phi	UnitWeight	Ru
20000.00	17.0	110.00	Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (2 profiles)

Profile: 1 (2 points) Material beneath: 1 - Sand and gravel, mixed grain size
0.00 5300.00 500.00 5290.00
Profile: 2 (2 points) Material beneath: 3 - Bedrock (shale)
0.00 5230.00 500.00 5228.00

Slope Surface (4 points)

0.00 5300.00 50.00 5298.00 237.00 5229.80 499.00 5228.80

Phreatic Surface (3 points)

0.00 5244.00 35.00 5244.00 500.00 5244.00

Failure Surface (Critical, from previous analysis)

Initial circular surface for critical search defined by: XL,XR,R
Intersects: XL: 95.10 YL: 5281.55 XR: 231.64 YR: 5231.75
Centre: XC: 331.14 YC: 5716.65 Radius: R: 495.00

Variable Restraints

Parameter descriptor: XL XR R
Range of variation: 90.00 100.00 10.00
Trial positions within range: 10 10 10

- -

RESULTS: Analysis 3 - Final Reclaimed 2

Bishop Simplified Method of Analysis - Circular Failure Surface
---
Critical Failure Surface Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure surface approximation: 2.668

There were: 601 successful analyses from a total of 1001 trial surfaces
400 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 2.64

Results Summary - Lowest 99 Factor of Safety circles

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	140.10	5265.14	237.20	5229.80	355.30	5705.35	490.00	2.640	<-- Critical Surface
2	140.10	5265.14	237.20	5229.80	355.69	5706.40	491.11	2.640	
3	140.10	5265.14	237.20	5229.80	356.07	5707.45	492.22	2.640	
4	140.10	5265.14	237.20	5229.80	356.45	5708.50	493.33	2.641	
5	130.10	5268.79	237.20	5229.80	350.13	5706.61	490.00	2.641	
6	140.10	5265.14	237.20	5229.80	356.83	5709.55	494.44	2.641	
7	130.10	5268.79	237.20	5229.80	350.51	5707.66	491.11	2.641	
8	140.10	5265.14	237.20	5229.80	357.22	5710.60	495.56	2.641	

9	130.10	5268.79	237.20	5229.80	350.89	5708.71	492.22	2.641
10	140.10	5265.14	237.20	5229.80	357.60	5711.65	496.67	2.641
11	130.10	5268.79	237.20	5229.80	351.28	5709.76	493.33	2.641
12	140.10	5265.14	237.20	5229.80	357.98	5712.70	497.78	2.642
13	130.10	5268.79	237.20	5229.80	351.66	5710.81	494.44	2.642
14	140.10	5265.14	237.20	5229.80	358.36	5713.75	498.89	2.642
15	130.10	5268.79	237.20	5229.80	352.04	5711.86	495.56	2.642
16	140.10	5265.14	237.20	5229.80	358.74	5714.80	500.00	2.642
17	130.10	5268.79	237.20	5229.80	352.43	5712.91	496.67	2.642
18	130.10	5268.79	237.20	5229.80	352.81	5713.97	497.78	2.642
19	130.10	5268.79	237.20	5229.80	353.19	5715.02	498.89	2.642
20	130.10	5268.79	237.20	5229.80	353.57	5716.07	500.00	2.643
21	120.10	5272.43	237.20	5229.80	344.93	5707.81	490.00	2.643
22	120.10	5272.43	237.20	5229.80	345.31	5708.86	491.11	2.643
23	120.10	5272.43	237.20	5229.80	345.70	5709.92	492.22	2.643
24	120.10	5272.43	237.20	5229.80	346.08	5710.97	493.33	2.644
25	120.10	5272.43	237.20	5229.80	346.46	5712.02	494.44	2.644
26	120.10	5272.43	237.20	5229.80	346.84	5713.07	495.56	2.644
27	120.10	5272.43	237.20	5229.80	347.23	5714.12	496.67	2.644
28	120.10	5272.43	237.20	5229.80	347.99	5716.23	498.89	2.644
29	120.10	5272.43	237.20	5229.80	347.61	5715.18	497.78	2.645
30	120.10	5272.43	237.20	5229.80	348.38	5717.28	500.00	2.645
31	110.10	5276.08	237.20	5229.80	339.70	5708.96	490.00	2.646
32	110.10	5276.08	237.20	5229.80	340.09	5710.01	491.11	2.646
33	110.10	5276.08	237.20	5229.80	340.47	5711.07	492.22	2.646
34	110.10	5276.08	237.20	5229.80	340.86	5712.12	493.33	2.646
35	110.10	5276.08	237.20	5229.80	341.24	5713.17	494.44	2.646
36	110.10	5276.08	237.20	5229.80	341.62	5714.23	495.56	2.647
37	110.10	5276.08	237.20	5229.80	342.01	5715.28	496.67	2.647
38	110.10	5276.08	237.20	5229.80	342.39	5716.33	497.78	2.647
39	110.10	5276.08	237.20	5229.80	342.77	5717.39	498.89	2.647
40	110.10	5276.08	237.20	5229.80	343.16	5718.44	500.00	2.647
41	100.10	5279.73	237.20	5229.80	334.46	5710.05	490.00	2.649
42	100.10	5279.73	237.20	5229.80	334.84	5711.11	491.11	2.649
43	100.10	5279.73	237.20	5229.80	335.23	5712.16	492.22	2.649
44	100.10	5279.73	237.20	5229.80	335.61	5713.22	493.33	2.650
45	100.10	5279.73	237.20	5229.80	335.99	5714.27	494.44	2.650
46	100.10	5279.73	237.20	5229.80	336.38	5715.33	495.56	2.650
47	100.10	5279.73	237.20	5229.80	336.76	5716.38	496.67	2.650
48	100.10	5279.73	237.20	5229.80	337.15	5717.44	497.78	2.650
49	100.10	5279.73	237.20	5229.80	337.53	5718.49	498.89	2.650
50	100.10	5279.73	237.20	5229.80	337.92	5719.55	500.00	2.651
51	90.10	5283.38	237.20	5229.80	329.19	5711.09	490.00	2.653
52	90.10	5283.38	237.20	5229.80	329.57	5712.14	491.11	2.653
53	90.10	5283.38	237.20	5229.80	329.96	5713.20	492.22	2.653
54	90.10	5283.38	237.20	5229.80	330.34	5714.26	493.33	2.653
55	90.10	5283.38	237.20	5229.80	330.73	5715.32	494.44	2.653
56	90.10	5283.38	237.20	5229.80	331.11	5716.37	495.56	2.654
57	90.10	5283.38	237.20	5229.80	331.50	5717.43	496.67	2.654
58	90.10	5283.38	237.20	5229.80	331.88	5718.49	497.78	2.654
59	90.10	5283.38	237.20	5229.80	332.27	5719.55	498.89	2.654
60	90.10	5283.38	237.20	5229.80	332.65	5720.60	500.00	2.654
61	80.10	5287.02	237.20	5229.80	323.89	5712.07	490.00	2.657

62	80.10	5287.02	237.20	5229.80	324.28	5713.13	491.11	2.657
63	80.10	5287.02	237.20	5229.80	324.67	5714.19	492.22	2.657
64	80.10	5287.02	237.20	5229.80	325.05	5715.25	493.33	2.657
65	80.10	5287.02	237.20	5229.80	325.44	5716.31	494.44	2.657
66	80.10	5287.02	237.20	5229.80	325.82	5717.37	495.56	2.658
67	80.10	5287.02	237.20	5229.80	326.21	5718.42	496.67	2.658
68	80.10	5287.02	237.20	5229.80	326.60	5719.48	497.78	2.658
69	80.10	5287.02	237.20	5229.80	326.98	5720.54	498.89	2.658
70	80.10	5287.02	237.20	5229.80	327.37	5721.60	500.00	2.658
71	70.10	5290.67	237.20	5229.80	318.58	5712.99	490.00	2.661
72	70.10	5290.67	237.20	5229.80	318.97	5714.06	491.11	2.661
73	70.10	5290.67	237.20	5229.80	319.35	5715.12	492.22	2.661
74	70.10	5290.67	237.20	5229.80	319.74	5716.18	493.33	2.661
75	70.10	5290.67	237.20	5229.80	320.13	5717.24	494.44	2.662
76	70.10	5290.67	237.20	5229.80	320.51	5718.30	495.56	2.662
77	70.10	5290.67	237.20	5229.80	320.90	5719.36	496.67	2.662
78	70.10	5290.67	237.20	5229.80	321.29	5720.42	497.78	2.662
79	70.10	5290.67	237.20	5229.80	321.67	5721.48	498.89	2.662
80	70.10	5290.67	237.20	5229.80	322.06	5722.54	500.00	2.662
81	60.10	5294.32	237.20	5229.80	313.24	5713.86	490.00	2.665
82	60.10	5294.32	237.20	5229.80	313.63	5714.93	491.11	2.666
83	60.10	5294.32	237.20	5229.80	314.02	5715.99	492.22	2.666
84	60.10	5294.32	237.20	5229.80	314.41	5717.05	493.33	2.666
85	60.10	5294.32	237.20	5229.80	314.79	5718.12	494.44	2.666
86	60.10	5294.32	237.20	5229.80	315.18	5719.18	495.56	2.666
87	60.10	5294.32	237.20	5229.80	315.57	5720.24	496.67	2.666
88	60.10	5294.32	237.20	5229.80	315.95	5721.31	497.78	2.666
89	60.10	5294.32	237.20	5229.80	316.34	5722.37	498.89	2.667
90	60.10	5294.32	237.20	5229.80	316.73	5723.43	500.00	2.667
91	95.10	5281.55	231.64	5231.75	331.14	5716.65	495.00	2.668
92	140.10	5265.14	226.09	5233.78	350.25	5707.79	490.00	2.669
93	140.10	5265.14	226.09	5233.78	350.63	5708.84	491.11	2.669
94	140.10	5265.14	226.09	5233.78	351.02	5709.88	492.22	2.669
95	140.10	5265.14	226.09	5233.78	351.40	5710.93	493.33	2.670
96	140.10	5265.14	226.09	5233.78	351.78	5711.98	494.44	2.670
97	140.10	5265.14	226.09	5233.78	352.16	5713.03	495.56	2.670
98	50.10	5297.96	237.20	5229.80	307.88	5714.67	490.00	2.670
99	140.10	5265.14	226.09	5233.78	352.54	5714.08	496.67	2.670

