

Perigo Mine Investigation



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COLORADO
Division of Reclamation,
Mining and Safety
Department of Natural Resources

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Introduction

The Perigo Mine currently discharges low pH, metal laden water into Gamble Gulch, a tributary to South Boulder Creek. Recent reclamation efforts have focused on assessing the impact of the Perigo Mine on downstream water quality, and the potential for implementation of source control remedies.

The Division of Reclamation, Mining and Safety (DRMS) conducted an investigation of the Perigo Mine that included a literature search of the geology, history and mine workings, along with site verification of geology and mine workings through field investigations and subsurface drilling. Various methods were employed to quantify geotechnical and hydrogeologic properties of the rock mass surrounding the mine, while subsurface geophysical tools were used to understand the physical properties associated with the mine workings.

Project Location and Background

The Perigo Mine is located in northern Gilpin County, Figure 1, approximately four (4) miles southwest of Rollinsville in the upper reaches of Gamble Gulch, a tributary to South Boulder Creek. The environment is subalpine with site elevations varying from approximately 9,500 to over 10,500 feet above sea level. Topography is dominated by Gamble Gulch, a perennial stream that drains the northeastern flank of Dakota Hill. Slopes in the area are moderate with the site situated in a northeast aspect.

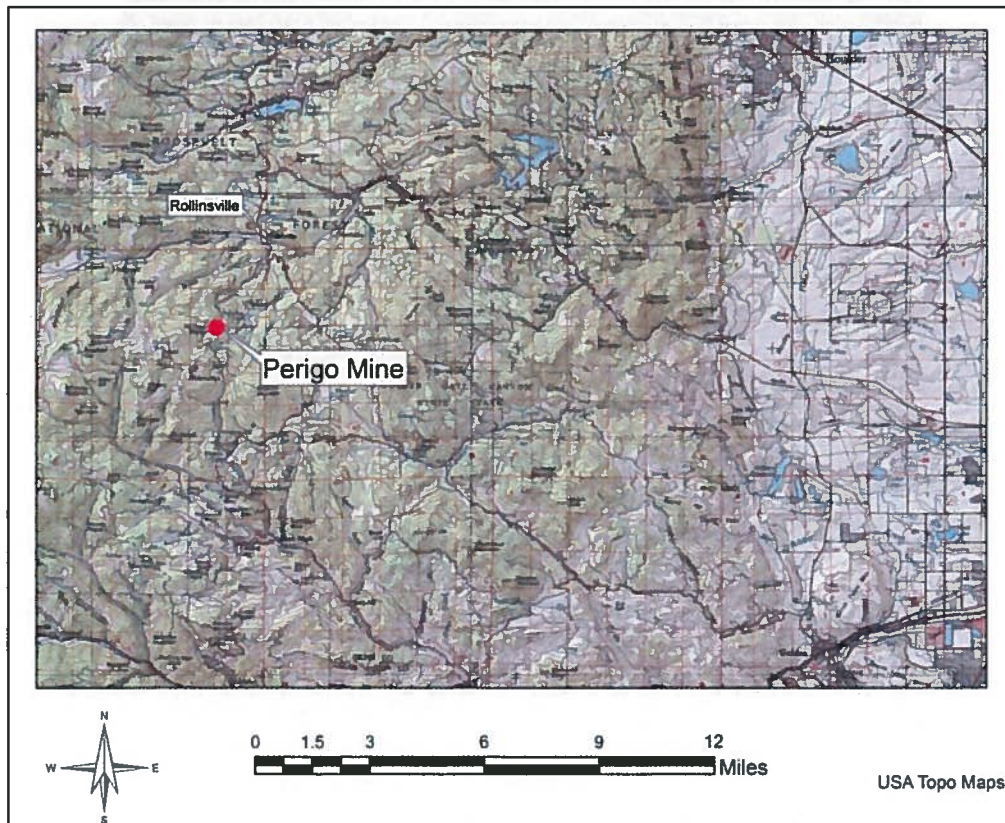


Figure 1. Location of the Perigo Mine.

Geologic Setting

The majority of northern Gilpin County is underlain by metamorphic rocks generally associated with the Idaho Springs Formation. The metamorphic rocks consist mostly of gneisses resulting from high-grade regional metamorphism, but have been intruded by igneous rocks possibly connected with the Boulder Creek Granodiorite and Silver Plume Granite (Gable, 1969). The gneissic rocks vary in composition from rich in biotite to rich in hornblende with areas of granitic composition that dominantly display migmatic texture. Numerous north and northwest trending folds and faults have resulted in a complex sequence of superimposed deformation events and apparent major discontinuities (Gable, 1969). Local geology is shown in Figure 2.