Critical Failure Surface (circle 1)

Intersects: XL: 140.10 YL: 5265.14 XR: 237.20 YR: 5229.80

Centre: XC: 355.30 YC: 5705.35 Radius: R: 490.00

Generated failure surface: (20 points)

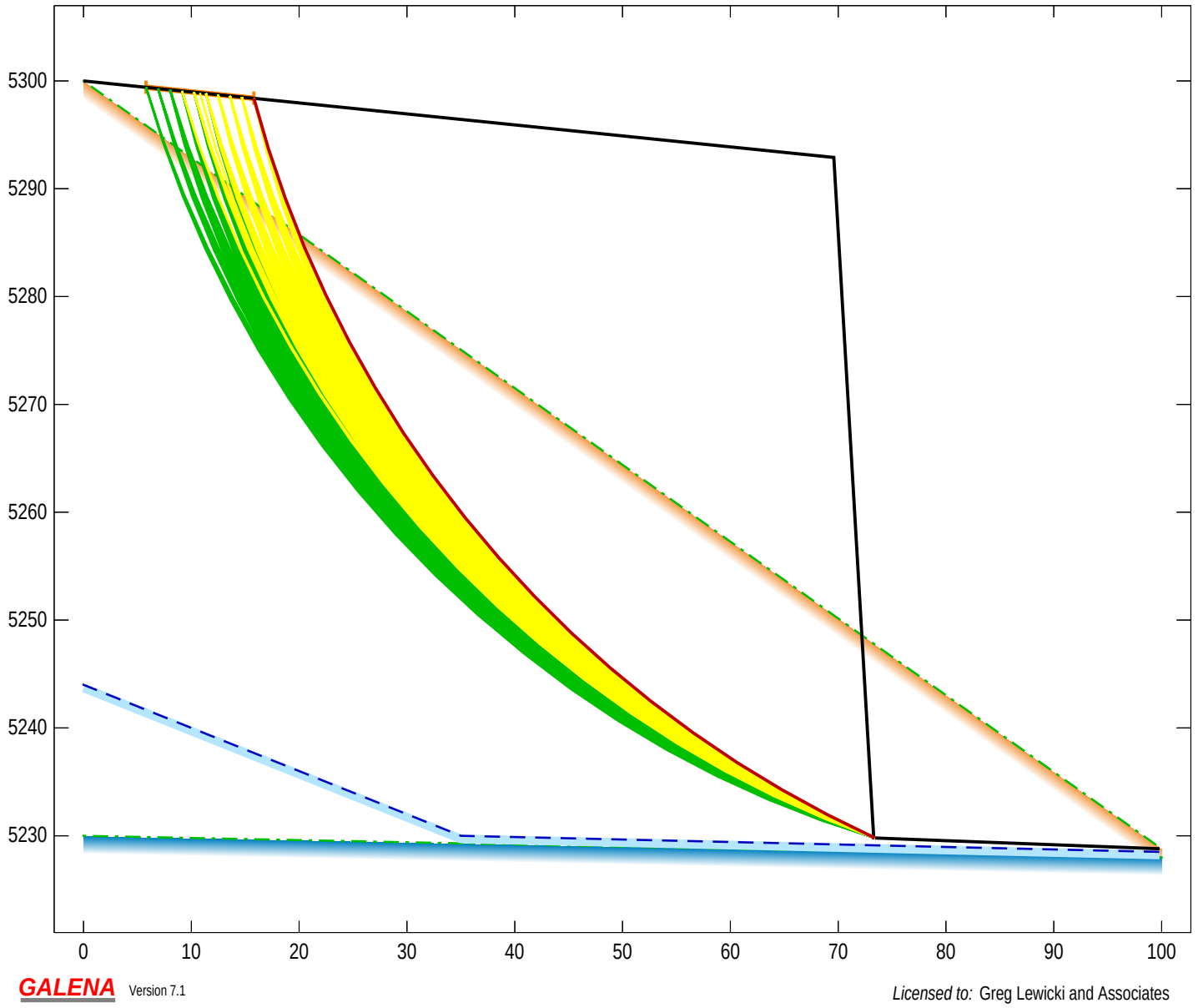
140.10	5265.14	145.01	5262.77	149.94	5260.46	154.90	5258.21	159.89	5256.01
164.90	5253.86	169.93	5251.77	174.98	5249.74	180.06	5247.76	185.16	5245.84
190.28	5243.98	195.42	5242.17	200.58	5240.42	205.76	5238.73	210.96	5237.10
216.17	5235.52	221.40	5234.00	226.65	5232.54	231.92	5231.14	237.20	5229.80

Slice Geometry and Properties - Critical Failure Surface (circle 1, 38 slices)

Slice	X-S	---------- Base ----------						PoreWater	Normal	Test	
X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor

1	140.10	0.35	25.7	2.45	2.72	1	0.00	45.0	38.75	0.00	13.35	0.94
2	142.55	1.06	25.7	2.45	2.72	1	0.00	45.0	116.53	0.00	40.15	0.94
3	145.01	1.73	25.1	2.47	2.72	1	0.00	45.0	190.81	0.00	65.69	0.94
4	147.48	2.37	25.1	2.47	2.72	1	0.00	45.0	260.24	0.00	89.59	0.94
5	149.94	2.97	24.5	2.48	2.72	1	0.00	45.0	326.99	0.00	112.48	0.94
6	152.42	3.53	24.5	2.48	2.72	1	0.00	45.0	388.00	0.00	133.47	0.94
7	154.90	4.06	23.8	2.49	2.72	1	0.00	45.0	446.83	0.00	153.59	0.94
8	157.39	4.54	23.8	2.49	2.72	1	0.00	45.0	499.16	0.00	171.60	0.94
9	159.89	5.00	23.2	2.50	2.72	1	0.00	45.0	549.85	0.00	188.92	0.94
10	162.39	5.40	23.2	2.50	2.72	1	0.00	45.0	593.97	0.00	204.07	0.94
11	164.90	5.79	22.6	2.52	2.72	1	0.00	45.0	636.38	0.00	218.55	0.94
12	167.41	6.10	22.5	2.52	2.72	1	0.00	45.0	671.52	0.00	230.63	0.94
13	169.93	6.41	21.9	2.53	2.72	1	0.00	45.0	705.37	0.00	242.18	0.94
14	172.45	6.65	21.9	2.53	2.72	1	0.00	45.0	731.70	0.00	251.23	0.94
15	174.98	6.88	21.3	2.54	2.72	1	0.00	45.0	756.91	0.00	259.83	0.94
16	177.52	7.04	21.3	2.54	2.72	1	0.00	45.0	774.36	0.00	265.83	0.94
17	180.06	7.19	20.6	2.55	2.72	1	0.00	45.0	790.68	0.00	271.42	0.94
18	182.61	7.27	20.6	2.55	2.72	1	0.00	45.0	799.31	0.00	274.36	0.94
19	185.16	7.25	20.0	2.53	2.69	1	0.00	45.0	797.05	0.00	276.89	0.94
20	187.69	7.24	20.0	2.53	2.69	1	0.00	45.0	796.50	0.00	276.70	0.94
21	190.22	7.40	19.4	2.60	2.76	1	0.00	45.0	813.73	78.70	279.49	0.94
22	192.82	7.31	19.4	2.60	2.76	1	0.00	45.0	803.81	235.81	282.85	0.94
23	195.42	7.30	18.7	2.65	2.79	1	0.00	45.0	802.70	396.74	285.09	0.94
24	198.06	6.77	18.7	2.52	2.66	1	0.00	45.0	745.04	522.24	310.24	0.94
25	200.58	6.76	18.1	2.59	2.72	1	0.00	45.0	743.71	680.04	360.23	0.94
26	203.17	6.51	18.1	2.59	2.72	1	0.00	45.0	715.62	823.80	408.82	0.94
27	205.76	6.23	17.4	2.60	2.72	1	0.00	45.0	685.40	965.20	456.27	0.94
28	208.36	5.89	17.5	2.60	2.72	1	0.00	45.0	647.99	1104.13	501.67	0.94
29	210.96	5.53	16.8	2.61	2.72	1	0.00	45.0	608.16	1240.50	545.91	0.94
30	213.56	5.10	16.8	2.61	2.72	1	0.00	45.0	561.38	1374.47	588.12	0.94
31	216.17	4.65	16.2	2.62	2.72	1	0.00	45.0	511.68	1505.97	629.04	0.94
32	218.79	4.14	16.2	2.62	2.72	1	0.00	45.0	455.47	1635.13	668.04	0.94
33	221.40	3.60	15.5	2.62	2.72	1	0.00	45.0	395.87	1761.60	705.65	0.94
34	224.03	3.00	15.5	2.62	2.72	1	0.00	45.0	330.31	1885.60	741.43	0.94
35	226.65	2.37	14.9	2.63	2.72	1	0.00	45.0	260.74	2007.21	775.73	0.94
36	229.29	1.69	14.9	2.63	2.72	1	0.00	45.0	185.52	2126.24	808.19	0.94
37	231.92	0.94	14.3	2.54	2.62	1	0.00	45.0	103.56	2155.86	838.59	0.94
38	234.46	0.22	14.3	2.74	2.83	1	0.00	45.0	23.84	2444.00	867.83	0.94
	---		---		---							

X-S Area: 184.23 Path Length: 103.52 X-S Weight: 20265.42



GALENA Version 7.1

Licensed to: Greg Lewicki and Associates

Material Keys

1: Sand and gravel, mixed grain size

3: Bedrock (shale)