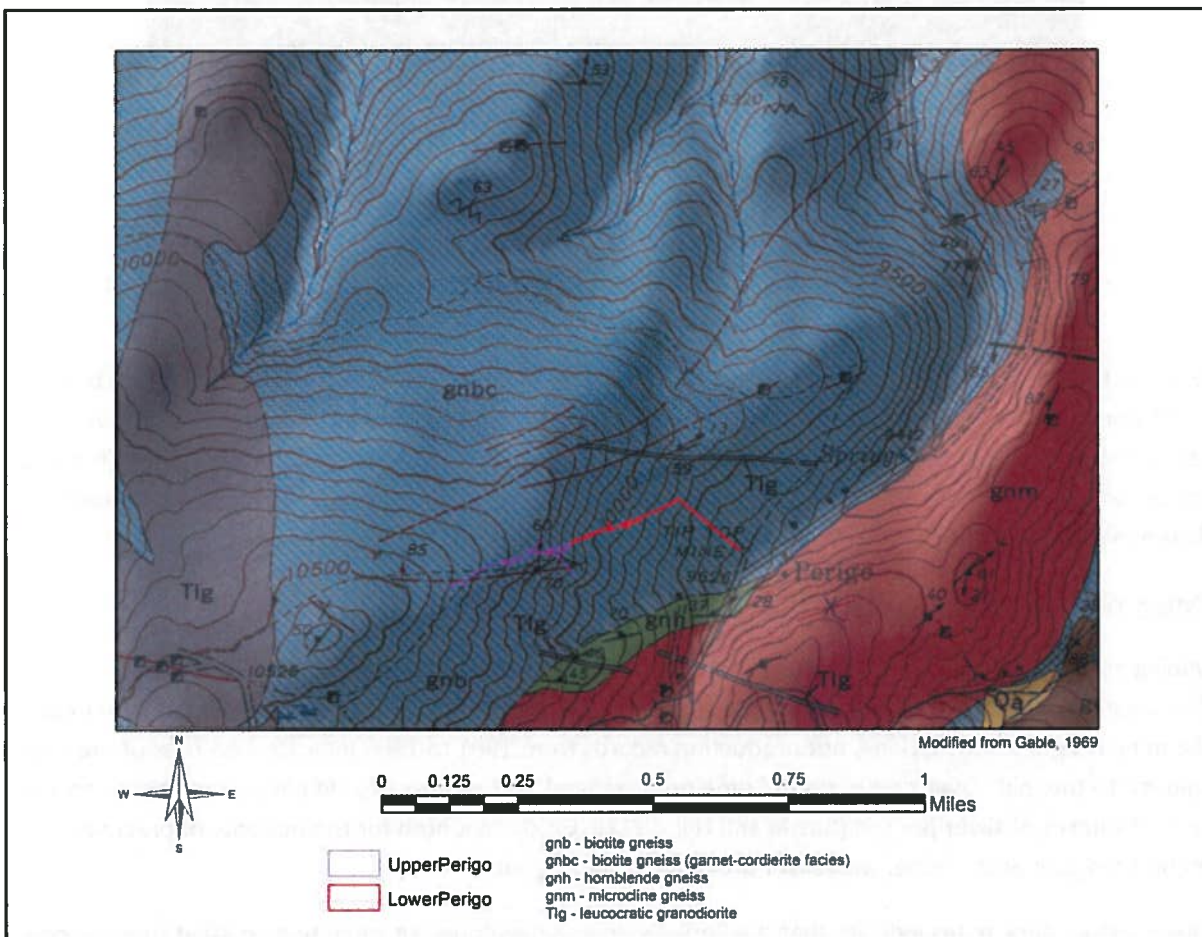


Figure 2. Local geology with overlaid Perigo Mine workings.

Locally, the Perigo mine site lies wholly within a large band of biotite gneiss (Figure 3) with areas of distinct migmatic texture. A zone of garnet-cordierite bearing gneiss lies just to the north of the site, while the site is bounded on the south by a hornblende bearing gneiss and microcline gneiss. An interesting intrusion of leucocratic (light colored) granodiorite underlies a large portion of Dakota Hill to the west, and may possibly be associated with ore deposition along veins in the Perigo District.



Figure 3. Photo of exposed biotite gneiss near Perigo Mine.

Veins in the Perigo District have a general east-northeasterly trend and vary from nearly vertical to a steep north dip. The developed veins consist mostly of the “pyritic gold type”, and were driven on persistent mineralized fracture zones (Lovering and Goddard, 1950). Mineralization along these fracture zones varies in width from merely inches to six (6) feet in some locations, and is defined by extensive dissemination of pyrite.

Perigo Mine History and Workings

Mining at the Perigo began in 1860 and continued sporadically until the early 1940’s, with no documented evidence of mining in the last seventy years. Information regarding early development at the mine is significantly lacking, but production records from 1901 to 1909 indicate 42.5 tons of ore was shipped to the mill. Over that period of time ore averaged 1.23 ounces of gold per ton and between 1.2 and 4.7 ounces of silver per ton (Bastin and Hill, 1917). Gold accounted for the majority of precious metal produced at the mine, with silver providing some payout.

The available mine maps indicate that the Perigo vein was developed through two crosscut tunnels, one termed the Lower Tunnel located near the Perigo townsite at an approximate elevation of 9,610 feet above MSL, and the Upper Tunnel located west of the townsite at an approximate elevation of 10,065 feet above MSL. The lower crosscut tunnel is approximately 780 feet long while the upper crosscut tunnel is approximately 350 feet long. Multiple smaller veins are associated with the larger Perigo vein system and are referred to on the mine maps as the Baker, Daisy, Red Pocket, and Ladysmith veins, and are shown in Figures 4 and 5. Another mine map acquired from a local landowner, Figure 6, depicts a cross section of the mine workings and indicates that the Perigo vein has been stoped over 750 feet

vertically from surface to the Lower Tunnel. The date associated with the Perigo Mine cross section is unknown. All of the available mine maps denote the Lower Tunnel as being the deepest development of the Perigo vein, but mine inspection reports from 1923 to 1937 discuss a 200 feet deep shaft (winze) driven downward from the “crosscut tunnel” (Lower Tunnel?).

Currently, neither of the Perigo crosscut tunnels are accessible, but some stopes along the western end of the mine workings are relatively open but not easily accessible. At this time no openings allow for safe underground exploration of the Perigo mine workings.

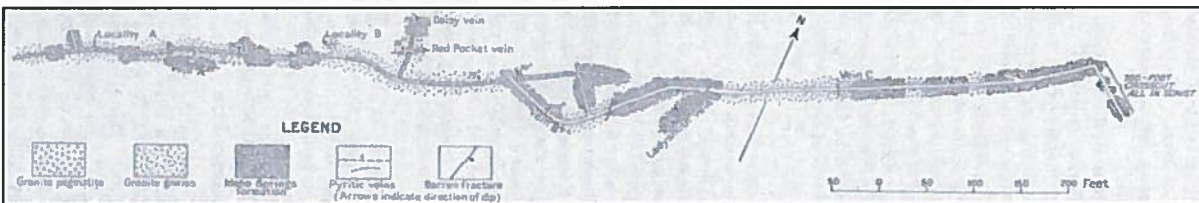


Figure 4. Lower Tunnel, Perigo Mine (from Bastin and Hill, 1917).

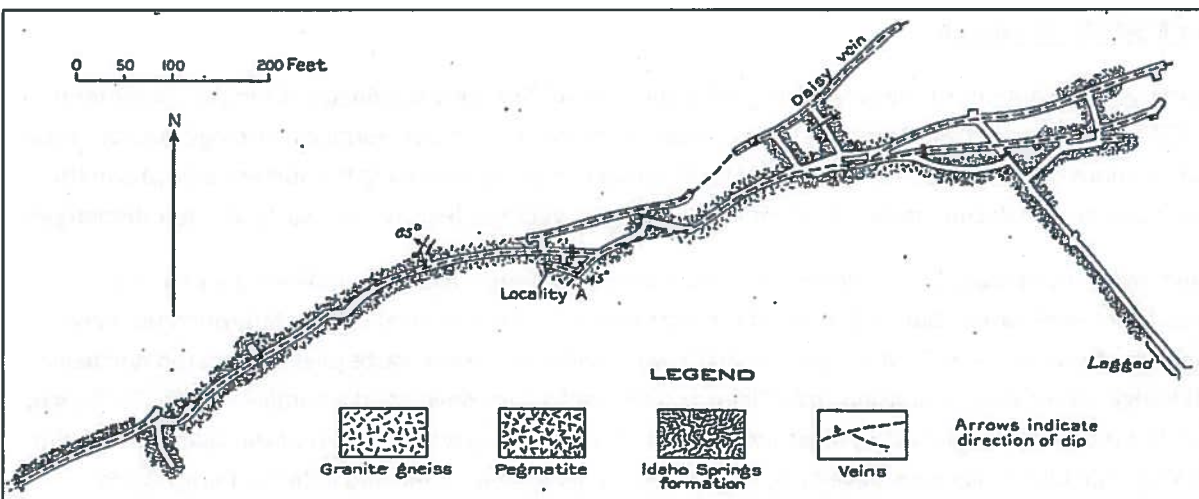


Figure 5. Upper Tunnel, Perigo Mine (From Bastin and Hill, 1917).