Analysis 1

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular

Results

Critical Factor of Safety: 1.23

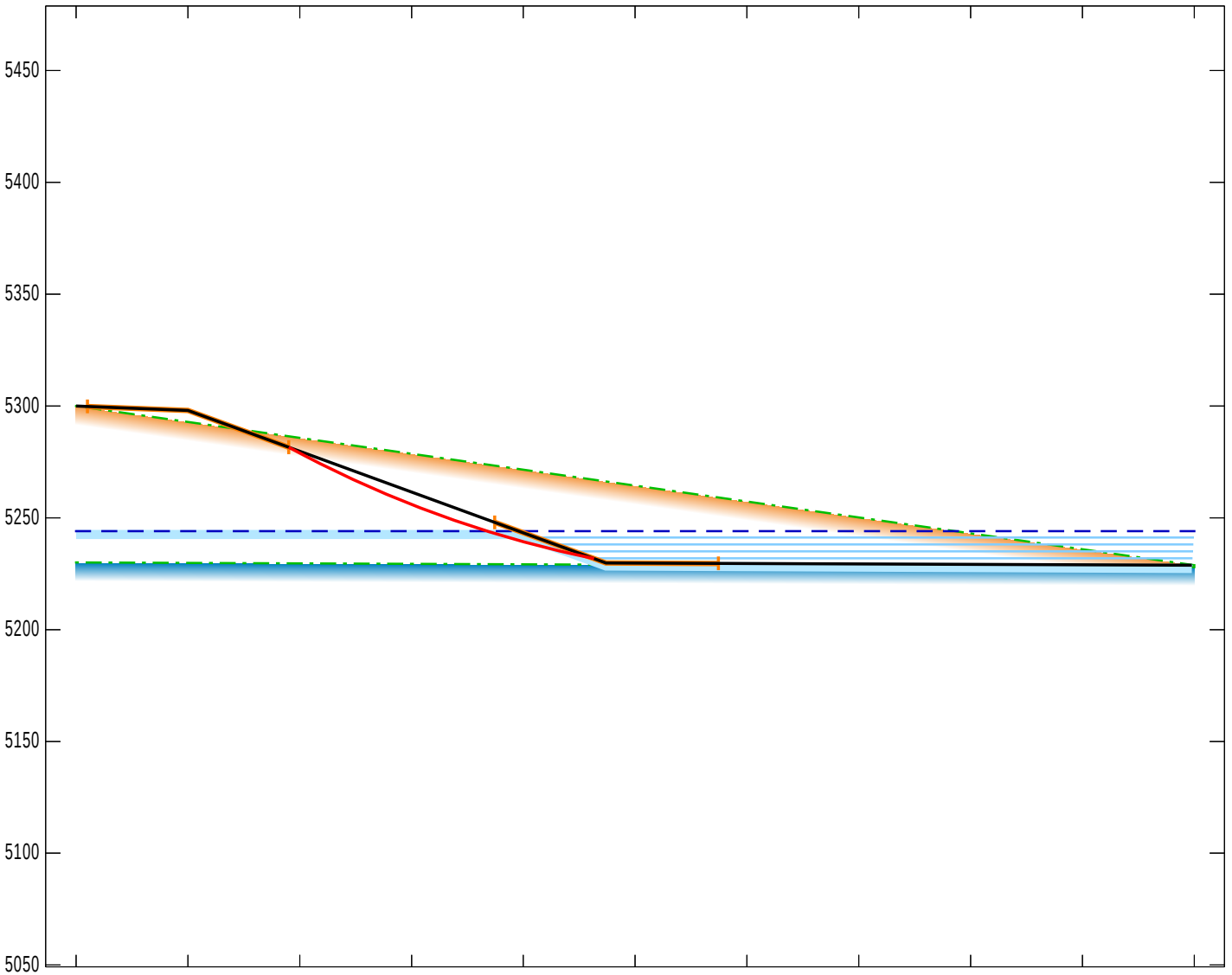
Edited: 18 Jul 2024

Processed: 18 Jul 2024

Project Limon Sand & Gravel
Active Mining

File: E:\Work\GLA Dropbox\Ben Langenfeld\Bettis Companies\Slope Stability\Limon S&G.gmf

Lewicki & Associates



GALENA Version 7.1

Licensed to: Greg Lewicki and Associates

Material Keys

1: Sand and gravel, mixed grain size

3: Bedrock (shale)

Analysis 2

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular

Results

Critical Factor of Safety: 2.67

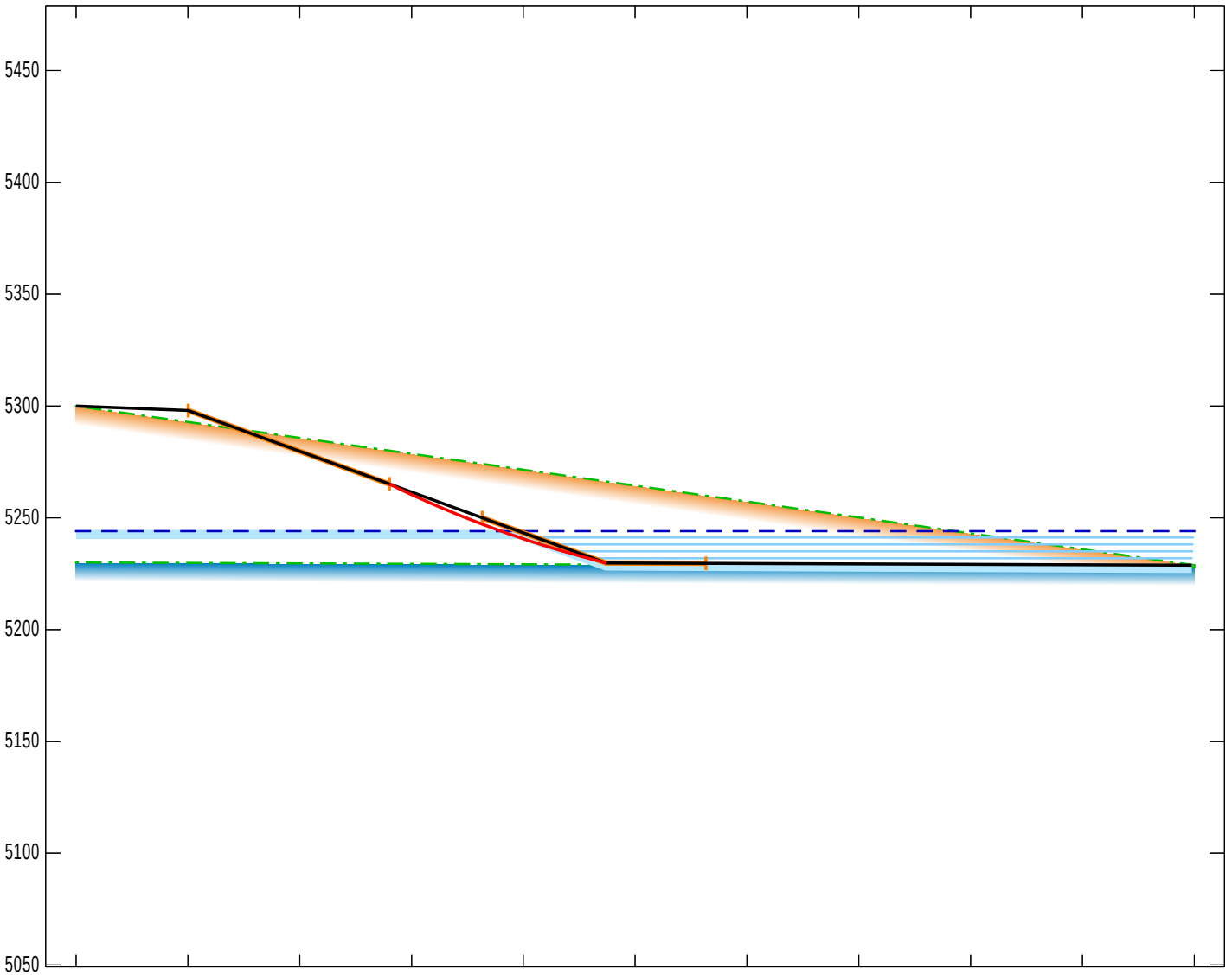
Edited: 18 Jul 2024

Processed: 18 Jul 2024

Project Limon Sand & Gravel
Final Reclaimed 1

File: E:\Work\GLA Dropbox\Ben Langenfeld\Bettis Companies\Slope Stability\Limon S&G.gmf

Lewicki & Associates



GALENA Version 7.1

Licensed to: Greg Lewicki and Associates

Material Keys

1: Sand and gravel, mixed grain size

3: Bedrock (shale)

Analysis 3

Multiple Stability Analysis

Method: Bishop Simplified

Surface: Circular (Critical Seed)

Results

Critical Factor of Safety: 2.64

Edited: 18 Jul 2024

Processed: 18 Jul 2024

Project Limon Sand & Gravel
Final Reclaimed 2

File: E:\Work\GLA Dropbox\Ben Langenfeld\Bettis Companies\Slope Stability\Limon S&G.gmf

Lewicki & Associates

GALENA 7.1 Analysis Results Version: 7.10.1.04 Licensee: Greg Lewicki and Associates

Project: Limon Sand & Gravel
File: E:\Work\GLA Dropbox\Ben Langenfeld\Bettis Companies\Slope Stability\Limon S&G.gmf
Processed: 18 Jul 2024 08:11:19

DATA: Analysis 1 - Active Mining

Material Properties (3 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Sand and gravel, mixed grain size
Cohesion Phi UnitWeight Ru
0.00 45.0 110.00 Auto
Material: 2 (Mohr-Coulomb Isotropic) - Loose sand, mixed grain size
Cohesion Phi UnitWeight Ru
0.00 34.0 99.00 Auto
Material: 3 (Mohr-Coulomb Isotropic) - Bedrock (shale)
Cohesion Phi UnitWeight Ru
20000.00 17.0 110.00 Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (2 profiles)

Profile: 1 (3 points) Material beneath: 1 - Sand and gravel, mixed grain size
0.00 5300.00 80.00 5292.00 100.00 5290.00
Profile: 2 (2 points) Material beneath: 3 - Bedrock (shale)
0.00 5230.00 100.00 5228.00

Slope Surface (4 points)

0.00 5300.00 69.60 5292.90 73.30 5229.80 99.80 5228.80

Phreatic Surface (3 points)

0.00 5244.00 35.00 5230.00 100.00 5228.50

Failure Surface

Initial circular surface for critical search defined by: XL,XR,R
Intersects: XL: 10.80 YL: 5298.90 XR: 73.40 YR: 5229.80
Centre: XC: 107.66 YC: 5323.74 Radius: R: 100.00

Variable Restraints

Parameter descriptor: XL XR R

Range of variation: 10.00 0.00 10.00
Trial positions within range: 10 1 10

- -

RESULTS: Analysis 1 - Active Mining

Bishop Simplified Method of Analysis - Circular Failure Surface
---
Critical Failure Surface Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure surface approximation: 1.383

There were: 101 successful analyses from a total of 101 trial surfaces

Critical (minimum) Factor of Safety: 1.23

Results Summary - Lowest 99 Factor of Safety circles

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	15.80	5298.39	73.40	5229.80	117.33	5325.17	105.00	1.232	<-- Critical Surface
2	15.80	5298.39	73.40	5229.80	116.39	5324.37	103.89	1.238	
3	15.80	5298.39	73.40	5229.80	115.44	5323.58	102.78	1.245	
4	15.80	5298.39	73.40	5229.80	114.50	5322.79	101.67	1.253	
5	14.69	5298.50	73.40	5229.80	116.10	5325.72	105.00	1.257	
6	15.80	5298.39	73.40	5229.80	113.55	5321.99	100.56	1.260	
7	14.69	5298.50	73.40	5229.80	115.16	5324.92	103.89	1.264	
8	15.80	5298.39	73.40	5229.80	112.59	5321.19	99.44	1.268	
9	14.69	5298.50	73.40	5229.80	114.22	5324.12	102.78	1.271	
10	15.80	5298.39	73.40	5229.80	111.64	5320.39	98.33	1.276	
11	14.69	5298.50	73.40	5229.80	113.28	5323.31	101.67	1.278	
12	13.58	5298.61	73.40	5229.80	114.87	5326.26	105.00	1.282	
13	15.80	5298.39	73.40	5229.80	110.68	5319.58	97.22	1.284	
14	14.69	5298.50	73.40	5229.80	112.34	5322.51	100.56	1.286	
15	13.58	5298.61	73.40	5229.80	113.94	5325.45	103.89	1.289	
16	15.80	5298.39	73.40	5229.80	109.72	5318.78	96.11	1.293	
17	14.69	5298.50	73.40	5229.80	111.39	5321.70	99.44	1.294	
18	13.58	5298.61	73.40	5229.80	113.01	5324.64	102.78	1.296	
19	15.80	5298.39	73.40	5229.80	108.76	5317.97	95.00	1.302	
20	14.69	5298.50	73.40	5229.80	110.44	5320.89	98.33	1.302	
21	13.58	5298.61	73.40	5229.80	112.07	5323.82	101.67	1.304	
22	12.47	5298.73	73.40	5229.80	113.65	5326.77	105.00	1.307	
23	14.69	5298.50	73.40	5229.80	109.49	5320.07	97.22	1.311	
24	13.58	5298.61	73.40	5229.80	111.13	5323.00	100.56	1.312	
25	12.47	5298.73	73.40	5229.80	112.72	5325.95	103.89	1.314	
26	14.69	5298.50	73.40	5229.80	108.53	5319.26	96.11	1.320	
27	13.58	5298.61	73.40	5229.80	110.19	5322.19	99.44	1.320	
28	12.47	5298.73	73.40	5229.80	111.79	5325.13	102.78	1.322	
29	13.58	5298.61	73.40	5229.80	109.24	5321.36	98.33	1.329	
30	14.69	5298.50	73.40	5229.80	107.57	5318.44	95.00	1.329	
31	12.47	5298.73	73.40	5229.80	110.86	5324.31	101.67	1.330	
32	11.36	5298.84	73.40	5229.80	112.43	5327.27	105.00	1.333	

33	13.58	5298.61	73.40	5229.80	108.30	5320.54	97.22	1.337
34	12.47	5298.73	73.40	5229.80	109.93	5323.48	100.56	1.338
35	11.36	5298.84	73.40	5229.80	111.51	5326.44	103.89	1.340
36	13.58	5298.61	73.40	5229.80	107.34	5319.71	96.11	1.347
37	12.47	5298.73	73.40	5229.80	108.99	5322.65	99.44	1.347
38	11.36	5298.84	73.40	5229.80	110.59	5325.61	102.78	1.348
39	12.47	5298.73	73.40	5229.80	108.05	5321.82	98.33	1.355
40	13.58	5298.61	73.40	5229.80	106.39	5318.88	95.00	1.356
41	11.36	5298.84	73.40	5229.80	109.66	5324.78	101.67	1.356
42	10.24	5298.96	73.40	5229.80	111.22	5327.75	105.00	1.359
43	12.47	5298.73	73.40	5229.80	107.11	5320.99	97.22	1.365
44	11.36	5298.84	73.40	5229.80	108.73	5323.94	100.56	1.365
45	10.24	5298.96	73.40	5229.80	110.30	5326.91	103.89	1.366
46	11.36	5298.84	73.40	5229.80	107.80	5323.10	99.44	1.374
47	12.47	5298.73	73.40	5229.80	106.16	5320.15	96.11	1.374
48	10.24	5298.96	73.40	5229.80	109.38	5326.07	102.78	1.375
49	11.36	5298.84	73.40	5229.80	106.86	5322.26	98.33	1.383
50	10.80	5298.90	73.40	5229.80	107.66	5323.74	100.00	1.383
51	10.24	5298.96	73.40	5229.80	108.46	5325.23	101.67	1.383
52	12.47	5298.73	73.40	5229.80	105.21	5319.31	95.00	1.384
53	9.13	5299.07	73.40	5229.80	110.01	5328.21	105.00	1.385
54	10.24	5298.96	73.40	5229.80	107.53	5324.38	100.56	1.392
55	11.36	5298.84	73.40	5229.80	105.92	5321.42	97.22	1.392
56	9.13	5299.07	73.40	5229.80	109.10	5327.36	103.89	1.393
57	10.24	5298.96	73.40	5229.80	106.60	5323.53	99.44	1.401
58	9.13	5299.07	73.40	5229.80	108.18	5326.51	102.78	1.401
59	11.36	5298.84	73.40	5229.80	104.98	5320.57	96.11	1.402
60	9.13	5299.07	73.40	5229.80	107.26	5325.66	101.67	1.410
61	10.24	5298.96	73.40	5229.80	105.67	5322.68	98.33	1.410
62	8.02	5299.18	73.40	5229.80	108.80	5328.65	105.00	1.411
63	11.36	5298.84	73.40	5229.80	104.03	5319.72	95.00	1.412
64	9.13	5299.07	73.40	5229.80	106.34	5324.80	100.56	1.419
65	8.02	5299.18	73.40	5229.80	107.89	5327.79	103.89	1.420
66	10.24	5298.96	73.40	5229.80	104.74	5321.83	97.22	1.420
67	9.13	5299.07	73.40	5229.80	105.42	5323.95	99.44	1.428
68	8.02	5299.18	73.40	5229.80	106.98	5326.93	102.78	1.428
69	10.24	5298.96	73.40	5229.80	103.80	5320.97	96.11	1.430
70	8.02	5299.18	73.40	5229.80	106.07	5326.07	101.67	1.437
71	9.13	5299.07	73.40	5229.80	104.49	5323.09	98.33	1.438
72	6.91	5299.29	73.40	5229.80	107.60	5329.07	105.00	1.438
73	10.24	5298.96	73.40	5229.80	102.86	5320.11	95.00	1.440
74	8.02	5299.18	73.40	5229.80	105.15	5325.21	100.56	1.446
75	6.91	5299.29	73.40	5229.80	106.70	5328.20	103.89	1.447
76	9.13	5299.07	73.40	5229.80	103.56	5322.22	97.22	1.448
77	6.91	5299.29	73.40	5229.80	105.79	5327.34	102.78	1.456
78	8.02	5299.18	73.40	5229.80	104.23	5324.34	99.44	1.456
79	9.13	5299.07	73.40	5229.80	102.62	5321.36	96.11	1.458
80	6.91	5299.29	73.40	5229.80	104.88	5326.47	101.67	1.465
81	5.80	5299.41	73.40	5229.80	106.40	5329.47	105.00	1.465
82	8.02	5299.18	73.40	5229.80	103.31	5323.47	98.33	1.466
83	9.13	5299.07	73.40	5229.80	101.69	5320.49	95.00	1.469
84	5.80	5299.41	73.40	5229.80	105.50	5328.60	103.89	1.474
85	6.91	5299.29	73.40	5229.80	103.97	5325.59	100.56	1.474

86	8.02	5299.18	73.40	5229.80	102.38	5322.60	97.22	1.476
87	5.80	5299.41	73.40	5229.80	104.60	5327.72	102.78	1.483
88	6.91	5299.29	73.40	5229.80	103.05	5324.72	99.44	1.484
89	8.02	5299.18	73.40	5229.80	101.45	5321.72	96.11	1.487
90	5.80	5299.41	73.40	5229.80	103.69	5326.84	101.67	1.493
91	6.91	5299.29	73.40	5229.80	102.13	5323.84	98.33	1.495
92	8.02	5299.18	73.40	5229.80	100.52	5320.84	95.00	1.498
93	5.80	5299.41	73.40	5229.80	102.79	5325.96	100.56	1.503
94	6.91	5299.29	73.40	5229.80	101.21	5322.96	97.22	1.505
95	5.80	5299.41	73.40	5229.80	101.87	5325.08	99.44	1.513
96	6.91	5299.29	73.40	5229.80	100.28	5322.07	96.11	1.516
97	5.80	5299.41	73.40	5229.80	100.96	5324.19	98.33	1.523
98	6.91	5299.29	73.40	5229.80	99.36	5321.18	95.00	1.528
99	5.80	5299.41	73.40	5229.80	100.04	5323.30	97.22	1.534