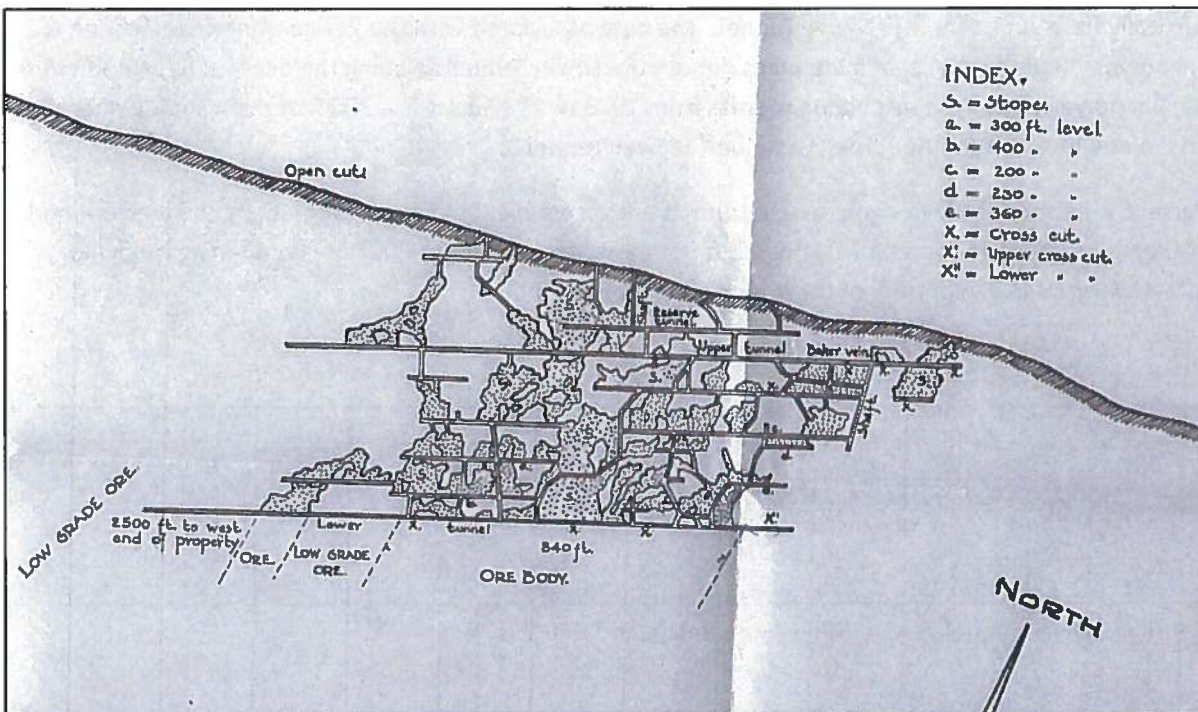


Figure 6. Perigo Mine cross section acquired from local landowner.

Surficial Mine Features

Surface investigations of the area surrounding the Perigo Mine were conducted during the summer of 2013 and 2014 to better understand site geology, mine working layout, surface hydrology, and potential implications of source control. The initial investigation involved traversing the surface area above the Perigo Mine and documenting observed mine workings, geologic features and surface water discharges.

Numerous historic waste piles cover the hillside above the Perigo town site indicating a period of significant exploration, but only a few of the sites observed suggest extensive underground workings and are shown in Figure 7. A number of shafts with reasonably sized waste piles are located northeast of Perigo on the Daisy Extension Lode Claim and appear to have developed a parallel vein to the Perigo, while a much more significant portal and associated waste pile just to the west of the shafts on the Jim Blaine Lode Claim may have developed Perigo veins and possibly connected with the Perigo Mine workings. Another set of relatively significant collapsed portals lies to the southwest of the site, but their subsurface orientation and developed veins are unknown.

There are numerous exploration borings and drill pads east of the Perigo site that likely were constructed in an effort to find the extension of the Perigo structure. One anecdotal story discusses the possibility that the exploration borings were actually drilled to explore and delineate a large porphyry molybdenum deposit that lies deep under Dakota Hill. There is no known evidence to confirm that story other than the discovery of some molybdenum bearing structures on top of Dakota Hill and the presence of so many drill pads.