Critical Failure Surface (circle 1)

Intersects: XL: 15.80 YL: 5298.39 XR: 73.40 YR: 5229.80

Centre: XC: 117.33 YC: 5325.17 Radius: R: 105.00

Generated failure surface: (20 points)

15.80	5298.39	17.15	5293.71	18.72	5289.10	20.50	5284.56	22.48	5280.12
24.67	5275.77	27.06	5271.53	29.65	5267.40	32.42	5263.40	35.37	5259.52
38.51	5255.80	41.81	5252.22	45.27	5248.79	48.89	5245.53	52.66	5242.45
56.56	5239.54	60.60	5236.81	64.75	5234.27	69.03	5231.94	73.40	5229.80

Slice Geometry and Properties - Critical Failure Surface (circle 1, 40 slices)

Slice	X-S	Base						PoreWater	Normal	Test
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	15.80	3.07	73.9	1.35	4.87	1	0.00	45.0	337.35	0.00	65.51	0.95
2	17.15	10.60	71.2	1.57	4.87	1	0.00	45.0	1165.79	0.00	219.54	0.92
3	18.72	19.86	68.6	1.78	4.87	1	0.00	45.0	2184.77	0.00	400.22	0.89
4	20.50	14.31	65.9	0.99	2.43	1	0.00	45.0	1574.00	0.00	562.48	0.87
5	21.49	16.42	65.9	0.99	2.43	1	0.00	45.0	1805.81	0.00	645.32	0.87
6	22.48	20.39	63.3	1.10	2.43	1	0.00	45.0	2243.42	0.00	784.22	0.85
7	23.58	22.65	63.3	1.10	2.44	1	0.00	45.0	2491.92	0.00	870.97	0.85
8	24.67	27.14	60.6	1.19	2.43	1	0.00	45.0	2985.65	0.00	1023.35	0.83
9	25.87	29.53	60.6	1.19	2.43	1	0.00	45.0	3248.55	0.00	1113.46	0.83
10	27.06	34.47	57.9	1.29	2.43	1	0.00	45.0	3791.77	0.00	1277.79	0.82
11	28.35	36.97	58.0	1.29	2.44	1	0.00	45.0	4066.38	0.00	1370.15	0.82
12	29.65	42.29	55.3	1.39	2.43	1	0.00	45.0	4652.33	0.00	1544.91	0.81
13	31.03	44.87	55.3	1.39	2.44	1	0.00	45.0	4936.04	0.00	1638.90	0.81
14	32.42	50.52	52.6	1.48	2.44	1	0.00	45.0	5557.35	0.00	1822.57	0.80
15	33.90	53.16	52.6	1.48	2.43	1	0.00	45.0	5847.44	0.00	1917.95	0.80
16	35.37	59.06	50.0	1.57	2.43	1	0.00	45.0	6496.77	0.00	2109.44	0.79
17	36.94	61.73	50.0	1.57	2.43	1	0.00	45.0	6790.55	0.00	2204.83	0.79
18	38.51	67.82	47.3	1.65	2.43	1	0.00	45.0	7460.11	0.00	2403.41	0.78
19	40.16	70.50	47.3	1.65	2.43	1	0.00	45.0	7754.54	0.00	2498.27	0.78
20	41.81	76.70	44.7	1.73	2.43	1	0.00	45.0	8436.85	0.00	2702.94	0.78
21	43.54	79.36	44.7	1.73	2.44	1	0.00	45.0	8729.20	0.00	2796.25	0.78
22	45.27	85.60	42.0	1.81	2.43	1	0.00	45.0	9416.41	0.00	3006.27	0.78
23	47.08	88.22	42.0	1.81	2.43	1	0.00	45.0	9703.97	0.00	3098.08	0.78
24	48.89	94.44	39.4	1.88	2.43	1	0.00	45.0	10388.32	0.00	3312.08	0.78

25	50.77	96.98	39.3	1.88	2.43	1	0.00	45.0	10668.26	0.00	3401.77	0.78
26	52.66	68.47	36.7	1.30	1.62	1	0.00	45.0	7531.64	0.00	3605.36	0.78
27	53.96	69.56	36.7	1.30	1.62	1	0.00	45.0	7651.47	0.00	3662.03	0.78
28	55.26	70.65	36.7	1.30	1.62	1	0.00	45.0	7771.37	0.00	3720.12	0.78
29	56.56	74.09	34.0	1.35	1.62	1	0.00	45.0	8150.44	0.00	3912.81	0.78
30	57.91	75.13	34.0	1.35	1.62	1	0.00	45.0	8264.58	0.00	3968.37	0.78
31	59.25	76.17	34.0	1.35	1.62	1	0.00	45.0	8378.76	0.00	4022.42	0.78
32	60.60	79.50	31.4	1.39	1.62	1	0.00	45.0	8744.47	0.00	4219.98	0.78
33	61.98	80.47	31.4	1.39	1.62	1	0.00	45.0	8851.78	0.00	4271.78	0.78
34	63.37	81.45	31.4	1.39	1.62	1	0.00	45.0	8959.15	0.00	4323.59	0.78
35	64.75	84.61	28.7	1.42	1.62	1	0.00	45.0	9307.64	0.00	4525.47	0.79
36	66.18	85.52	28.7	1.42	1.62	1	0.00	45.0	9406.92	0.00	4572.87	0.79
37	67.60	86.42	28.7	1.42	1.62	1	0.00	45.0	9506.37	0.00	4622.09	0.79
38	69.03	35.14	26.1	0.57	0.64	1	0.00	45.0	3865.16	0.00	4812.74	0.80
39	69.60	84.96	26.0	1.85	2.06	1	0.00	45.0	9345.39	0.00	3616.34	0.80
40	71.45	28.18	26.1	1.95	2.17	1	0.00	45.0	3099.47	0.00	1137.73	0.80

X-S Area: 2286.98 Path Length: 92.53 X-S Weight: 251568.17

DATA: Analysis 2 - Final Reclaimed 1

Material Properties (3 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Sand and gravel, mixed grain size
Cohesion Phi UnitWeight Ru
0.00 45.0 110.00 Auto
Material: 2 (Mohr-Coulomb Isotropic) - Loose sand, mixed grain size
Cohesion Phi UnitWeight Ru
0.00 34.0 99.00 Auto
Material: 3 (Mohr-Coulomb Isotropic) - Bedrock (shale)
Cohesion Phi UnitWeight Ru
20000.00 17.0 110.00 Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (2 profiles)

Profile: 1 (2 points) Material beneath: 1 - Sand and gravel, mixed grain size
0.00 5300.00 500.00 5290.00
Profile: 2 (2 points) Material beneath: 3 - Bedrock (shale)
0.00 5230.00 500.00 5228.00

Slope Surface (4 points)

0.00 5300.00 50.00 5298.00 237.00 5229.80 499.00 5228.80

Phreatic Surface (3 points)

0.00 5244.00 35.00 5244.00 500.00 5244.00

Failure Surface

Initial circular surface for critical search defined by: XL,XR,R
Intersects: XL: 50.10 YL: 5297.96 XR: 237.20 YR: 5229.80
Centre: XC: 311.38 YC: 5724.27 Radius: R: 500.00

Variable Restraints

Parameter descriptor: XL XR R
Range of variation: 90.00 100.00 10.00
Trial positions within range: 10 10 10

- -

RESULTS: Analysis 2 - Final Reclaimed 1

Bishop Simplified Method of Analysis - Circular Failure Surface
---
Critical Failure Surface Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure surface approximation: 2.671

There were: 511 successful analyses from a total of 1001 trial surfaces
490 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 2.67

Results Summary - Lowest 99 Factor of Safety circles

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	95.10	5281.55	231.64	5231.75	331.14	5716.65	495.00	2.668	<-- Critical Surface
2	95.10	5281.55	231.64	5231.75	331.52	5717.71	496.11	2.668	
3	95.10	5281.55	231.64	5231.75	331.91	5718.76	497.22	2.669	
4	95.10	5281.55	231.64	5231.75	332.29	5719.82	498.33	2.669	
5	95.10	5281.55	231.64	5231.75	332.68	5720.87	499.44	2.669	
6	95.10	5281.55	231.64	5231.75	333.06	5721.93	500.56	2.669	
7	95.10	5281.55	231.64	5231.75	333.45	5722.98	501.67	2.669	
8	95.10	5281.55	231.64	5231.75	333.83	5724.04	502.78	2.669	
9	95.10	5281.55	231.64	5231.75	334.22	5725.09	503.89	2.670	
10	95.10	5281.55	231.64	5231.75	334.60	5726.15	505.00	2.670	
11	50.10	5297.96	237.20	5229.80	311.38	5724.27	500.00	2.671	
12	85.10	5285.20	231.64	5231.75	325.86	5717.70	495.00	2.673	
13	85.10	5285.20	231.64	5231.75	326.24	5718.76	496.11	2.673	
14	85.10	5285.20	231.64	5231.75	326.63	5719.82	497.22	2.673	
15	85.10	5285.20	231.64	5231.75	327.01	5720.88	498.33	2.673	
16	85.10	5285.20	231.64	5231.75	327.40	5721.93	499.44	2.673	
17	85.10	5285.20	231.64	5231.75	327.78	5722.99	500.56	2.673	
18	85.10	5285.20	231.64	5231.75	328.17	5724.05	501.67	2.673	
19	85.10	5285.20	231.64	5231.75	328.55	5725.10	502.78	2.674	

20	85.10	5285.20	231.64	5231.75	328.94	5726.16	503.89	2.674
21	85.10	5285.20	231.64	5231.75	329.33	5727.22	505.00	2.674
22	75.10	5288.85	231.64	5231.75	320.55	5718.70	495.00	2.677
23	75.10	5288.85	231.64	5231.75	320.94	5719.76	496.11	2.677
24	75.10	5288.85	231.64	5231.75	321.33	5720.82	497.22	2.677
25	75.10	5288.85	231.64	5231.75	321.71	5721.88	498.33	2.677
26	75.10	5288.85	231.64	5231.75	322.10	5722.94	499.44	2.678
27	75.10	5288.85	231.64	5231.75	322.49	5724.00	500.56	2.678
28	75.10	5288.85	231.64	5231.75	322.87	5725.06	501.67	2.678
29	75.10	5288.85	231.64	5231.75	323.26	5726.11	502.78	2.678
30	75.10	5288.85	231.64	5231.75	323.64	5727.17	503.89	2.678
31	75.10	5288.85	231.64	5231.75	324.03	5728.23	505.00	2.678
32	65.10	5292.49	231.64	5231.75	315.23	5719.64	495.00	2.682
33	65.10	5292.49	231.64	5231.75	315.62	5720.71	496.11	2.682
34	65.10	5292.49	231.64	5231.75	316.01	5721.77	497.22	2.682
35	65.10	5292.49	231.64	5231.75	316.39	5722.83	498.33	2.682
36	65.10	5292.49	231.64	5231.75	316.78	5723.89	499.44	2.682
37	65.10	5292.49	231.64	5231.75	317.17	5724.95	500.56	2.682
38	65.10	5292.49	231.64	5231.75	317.56	5726.01	501.67	2.682
39	65.10	5292.49	231.64	5231.75	317.94	5727.07	502.78	2.683
40	65.10	5292.49	231.64	5231.75	318.33	5728.13	503.89	2.683
41	65.10	5292.49	231.64	5231.75	318.72	5729.19	505.00	2.683
42	55.10	5296.14	231.64	5231.75	309.89	5720.53	495.00	2.686
43	55.10	5296.14	231.64	5231.75	310.28	5721.59	496.11	2.687
44	55.10	5296.14	231.64	5231.75	310.67	5722.66	497.22	2.687
45	55.10	5296.14	231.64	5231.75	311.05	5723.72	498.33	2.687
46	55.10	5296.14	231.64	5231.75	311.44	5724.78	499.44	2.687
47	55.10	5296.14	231.64	5231.75	311.83	5725.84	500.56	2.687
48	55.10	5296.14	231.64	5231.75	312.22	5726.91	501.67	2.687
49	55.10	5296.14	231.64	5231.75	312.61	5727.97	502.78	2.687
50	55.10	5296.14	231.64	5231.75	312.99	5729.03	503.89	2.687
51	55.10	5296.14	231.64	5231.75	313.38	5730.09	505.00	2.687
52	45.10	5298.20	231.64	5231.75	301.10	5721.86	495.00	2.704
53	45.10	5298.20	231.64	5231.75	301.48	5722.92	496.11	2.704
54	45.10	5298.20	231.64	5231.75	301.86	5723.99	497.22	2.704
55	45.10	5298.20	231.64	5231.75	302.24	5725.06	498.33	2.704
56	45.10	5298.20	231.64	5231.75	302.62	5726.13	499.44	2.704
57	45.10	5298.20	231.64	5231.75	303.00	5727.20	500.56	2.704
58	45.10	5298.20	231.64	5231.75	303.39	5728.26	501.67	2.705
59	45.10	5298.20	231.64	5231.75	303.77	5729.33	502.78	2.705
60	45.10	5298.20	231.64	5231.75	304.15	5730.40	503.89	2.705
61	45.10	5298.20	231.64	5231.75	304.53	5731.47	505.00	2.705
62	95.10	5281.55	220.53	5235.81	325.87	5719.47	495.00	2.706
63	95.10	5281.55	220.53	5235.81	326.25	5720.52	496.11	2.706
64	95.10	5281.55	220.53	5235.81	326.64	5721.57	497.22	2.706
65	95.10	5281.55	220.53	5235.81	327.02	5722.63	498.33	2.706
66	95.10	5281.55	220.53	5235.81	327.41	5723.68	499.44	2.706
67	95.10	5281.55	220.53	5235.81	327.79	5724.73	500.56	2.706
68	95.10	5281.55	220.53	5235.81	328.18	5725.79	501.67	2.707
69	95.10	5281.55	220.53	5235.81	328.56	5726.84	502.78	2.707
70	95.10	5281.55	220.53	5235.81	328.94	5727.89	503.89	2.707
71	95.10	5281.55	220.53	5235.81	329.33	5728.95	505.00	2.707
72	85.10	5285.20	220.53	5235.81	320.61	5720.58	495.00	2.711

73	85.10	5285.20	220.53	5235.81	321.00	5721.64	496.11	2.711
74	85.10	5285.20	220.53	5235.81	321.38	5722.69	497.22	2.711
75	85.10	5285.20	220.53	5235.81	321.77	5723.75	498.33	2.711
76	85.10	5285.20	220.53	5235.81	322.15	5724.80	499.44	2.711
77	85.10	5285.20	220.53	5235.81	322.54	5725.86	500.56	2.711
78	85.10	5285.20	220.53	5235.81	322.92	5726.91	501.67	2.711
79	85.10	5285.20	220.53	5235.81	323.30	5727.97	502.78	2.711
80	85.10	5285.20	220.53	5235.81	323.69	5729.02	503.89	2.711
81	85.10	5285.20	220.53	5235.81	324.07	5730.08	505.00	2.711
82	75.10	5288.85	220.53	5235.81	315.33	5721.64	495.00	2.715
83	75.10	5288.85	220.53	5235.81	315.72	5722.70	496.11	2.715
84	75.10	5288.85	220.53	5235.81	316.10	5723.76	497.22	2.715
85	75.10	5288.85	220.53	5235.81	316.49	5724.81	498.33	2.715
86	75.10	5288.85	220.53	5235.81	316.87	5725.87	499.44	2.715
87	75.10	5288.85	220.53	5235.81	317.26	5726.93	500.56	2.715
88	75.10	5288.85	220.53	5235.81	317.65	5727.98	501.67	2.715
89	75.10	5288.85	220.53	5235.81	318.03	5729.04	502.78	2.715
90	75.10	5288.85	220.53	5235.81	318.42	5730.10	503.89	2.716
91	75.10	5288.85	220.53	5235.81	318.80	5731.15	505.00	2.716
92	65.10	5292.49	220.53	5235.81	310.03	5722.65	495.00	2.720
93	65.10	5292.49	220.53	5235.81	310.42	5723.71	496.11	2.720
94	65.10	5292.49	220.53	5235.81	310.81	5724.76	497.22	2.720
95	65.10	5292.49	220.53	5235.81	311.19	5725.82	498.33	2.720
96	65.10	5292.49	220.53	5235.81	311.58	5726.88	499.44	2.720
97	65.10	5292.49	220.53	5235.81	311.97	5727.94	500.56	2.720
98	65.10	5292.49	220.53	5235.81	312.35	5729.00	501.67	2.720
99	65.10	5292.49	220.53	5235.81	312.74	5730.06	502.78	2.720

Critical Failure Surface (circle 1)

Intersects: XL: 95.10 YL: 5281.55 XR: 231.64 YR: 5231.75

Centre: XC: 331.14 YC: 5716.65 Radius: R: 495.00

Generated failure surface: (20 points)

95.10	5281.55	101.88	5277.94	108.71	5274.44	115.59	5271.04	122.53	5267.75
129.52	5264.57	136.55	5261.50	143.64	5258.54	150.76	5255.68	157.93	5252.94
165.15	5250.31	172.40	5247.79	179.69	5245.39	187.02	5243.10	194.38	5240.92
201.77	5238.85	209.20	5236.91	216.65	5235.07	224.14	5233.35	231.64	5231.75

Slice Geometry and Properties - Critical Failure Surface (circle 1, 38 slices)

Slice	X-S	Base						PoreWater	Normal	Test	
	X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor
1	95.10	0.96	28.0	3.39	3.84	1	0.00	45.0	105.92	0.00	26.06	0.94
2	98.49	2.89	28.0	3.39	3.84	1	0.00	45.0	317.75	0.00	78.18	0.94
3	101.88	4.75	27.1	3.42	3.84	1	0.00	45.0	522.15	0.00	128.22	0.94
4	105.29	6.47	27.1	3.42	3.84	1	0.00	45.0	712.04	0.00	174.85	0.94
5	108.71	8.16	26.3	3.44	3.84	1	0.00	45.0	897.32	0.00	219.99	0.94
6	112.15	9.68	26.3	3.44	3.84	1	0.00	45.0	1065.02	0.00	261.10	0.94
7	115.59	11.18	25.4	3.47	3.84	1	0.00	45.0	1229.90	0.00	301.10	0.94
8	119.06	12.50	25.4	3.47	3.84	1	0.00	45.0	1374.83	0.00	336.56	0.94
9	122.53	13.81	24.5	3.49	3.84	1	0.00	45.0	1518.62	0.00	371.33	0.94
10	126.02	14.91	24.5	3.49	3.84	1	0.00	45.0	1640.21	0.00	401.05	0.94
11	129.52	16.02	23.6	3.52	3.84	1	0.00	45.0	1761.70	0.00	430.35	0.94