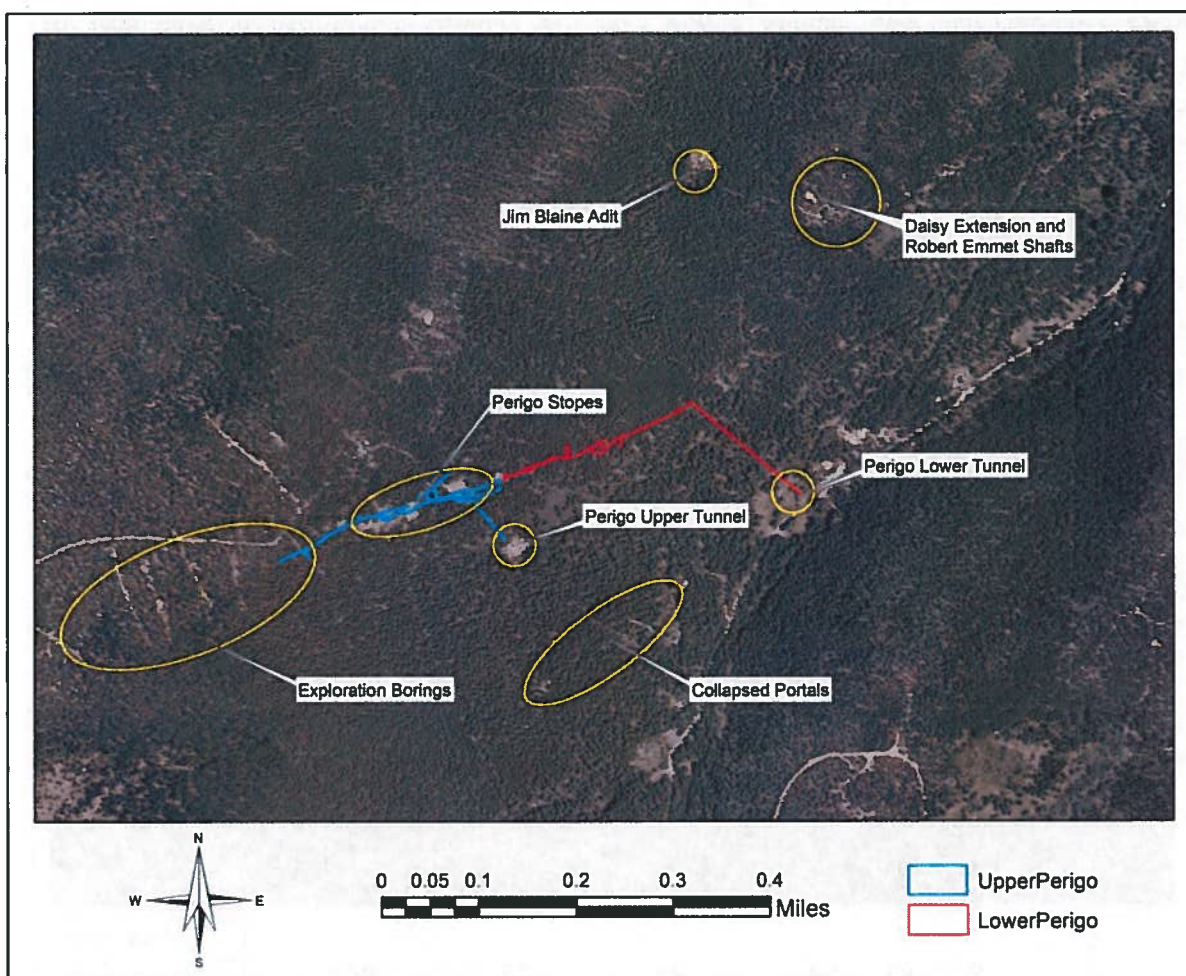


Figure 7. Surficial mine features in the Perigo area.

The Lower Perigo Tunnel and Upper Perigo Tunnel are the most significant waste piles in the Perigo area, indicating that they were the most productive mines. Some open/collapsed stopes and shafts on the ridgeline located due west of the townsite appear to be associated with the Upper Perigo Tunnel, and are likely surface expressions of upper level stoping in the mine. The majority of mining along the Perigo Vein was conducted via access along both the Lower and Upper Tunnels, and not from vertical shafts driven from surface.

Surface Water and Groundwater

During the surface investigation of the Perigo area, spring and adit discharges were documented along with a records search for permitted groundwater wells. Figure 8 depicts the location of all the surface water and groundwater features that were discovered during the investigation. A description of the three household water wells is included in Appendix I, and is taken directly from the Colorado Division of Water Resources website.

Surface water discharges were sampled for flow and water chemistry in June 2014 and September 2014 by EPA and their contractor. Results for those sampling events can be obtained from EPA.

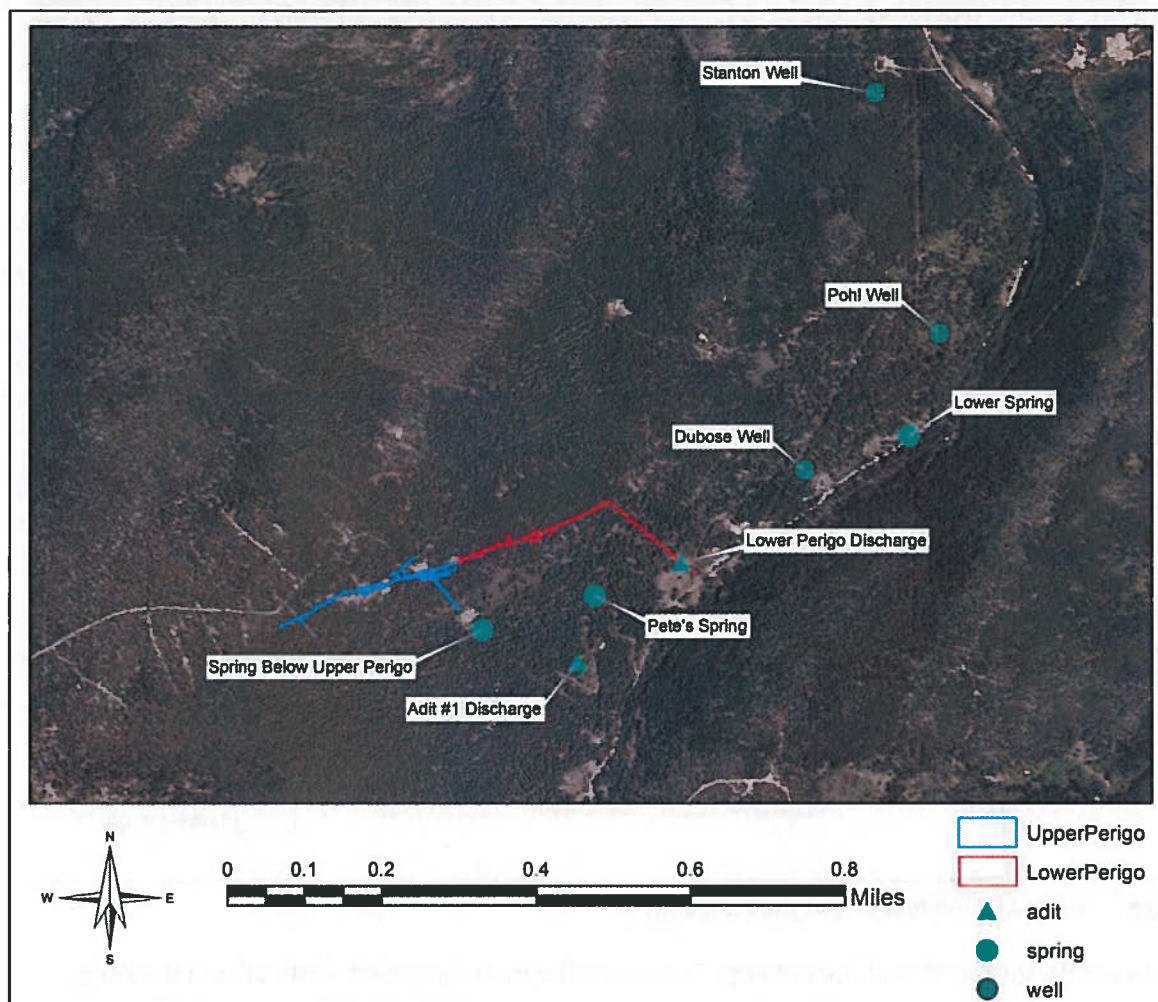


Figure 8. Location of surface water discharges and groundwater wells.