12	133.04	16.91	23.6	3.52	3.84	1	0.00	45.0	1859.94	0.00	454.37	0.94
13	136.55	17.81	22.7	3.54	3.84	1	0.00	45.0	1958.67	0.00	478.15	0.94
14	140.09	18.48	22.7	3.54	3.84	1	0.00	45.0	2032.66	0.00	496.21	0.94
15	143.64	19.16	21.8	3.56	3.84	1	0.00	45.0	2107.69	0.00	514.28	0.94
16	147.20	19.61	21.8	3.56	3.84	1	0.00	45.0	2157.26	0.00	526.35	0.94
17	150.76	20.07	20.9	3.59	3.84	1	0.00	45.0	2207.88	0.00	538.61	0.94
18	154.35	20.30	20.9	3.59	3.84	1	0.00	45.0	2232.91	0.00	544.71	0.94
19	157.93	20.53	20.0	3.61	3.84	1	0.00	45.0	2258.67	0.00	551.03	0.94
20	161.54	20.53	20.0	3.61	3.84	1	0.00	45.0	2258.48	0.00	550.95	0.94
21	165.15	20.53	19.2	3.63	3.84	1	0.00	45.0	2258.32	0.00	551.06	0.94
22	168.77	20.30	19.1	3.63	3.84	1	0.00	45.0	2233.00	0.00	544.91	0.94
23	172.40	20.06	18.3	3.65	3.84	1	0.00	45.0	2206.84	0.00	538.74	0.94
24	176.04	19.60	18.3	3.65	3.84	1	0.00	45.0	2155.93	0.00	526.34	0.94
25	179.69	23.07	17.4	4.44	4.65	1	0.00	45.0	2537.53	0.00	511.81	0.94
26	184.13	14.47	17.4	2.89	3.03	1	0.00	45.0	1591.74	85.41	496.07	0.94
27	187.02	17.69	16.5	3.68	3.84	1	0.00	45.0	1945.97	346.89	484.93	0.94
28	190.70	16.76	16.5	3.68	3.84	1	0.00	45.0	1843.57	607.84	466.66	0.94
29	194.38	15.74	15.6	3.69	3.83	1	0.00	45.0	1731.00	858.91	446.38	0.94
30	198.06	14.66	15.6	3.71	3.85	1	0.00	45.0	1612.29	1112.05	459.12	0.94
31	201.77	13.38	14.7	3.71	3.84	1	0.00	45.0	1471.72	1349.30	507.69	0.94
32	205.49	11.97	14.7	3.71	3.84	1	0.00	45.0	1316.58	1582.69	552.01	0.94
33	209.20	10.48	13.8	3.73	3.84	1	0.00	45.0	1153.20	1809.18	593.90	0.94
34	212.93	8.83	13.8	3.73	3.84	1	0.00	45.0	971.61	2028.77	631.78	0.94
35	216.65	7.09	12.9	3.74	3.84	1	0.00	45.0	780.31	2241.56	667.03	0.94
36	220.39	5.20	12.9	3.74	3.84	1	0.00	45.0	572.12	2447.29	698.46	0.94
37	224.14	3.20	12.0	3.75	3.84	1	0.00	45.0	352.26	2645.81	726.89	0.95
38	227.89	1.07	12.0	3.75	3.84	1	0.00	45.0	117.35	2837.57	751.76	0.95

X-S Area: 518.83 Path Length: 145.87 X-S Weight: 57070.95

DATA: Analysis 3 - Final Reclaimed 2

Material Properties (3 materials)

Material: 1 (Mohr-Coulomb Isotropic) - Sand and gravel, mixed grain size

Cohesion	Phi	UnitWeight	Ru
0.00	45.0	110.00	Auto

Material: 2 (Mohr-Coulomb Isotropic) - Loose sand, mixed grain size

Cohesion	Phi	UnitWeight	Ru
0.00	34.0	99.00	Auto

Material: 3 (Mohr-Coulomb Isotropic) - Bedrock (shale)

Cohesion	Phi	UnitWeight	Ru
20000.00	17.0	110.00	Auto

Water Properties

Unit weight of water: 62.400 Unit weight of water/medium above ground: 62.400

Material Profiles (2 profiles)

Profile: 1 (2 points) Material beneath: 1 - Sand and gravel, mixed grain size
0.00 5300.00 500.00 5290.00
Profile: 2 (2 points) Material beneath: 3 - Bedrock (shale)
0.00 5230.00 500.00 5228.00

Slope Surface (4 points)

0.00 5300.00 50.00 5298.00 237.00 5229.80 499.00 5228.80

Phreatic Surface (3 points)

0.00 5244.00 35.00 5244.00 500.00 5244.00

Failure Surface (Critical, from previous analysis)

Initial circular surface for critical search defined by: XL,XR,R
Intersects: XL: 95.10 YL: 5281.55 XR: 231.64 YR: 5231.75
Centre: XC: 331.14 YC: 5716.65 Radius: R: 495.00

Variable Restraints

Parameter descriptor: XL XR R
Range of variation: 90.00 100.00 10.00
Trial positions within range: 10 10 10

- -

RESULTS: Analysis 3 - Final Reclaimed 2

Bishop Simplified Method of Analysis - Circular Failure Surface
---
Critical Failure Surface Search using Multiple Circle Generation Techniques

Factor of Safety for initial failure surface approximation: 2.668

There were: 601 successful analyses from a total of 1001 trial surfaces
400 analyses terminated due to unacceptable geometry

Critical (minimum) Factor of Safety: 2.64

Results Summary - Lowest 99 Factor of Safety circles

Circle	X-Left	Y-Left	X-Right	Y-Right	X-Centre	Y-Centre	Radius	FoS	
1	140.10	5265.14	237.20	5229.80	355.30	5705.35	490.00	2.640	<-- Critical Surface
2	140.10	5265.14	237.20	5229.80	355.69	5706.40	491.11	2.640	
3	140.10	5265.14	237.20	5229.80	356.07	5707.45	492.22	2.640	
4	140.10	5265.14	237.20	5229.80	356.45	5708.50	493.33	2.641	
5	130.10	5268.79	237.20	5229.80	350.13	5706.61	490.00	2.641	
6	140.10	5265.14	237.20	5229.80	356.83	5709.55	494.44	2.641	
7	130.10	5268.79	237.20	5229.80	350.51	5707.66	491.11	2.641	
8	140.10	5265.14	237.20	5229.80	357.22	5710.60	495.56	2.641	

9	130.10	5268.79	237.20	5229.80	350.89	5708.71	492.22	2.641
10	140.10	5265.14	237.20	5229.80	357.60	5711.65	496.67	2.641
11	130.10	5268.79	237.20	5229.80	351.28	5709.76	493.33	2.641
12	140.10	5265.14	237.20	5229.80	357.98	5712.70	497.78	2.642
13	130.10	5268.79	237.20	5229.80	351.66	5710.81	494.44	2.642
14	140.10	5265.14	237.20	5229.80	358.36	5713.75	498.89	2.642
15	130.10	5268.79	237.20	5229.80	352.04	5711.86	495.56	2.642
16	140.10	5265.14	237.20	5229.80	358.74	5714.80	500.00	2.642
17	130.10	5268.79	237.20	5229.80	352.43	5712.91	496.67	2.642
18	130.10	5268.79	237.20	5229.80	352.81	5713.97	497.78	2.642
19	130.10	5268.79	237.20	5229.80	353.19	5715.02	498.89	2.642
20	130.10	5268.79	237.20	5229.80	353.57	5716.07	500.00	2.643
21	120.10	5272.43	237.20	5229.80	344.93	5707.81	490.00	2.643
22	120.10	5272.43	237.20	5229.80	345.31	5708.86	491.11	2.643
23	120.10	5272.43	237.20	5229.80	345.70	5709.92	492.22	2.643
24	120.10	5272.43	237.20	5229.80	346.08	5710.97	493.33	2.644
25	120.10	5272.43	237.20	5229.80	346.46	5712.02	494.44	2.644
26	120.10	5272.43	237.20	5229.80	346.84	5713.07	495.56	2.644
27	120.10	5272.43	237.20	5229.80	347.23	5714.12	496.67	2.644
28	120.10	5272.43	237.20	5229.80	347.99	5716.23	498.89	2.644
29	120.10	5272.43	237.20	5229.80	347.61	5715.18	497.78	2.645
30	120.10	5272.43	237.20	5229.80	348.38	5717.28	500.00	2.645
31	110.10	5276.08	237.20	5229.80	339.70	5708.96	490.00	2.646
32	110.10	5276.08	237.20	5229.80	340.09	5710.01	491.11	2.646
33	110.10	5276.08	237.20	5229.80	340.47	5711.07	492.22	2.646
34	110.10	5276.08	237.20	5229.80	340.86	5712.12	493.33	2.646
35	110.10	5276.08	237.20	5229.80	341.24	5713.17	494.44	2.646
36	110.10	5276.08	237.20	5229.80	341.62	5714.23	495.56	2.647
37	110.10	5276.08	237.20	5229.80	342.01	5715.28	496.67	2.647
38	110.10	5276.08	237.20	5229.80	342.39	5716.33	497.78	2.647
39	110.10	5276.08	237.20	5229.80	342.77	5717.39	498.89	2.647
40	110.10	5276.08	237.20	5229.80	343.16	5718.44	500.00	2.647
41	100.10	5279.73	237.20	5229.80	334.46	5710.05	490.00	2.649
42	100.10	5279.73	237.20	5229.80	334.84	5711.11	491.11	2.649
43	100.10	5279.73	237.20	5229.80	335.23	5712.16	492.22	2.649
44	100.10	5279.73	237.20	5229.80	335.61	5713.22	493.33	2.650
45	100.10	5279.73	237.20	5229.80	335.99	5714.27	494.44	2.650
46	100.10	5279.73	237.20	5229.80	336.38	5715.33	495.56	2.650
47	100.10	5279.73	237.20	5229.80	336.76	5716.38	496.67	2.650
48	100.10	5279.73	237.20	5229.80	337.15	5717.44	497.78	2.650
49	100.10	5279.73	237.20	5229.80	337.53	5718.49	498.89	2.650
50	100.10	5279.73	237.20	5229.80	337.92	5719.55	500.00	2.651
51	90.10	5283.38	237.20	5229.80	329.19	5711.09	490.00	2.653
52	90.10	5283.38	237.20	5229.80	329.57	5712.14	491.11	2.653
53	90.10	5283.38	237.20	5229.80	329.96	5713.20	492.22	2.653
54	90.10	5283.38	237.20	5229.80	330.34	5714.26	493.33	2.653
55	90.10	5283.38	237.20	5229.80	330.73	5715.32	494.44	2.653
56	90.10	5283.38	237.20	5229.80	331.11	5716.37	495.56	2.654
57	90.10	5283.38	237.20	5229.80	331.50	5717.43	496.67	2.654
58	90.10	5283.38	237.20	5229.80	331.88	5718.49	497.78	2.654
59	90.10	5283.38	237.20	5229.80	332.27	5719.55	498.89	2.654
60	90.10	5283.38	237.20	5229.80	332.65	5720.60	500.00	2.654
61	80.10	5287.02	237.20	5229.80	323.89	5712.07	490.00	2.657

62	80.10	5287.02	237.20	5229.80	324.28	5713.13	491.11	2.657
63	80.10	5287.02	237.20	5229.80	324.67	5714.19	492.22	2.657
64	80.10	5287.02	237.20	5229.80	325.05	5715.25	493.33	2.657
65	80.10	5287.02	237.20	5229.80	325.44	5716.31	494.44	2.657
66	80.10	5287.02	237.20	5229.80	325.82	5717.37	495.56	2.658
67	80.10	5287.02	237.20	5229.80	326.21	5718.42	496.67	2.658
68	80.10	5287.02	237.20	5229.80	326.60	5719.48	497.78	2.658
69	80.10	5287.02	237.20	5229.80	326.98	5720.54	498.89	2.658
70	80.10	5287.02	237.20	5229.80	327.37	5721.60	500.00	2.658
71	70.10	5290.67	237.20	5229.80	318.58	5712.99	490.00	2.661
72	70.10	5290.67	237.20	5229.80	318.97	5714.06	491.11	2.661
73	70.10	5290.67	237.20	5229.80	319.35	5715.12	492.22	2.661
74	70.10	5290.67	237.20	5229.80	319.74	5716.18	493.33	2.661
75	70.10	5290.67	237.20	5229.80	320.13	5717.24	494.44	2.662
76	70.10	5290.67	237.20	5229.80	320.51	5718.30	495.56	2.662
77	70.10	5290.67	237.20	5229.80	320.90	5719.36	496.67	2.662
78	70.10	5290.67	237.20	5229.80	321.29	5720.42	497.78	2.662
79	70.10	5290.67	237.20	5229.80	321.67	5721.48	498.89	2.662
80	70.10	5290.67	237.20	5229.80	322.06	5722.54	500.00	2.662
81	60.10	5294.32	237.20	5229.80	313.24	5713.86	490.00	2.665
82	60.10	5294.32	237.20	5229.80	313.63	5714.93	491.11	2.666
83	60.10	5294.32	237.20	5229.80	314.02	5715.99	492.22	2.666
84	60.10	5294.32	237.20	5229.80	314.41	5717.05	493.33	2.666
85	60.10	5294.32	237.20	5229.80	314.79	5718.12	494.44	2.666
86	60.10	5294.32	237.20	5229.80	315.18	5719.18	495.56	2.666
87	60.10	5294.32	237.20	5229.80	315.57	5720.24	496.67	2.666
88	60.10	5294.32	237.20	5229.80	315.95	5721.31	497.78	2.666
89	60.10	5294.32	237.20	5229.80	316.34	5722.37	498.89	2.667
90	60.10	5294.32	237.20	5229.80	316.73	5723.43	500.00	2.667
91	95.10	5281.55	231.64	5231.75	331.14	5716.65	495.00	2.668
92	140.10	5265.14	226.09	5233.78	350.25	5707.79	490.00	2.669
93	140.10	5265.14	226.09	5233.78	350.63	5708.84	491.11	2.669
94	140.10	5265.14	226.09	5233.78	351.02	5709.88	492.22	2.669
95	140.10	5265.14	226.09	5233.78	351.40	5710.93	493.33	2.670
96	140.10	5265.14	226.09	5233.78	351.78	5711.98	494.44	2.670
97	140.10	5265.14	226.09	5233.78	352.16	5713.03	495.56	2.670
98	50.10	5297.96	237.20	5229.80	307.88	5714.67	490.00	2.670
99	140.10	5265.14	226.09	5233.78	352.54	5714.08	496.67	2.670

Critical Failure Surface (circle 1)

Intersects: XL: 140.10 YL: 5265.14 XR: 237.20 YR: 5229.80

Centre: XC: 355.30 YC: 5705.35 Radius: R: 490.00

Generated failure surface: (20 points)

140.10	5265.14	145.01	5262.77	149.94	5260.46	154.90	5258.21	159.89	5256.01
164.90	5253.86	169.93	5251.77	174.98	5249.74	180.06	5247.76	185.16	5245.84
190.28	5243.98	195.42	5242.17	200.58	5240.42	205.76	5238.73	210.96	5237.10
216.17	5235.52	221.40	5234.00	226.65	5232.54	231.92	5231.14	237.20	5229.80

Slice Geometry and Properties - Critical Failure Surface (circle 1, 38 slices)

Slice	X-S	---------- Base ----------						PoreWater	Normal	Test	
X-Left	Area	Angle	Width	Length	Matl	Cohesion	Phi	Weight	Force	Stress	Factor

1	140.10	0.35	25.7	2.45	2.72	1	0.00	45.0	38.75	0.00	13.35	0.94
2	142.55	1.06	25.7	2.45	2.72	1	0.00	45.0	116.53	0.00	40.15	0.94
3	145.01	1.73	25.1	2.47	2.72	1	0.00	45.0	190.81	0.00	65.69	0.94
4	147.48	2.37	25.1	2.47	2.72	1	0.00	45.0	260.24	0.00	89.59	0.94
5	149.94	2.97	24.5	2.48	2.72	1	0.00	45.0	326.99	0.00	112.48	0.94
6	152.42	3.53	24.5	2.48	2.72	1	0.00	45.0	388.00	0.00	133.47	0.94
7	154.90	4.06	23.8	2.49	2.72	1	0.00	45.0	446.83	0.00	153.59	0.94
8	157.39	4.54	23.8	2.49	2.72	1	0.00	45.0	499.16	0.00	171.60	0.94
9	159.89	5.00	23.2	2.50	2.72	1	0.00	45.0	549.85	0.00	188.92	0.94
10	162.39	5.40	23.2	2.50	2.72	1	0.00	45.0	593.97	0.00	204.07	0.94
11	164.90	5.79	22.6	2.52	2.72	1	0.00	45.0	636.38	0.00	218.55	0.94
12	167.41	6.10	22.5	2.52	2.72	1	0.00	45.0	671.52	0.00	230.63	0.94
13	169.93	6.41	21.9	2.53	2.72	1	0.00	45.0	705.37	0.00	242.18	0.94
14	172.45	6.65	21.9	2.53	2.72	1	0.00	45.0	731.70	0.00	251.23	0.94
15	174.98	6.88	21.3	2.54	2.72	1	0.00	45.0	756.91	0.00	259.83	0.94
16	177.52	7.04	21.3	2.54	2.72	1	0.00	45.0	774.36	0.00	265.83	0.94
17	180.06	7.19	20.6	2.55	2.72	1	0.00	45.0	790.68	0.00	271.42	0.94
18	182.61	7.27	20.6	2.55	2.72	1	0.00	45.0	799.31	0.00	274.36	0.94
19	185.16	7.25	20.0	2.53	2.69	1	0.00	45.0	797.05	0.00	276.89	0.94
20	187.69	7.24	20.0	2.53	2.69	1	0.00	45.0	796.50	0.00	276.70	0.94
21	190.22	7.40	19.4	2.60	2.76	1	0.00	45.0	813.73	78.70	279.49	0.94
22	192.82	7.31	19.4	2.60	2.76	1	0.00	45.0	803.81	235.81	282.85	0.94
23	195.42	7.30	18.7	2.65	2.79	1	0.00	45.0	802.70	396.74	285.09	0.94
24	198.06	6.77	18.7	2.52	2.66	1	0.00	45.0	745.04	522.24	310.24	0.94
25	200.58	6.76	18.1	2.59	2.72	1	0.00	45.0	743.71	680.04	360.23	0.94
26	203.17	6.51	18.1	2.59	2.72	1	0.00	45.0	715.62	823.80	408.82	0.94
27	205.76	6.23	17.4	2.60	2.72	1	0.00	45.0	685.40	965.20	456.27	0.94
28	208.36	5.89	17.5	2.60	2.72	1	0.00	45.0	647.99	1104.13	501.67	0.94
29	210.96	5.53	16.8	2.61	2.72	1	0.00	45.0	608.16	1240.50	545.91	0.94
30	213.56	5.10	16.8	2.61	2.72	1	0.00	45.0	561.38	1374.47	588.12	0.94
31	216.17	4.65	16.2	2.62	2.72	1	0.00	45.0	511.68	1505.97	629.04	0.94
32	218.79	4.14	16.2	2.62	2.72	1	0.00	45.0	455.47	1635.13	668.04	0.94
33	221.40	3.60	15.5	2.62	2.72	1	0.00	45.0	395.87	1761.60	705.65	0.94
34	224.03	3.00	15.5	2.62	2.72	1	0.00	45.0	330.31	1885.60	741.43	0.94
35	226.65	2.37	14.9	2.63	2.72	1	0.00	45.0	260.74	2007.21	775.73	0.94
36	229.29	1.69	14.9	2.63	2.72	1	0.00	45.0	185.52	2126.24	808.19	0.94
37	231.92	0.94	14.3	2.54	2.62	1	0.00	45.0	103.56	2155.86	838.59	0.94
38	234.46	0.22	14.3	2.74	2.83	1	0.00	45.0	23.84	2444.00	867.83	0.94
	---		---		---							

X-S Area: 184.23 Path Length: 103.52 X-S Weight: 20265.42