Surface water discharges associated with mining appear to be limited to the Perigo Mine, with the majority of flow emanating from the Lower Perigo Tunnel. All other mines in the area except for the site labeled Adit #1 Discharge were dry during visitation in both spring and fall, and showed no visible signs that flow from those portals has occurred recently. Both the Lower Spring and Pete's spring appear to be perennial, with strong visible evidence for year round flow. The Lower Spring may be associated with an extension of the Perigo structure towards Gamble Gulch, but no bedrock geology is exposed near that location for verification. Pete's spring is more likely associated with a strong break in slope, where exposed bedrock drops into colluvial and morainal cover lower on the slope.

Flow at the Lower Perigo Portal has been measured on various occasions over the last four (4) years during EPA sampling events, and varied between 54 and 512 gpm with an average flow of 174 gpm. On a number of documented cases, the flow rate from the Lower Perigo Portal has increased significantly

for short periods of time, often termed “surges” or “blowouts,” even though the physical condition of the collapsed portal has not changed. The Lower Perigo Portal likely acts as a “French Drain” not only for the mine workings, but also for the surrounding area, while possibly intercepting more regional groundwater.

Drilling Investigation

During October 2013, a drill rig was mobilized to the site to determine the exact location of subsurface mine workings associated with the Lower Perigo Portal and gather hydrogeologic and geotechnical information that could be used for portal rehab design and potential bulkhead planning. Five borings were drilled to find the Lower Perigo Crosscut at two separate locations. This methodology has been successfully deployed at other collapsed portals to gather accurate information that can be used for portal rehab and excavation. Figure 9 shows the location of all five borings, and the likely location of mine workings based on actual intercepts at each of the locations. All drilling was done with a track mounted CME-55 rig with borings advanced using a combination of 6-inch ODEX, 5-inch down the hole hammer (DTHH), and HQ wireline core.

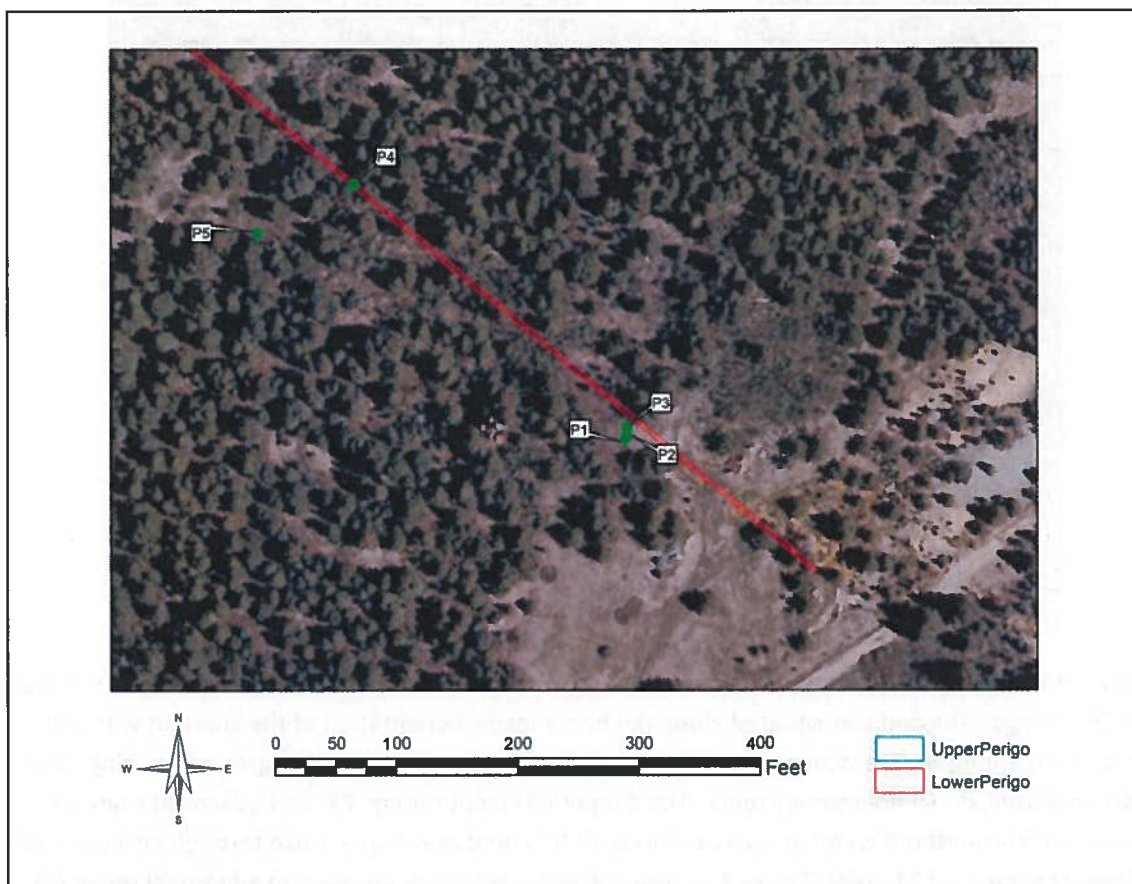


Figure 9. Boring locations.

The lower drill pad was constructed directly above the current discharge for the lower portal (Figure 10), and was intended to determine the subsurface location, orientation and depth of the crosscut at a shallow depth to better direct a much deeper intercept boring farther up the hill. Three borings were advanced to 49, 50 and 53 feet respectively on approximately five (5) foot intervals across the likely location of the crosscut tunnel. The first two (2) borings failed to intercept any mine workings, but the third boring appeared to intercept a six (6) inch void at approximately 49 feet resulting in a loss of circulation and agitation of iron precipitate in the portal discharge. The small void encountered in boring P3 likely indicated that the workings were “nicked” at 49 feet, but the exact location, orientation, and dimensions of the crosscut could not be determined. No additional borings could be drilled at this location to verify the location of mine workings due to the limited area of the constructed drill pad. Boring P2 was completed as a 2-inch monitoring well, while the other two borings were abandoned with grout and bentonite.



Figure 10. Drill rig at lower drill pad above collapsed portal.

An upper drill pad was constructed along an old mine road approximately 300 feet uphill from the first three (3) borings. The pad was situated along the hypothesized orientation of the crosscut with the hope of intercepting the crosscut at a location where the condition of the underground workings could be assessed using down hole survey tools. The deeper intercept boring, P4, was advanced using air hammer and encountered water at approximately 37 feet, and eventually broke through into open mine workings at a depth of 117 feet (Figure 11). The drill string was then lowered an additional seven (7) feet and encountered the mine floor, verifying the height of the crosscut tunnel at approximately seven (7) feet. Fifteen (15) feet of 4-inch, PVC casing was placed in P4 and then grouted. The remaining

portion of the boring was left open to the mine workings to allow for access with geophysical tooling. Upon completion of the well, the water level was measured at 107 feet below ground surface, indicating a water level approximately 10 feet above the back of the crosscut.



Figure 11. P4 boring at time of mine working intercept.

An additional boring (P5) was located along the mine road approximately 65 feet from P4 to provide rock core information and allow for packer testing. The boring was advanced to 49 feet with ODEX and DTTH, and then, HQ core was advanced to a depth of 127 feet. Detailed core logs and photos are provided in Appendix II. All rock encountered was biotite gneiss with varying lenses of granitic migmatite suggesting localized high temperature melting. Strong foliation and banding with a dip of approximately 45 degrees was evident in most recovered core, but some core runs had less discernible foliation. Generally, the recovered core had a very high Rock Quality Description (RQD) with values ranging from 70% to 100% and averaging 91%, and not surprisingly, the rock had relatively few fractures per foot, averaging approximately one (1). A preliminary rock mass analysis of core recovered from P5 is included in Appendix III, and indicates a Rock Mass Rating (RMR) of 67 (Good), and a Q Rating of 12.13 (Good). The RMR and Q rating would suggest that ground conditions within the cross cut portion of the lower tunnel should be good and would only require minimal ground control during rehab. Sections of the lower tunnel cross cut that parallel or cross geologic structures may require areas of increased ground control, but the general rock mass appears to be good. Boring P5 was completed as a 2-inch monitoring well with the screen interval from 107-127 feet, sand pack from 105-127 feet, and grout from 105 feet to surface.

During completion of Boring P5, packer testing was conducted along three, ten (10) foot zones to gain a better understanding of bedrock hydraulic conductivity and aid in bulkhead design. Packer testing was conducted using a single HQ-wireline packer, which allowed testing to be performed without "tripping" out the drill string. At the end of a core run, the drill string was lifted 10 feet, and the packer inserted and inflated, to allow packer testing along that section. Water was pumped down the drill string using a Moyno pump mounted to the rig, while total flow was tracked by an in-line mounted analog flow meter, graduated in tenths of a gallon.

A Lugeon packer testing procedure was followed for each of the three packer tests. The Lugeon test is a pressure step method that measures steady-state water uptake of the formation across three pressures that are increased and then decreased, creating a closed pressure loop. The plotted pattern of flow versus pressure has been shown to represent various flow patterns inherent to the conductive fractures in the bedrock (Singhal and Gupta, 2010), and allow for calculation of a Lugeon value and hydraulic conductivity value across the zone tested. Results from each of the packer tests are included in Appendix IV.

The first packer test interval between 71-feet and 82-feet indicated void filling, with a calculated Lugeon value of 0.2 and a hydraulic conductivity of 2.33×10^{-6} cm/sec. The indication of void filling is probably a result of insufficiently flushing the test section of cuttings prior to conducting the packer test. The conductivity value is likely higher than calculated due to void filling with cuttings that took place. The second packer test conducted between 92-feet and 102-ft was consistent with turbulent flow, and a Lugeon value of 1.5 and hydraulic conductivity of 1.59×10^{-5} cm/sec. The turbulent flow and higher Lugeon value suggest that minor fracture dilation may have occurred at the higher pressure causing flow to increase as the pressures were stepped down. The final packer test was conducted between 117-feet and 127-feet and indicated laminar flow. A Lugeon value of 0.4 and hydraulic conductivity of 4.48×10^{-6} cm/sec were calculated for the final packer test interval.

All of the packer tests indicate that the gneiss bedrock is tight to very tight with low to very low hydraulic conductivities. Interestingly, the final packer test section (117-127-feet) was one of the more highly fractured and jointed zones encountered, but yielded very low Lugeon and hydraulic conductivity values suggesting narrow aperture and limited interconnectedness. Additional packer testing could be conducted to confirm that the calculated conductivities are representative of the bedrock on a larger scale, but initial testing confirms that locally, the hydrogeologic properties would not be a limiting factor on bulkhead effectiveness.

Following completion of the borings, geophysical survey tools were lowered into boring P4 to determine the dimensions of the intercepted open workings. A report completed by Zapata to Shannon and Wilson is included in Appendix V, and provides details associated with the survey. A borehole camera that was lowered into the opening and indicated that the mine workings were nearly filled with iron hydroxides, to the point that only one foot of headspace between the precipitate and back was present. After completing the borehole camera work, a geophysical sonar tool was lowered into the boring to map the dimensions of the drift on 6-inch vertical sections. The sonar tool develops a map of the

workings based on returns from obstructions, so only the unobstructed extent of workings in “line of sight” were mapped. Due to the extensive precipitate filling the crosscut, just the upper two feet of the tunnel were open to mapping. The maximum length of drift surveyed was approximately 74 feet long, with a drift width of approximately seven (7) feet. The estimated height of the drift was approximately seven (7) feet, based on initial drilling. Most of the surveyed drift, 56 feet, was towards the portal, with only 18 feet to the northwest, most likely due to downstream flushing of precipitate during drilling.

It is difficult to determine the extent to which the crosscut is open and accessible based on the sonar and downhole camera survey, since the crosscut was mostly filled with precipitate. It is reasonable to assume that the crosscut is intact but filled with iron hydroxide sludge, based on the core information indicating a competent rock mass, and drilling information confirming hard, intact rock below the surface overburden. The downhole survey does indicate that the crosscut will likely be filled with precipitate for the extent that it is flooded, which may complicate portal reopening and crosscut cleanout.

Remedial Implications

When considering remedial options at the Perigo mine, it is imperative to honestly evaluate the feasibility of implementing a particular remedy and to consider the cost associated with initial construction and long term Operations and Maintenance (O&M). Of particular interest at the Perigo mine is the possibility of implementing source control that could reduce overall metals loading without construction of an active treatment facility and the burdensome O&M associated with perpetual treatment. Initial investigation of the site suggests that source control remedies including reduction of infiltration through collapsed stopes and installation of hydraulic seal bulkheads are viable options that could be implemented.

There are numerous collapsed stopes located uphill from the Upper Perigo mine workings that likely provide pathways for surface water to enter the underground workings, eventually discharging from the lower portal. Diversion ditches and recontoured slopes would provide effective means to move surface water flows away from collapsed stopes. Additionally, near surface seals consisting of low permeability materials (geomembranes, clays, polyurethane foam plugs, ect.) could be installed over the collapsed stopes to further reduce infiltration from snow melt and precipitation. To adequately reduce infiltration near surface seals would have to be installed slightly below the upper bedrock surface to address near surface groundwater flow within the overburden and weathered bedrock zone. These measures could provide a cost effective reduction in overall discharge at the Lower Portal, but will not eliminate discharge completely.

Installation of one or more hydraulic seal bulkheads would likely provide additional reduction in discharge at the Lower Portal. A number of historic “surges” or “blowouts” from the lower portal have been documented in the past, but with installation of a hydraulic seal bulkhead, those events could be eliminated. Bulkheads could also provide a means to return the groundwater system to near “pre-mining” levels, thereby reducing oxidation of sulfides through flooding and the subsequent associated

acid mine drainage. If bulkheads were installed, the option for some type of in-mine treatment to further address acid mine drainage could be explored.

Another alternative to typical hydraulic seal bulkheads would be the installation of “squeeze plugs” along the Lower Perigo crosscut. Squeeze plugs function similar to typical bulkheads, but consist of low mobility grouts pumped into the crosscut from the surface through boreholes at multiple locations. The use of boreholes to install the plugs eliminates the requirement to re-open the collapsed portal, treat the discharge, and handle the iron hydroxide sludge. This remedy would require a number of additional boreholes and likely some road improvements above the collapsed lower portal.

Next Steps

The logical sequence of next steps at the Perigo site would be to design and construct surface water controls at the collapsed stopes, and then open and rehabilitate either or both the Upper and Lower Perigo crosscuts. Depending on the remedial approach, re-opening of one or more of the portals is necessary to allow for information collection to facilitate bulkhead design. These steps could be accomplished simultaneously to facilitate expedited remedial action at the site.

Installation of surface water controls could be accomplished relatively easily since the site would only require minor road improvement to allow access by equipment. The majority of collapsed stopes are well defined in their location and extent by their surface expressions, facilitating effective remedy implementation.

Additional drilling could be conducted along the Lower Perigo crosscut up gradient from the location of boring P4 to provide additional geotechnical information for bulkhead or squeeze plug design. These borings would be sited to intercept the crosscut at potential locations where the bulkhead or squeeze plugs would be installed.

Excavation and rehabilitation of the Upper Perigo crosscut will pose more challenges than installation of surface water controls, but appears to be feasible based on initial assessment. Currently, the portal is completely collapsed, but does not appear to be impounding significant water. A safe and stable portal entry structure will need to be constructed by excavation of the collapse and installation of large diameter culvert. Once the crosscut is accessible, the underground workings can be assessed to determine the amount and degree of rehabilitation required to provide safe underground access. Rehabilitation of the upper portal will allow collection of information that could be used to further refine the remedial approach at the site and specifically the Lower Perigo crosscut.

If a remedial option is chosen that requires access to the Lower Perigo crosscut, a similar process can be followed to establish access to the underground workings, although installation of a portal structure at the lower crosscut poses significant challenges due to the amount of water impounded by the collapse. There appears to be at least seventeen (17) vertical feet of impounded water at the current collapse location. To establish entry into the crosscut at the original crosscut elevation, impounded water will have to be drained or pumped and then treated during excavation prior to release from the site. Discharge from the collapsed portal during excavation will undoubtedly be concentrated with

suspended solids like iron hydroxides, that will require significant settlement ponds to allow polishing before release. Settlement times could be reduced through the addition of flocculants, but that will not eliminate the need for a number of ponds. Once access has been established, the underground workings can be assessed for additional rehab and bulkhead feasibility.

Conclusion

Initial investigation of geology, hydrology and mine workings conducted by DRMS through surface and subsurface methods indicate that the Perigo Mine is a viable location for implementation of source control remedies. The geology and mine layout appear to be favorable for installation of one (1) or more hydraulic seal bulkheads, while collapsed stopes associated with the mine can be addressed through surface means to reduce infiltration of meteoric water into the mine workings. Implementation of source control should provide an effective means of reducing metals loading to Gamble Gulch from the Perigo Mine.

Bibliography

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Appendix I

Groundwater Wells

Colorado Department of Natural Resources

Colorado.gov | Contact Us

Colorado Division of Water Resources

Colorado's Well Permit Search

Well Constructed

[Help](#) Last Refresh: 11/14/2014 12:01:53 AM

Receipt: 0404223 **Division:** 1
Permit #: 197116- **Water District:** 6
Well Name / #: **County:** GILPIN
Designated Basin: **Management District:**
Case Number:
WDID:

[-] Applicant/Owners History

Date Range	Applicant/Owner Name	Address	City/State/Zip
Unknown - Present	STANTON SOLOMAN R	1812 UPPER MOON GULCH ROAD	BLACK HAWK, CO 80422

[-] Location Information

Approved Well Location:

Q40	Q160	Section	Township	Range	PM	Footage from Section Lines
NW	SE	11	2.0S	73.0W	Subd	2765 N 2230 E
Northing (UTM y):		4415545.6		Easting (UTM x):		455056.0
Location Accuracy: Spotted from section lines						

Physical Address **Subdivision Name**
 JOHN Q A ROLLINS ET AL PLACER
City/State/Zip **Filing Block Lot**

Parcel ID: **Acres in Tract:** 5.16

[-] Permit Details

Date Issued: 08/06/1996 **Date Expires:** 08/06/1998
Use(s): HOUSEHOLD USE ONLY **Aquifer(s):** ALL UNNAMED AQUIFERS
Special Use:

Area which may be irrigated:
Maximum annual volume of appropriation:

Statute:

Permit Requirements:	Totalizing Flow Meter	Geophysical Log	Abandonment Report
No	No	No	No

Cross Reference	Permit Number	Receipt	Description
Permit(s):			
Comments: PORTION OF			

[-] Construction/Usage Details

Well Construction Date: 12/16/1996		Pump Installation Date:	
Well Plugged:		1st Beneficial Use:	
Elevation	Depth	Perforated Casing (Top)	Perforated Casing (Bottom)
9000	220	160	220
Static Water Level	Pump Rate		
18	6		
Driller	Lic # Name	Address	Phone Number
	328 SMITH, CALVIN R.	109 GAP ROAD BLACKHAWK, CO 80403	303-642-3339

[-] Application/Permit History

Ownership Change	09/17/2014
Well Construction Report Received	02/07/1997
Well Constructed	12/16/1996
Permit Issued	08/06/1996
Application Received	07/30/1996

[-] Imaged Documents

Document Name	Date Imaged	Annotated
Change in Owner Name/Address/Location	10/24/2014	No
Original File	12/07/2007	No

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

For Office Use only

RECEIVED

FEB 07 1997

1. WELL PERMIT NUMBER <u>197116</u>	
2. OWNER NAME(S) <u>Dennis McCoy</u> Mailing Address <u>4599 N. Broadway</u> City, St Zip <u>Boulder, CO 80304</u> Phone () <u>442-4083</u>	
3. WELL LOCATION AS DRILLED: NW <u>1/4</u> SE <u>1/4</u> , Sec. <u>11</u> Twp. <u>2 S</u> , Range <u>73W</u> 6thp. a. DISTANCES FROM SEC. LINES: <u>2765</u> ft. from <u>North</u> Sec. line. and <u>2230</u> ft. from <u>East</u> Sec. line. OR (north or south) (east or west) SUBDIVISION: <u>John O A Rollins Et Al Placer</u> LOT <u> </u> BLOCK <u> </u> FILING(UNIT) <u> </u> STREET ADDRESS AT WELL LOCATION: <u>Moon Gulch Road</u>	
4. GROUND SURFACE ELEVATION <u>9000</u> ft. DRILLING METHOD <u>Airpercussion</u> DATE COMPLETED <u>12/16/96</u> TOTAL DEPTH <u>220</u> ft. DEPTH COMPLETED <u>220</u> ft.	
5. GEOLOGIC LOG: Depth Description of Material (Type, Size, Color, Water Location) <u>0 - 2 ft Black-brown Fill dirt</u> <u>2 - 14 " Brown dirt</u> <u>14 - 22 " Gray granite</u> <u>22 - 27 " Brown granite</u> <u>27 - 95 " Gray granite</u> <u>95 - 97 " Brown granite</u> <u>97 - 181 " Gray schist</u> <u>181 - 195 " Gray granite, white quartz</u> <u>195 - 220 " Gray schist</u>	6. HOLE DIAM. (in.) From (ft) To (ft) <u>8 1/2"</u> <u>0</u> <u>20</u> <u>6"</u> <u>20</u> <u>220</u>
	7. PLAIN CASING OD (in) Kind Wall Size From(ft) To(ft) <u>6 5/8"</u> <u>Steel</u> <u>.188</u> <u>-1</u> <u>20</u> <u>4"</u> <u>PVC</u> <u>200 psi</u> <u>15</u> <u>160</u>
	PERF. CASING: Screen Slot Size: <u>1/8"</u> <u>4"</u> <u>PVC</u> <u>200 psi</u> <u>160</u> <u>220</u>
	8. FILTER PACK: Material <u>N/A</u> Size <u> </u> Interval <u> </u>
	9. PACKER PLACEMENT: Type <u>N/A</u> Depth <u> </u>
	10. GROUTING RECORD: Material Amount Density Interval Placement <u>Cement 188# 17# 0-20 pour+vibrate</u>
REMARKS: <u>Water located at: 192 ft.</u>	
11. DISINFECTION: Type <u>Chlorine (dry)</u> Amt. Used <u>1 cup</u>	
12. WELL TEST DATA: <input type="checkbox"/> Check box if Test Data is submitted on Form No. GWS 39 Supplemental Well Test. TESTING METHOD <u>air</u> Static Level <u>18</u> ft. Date/Time measured <u>12/16/96</u> Production Rate <u>6</u> gpm. Pumping level <u>215</u> ft. Date/Time measured <u>2 p.m. - 4 p.m.</u> Test length (hrs.) <u>2</u> Remarks <u> </u>	
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 <u>C.R. Smith Drilling</u> Phone <u>(303) 642-3339</u> Lic. No. <u>328</u> Mailing Address <u>109 Gap Road, Black Hawk, CO 80402</u> Name/Title (Please type or print) <u>Calvin R. Smith</u> Signature <u>Calvin R. Smith</u> Date <u>1/8/97</u>	

INSTRUCTIONS FOR WELL CONSTRUCTION AND TEST REPORT

- Rev. Oct. 94

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. Photocopy reproductions must retain margins and print quality of the original form.

The original 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.

A 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) 866-3661

716

APPLICANT

WELL PERMIT NUMBER 197116
DIV. 1 CNTY. 24 WD 6 DES. BASIN MD

Lot: Block: Filing: Subdiv: JOHN Q A ROLLINS ET AL PLACER

APPROVED WELL LOCATION
GILPIN COUNTY

NW 1/4 SE 1/4 Section 11
Twp 2 S RANGE 73 W 6th P.M.

DISTANCES FROM SECTION LINES

2785 Ft. from North Section Line
2230 Ft. from East Section Line

DENNIS MCCOY
% GROUND WATER SYSTEMS
4599 N BROADWAY
BOULDER CO 80304-

(303)442-4083

PERMIT TO CONSTRUCT A WELL

ISSUANCE OF THIS PERMIT DOES NOT CONFER A WATER RIGHT

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 37-92-602(3)(b)(II)(A) as the only well on a residential site of 5.155 acres described as that portion of the John Q. A. Rollins et al Placer, Gilpin County, being more particularly described on the attached exhibit "A".
- 4) The use of ground water from this well is limited to ordinary household purposes inside a single family dwelling. The ground water shall not be used for irrigation or other purposes.
- 5) The maximum pumping rate shall not exceed 15 GPM.
- 6) The return flow from the use of this well must be through an individual waste water disposal system of the non-evaporative type where the water is returned to the same stream system in which the well is located.
- 7) This well shall be constructed not more than 200 feet from the location specified on this permit.

M. M. 8-6-96

APPROVED
MAM

Hal D. Simpson
State Engineer

M. A. Malley
By

Receipt No. 0404223

DATE ISSUED AUG 06 1996

EXPIRATION DATE AUG 06 1998

11.

COLORADO DIVISION OF WATER RESOURCES
DEPARTMENT OF NATURAL RESOURCES
1313 SHERMAN ST., RM. 818, DENVER CO 80203
phone - info: (303) 866-3587 main: (303) 866-3581

RECEIVED

1971/6
JUL 30 1996

WATER RESOURCES
STATE ENGINEER

RESIDENTIAL * (Note: You may also use this form to apply for livestock watering)
Review instructions prior to completing form

Water Well Permit Application
Must be completed in black ink or typed

1. APPLICANT INFORMATION				6. USE OF WELL (check appropriate entry or entries)			
Name of applicant: Dennis McCoy				See instructions to determine use(s) for which you may qualify - <input checked="" type="checkbox"/> A. Ordinary household use in one single-family dwelling (NO outside use) <input type="checkbox"/> B. Ordinary household use in 1 to 3 single-family dwellings: Number of dwellings: _____ <input type="checkbox"/> Home garden/lawn irrigation, not to exceed 1 acre: area irrigated _____ sq. ft. <input type="checkbox"/> acre <input type="checkbox"/> Domestic animal watering - (non-commercial) <input type="checkbox"/> C. Livestock watering (on farm/ranch/range/pasture)			
Mailing Address: 4599 N. Broadway				7. WELL DATA			
City Boulder,		State CO		Zip code 80304		Maximum pumping rate 15 gpm	
Telephone Number (include area code) 303-442-4083				Annual amount to be withdrawn 1 acre-feet		Test depth 400 feet	
2. TYPE OF APPLICATION (check applicable box(es)) <input checked="" type="checkbox"/> Construct new well <input type="checkbox"/> Use existing well <input type="checkbox"/> Replace existing well <input type="checkbox"/> Change / Increase Use <input type="checkbox"/> Change (source) aquifer <input type="checkbox"/> Reapplication (expired permit) <input type="checkbox"/> Other:				Aquifer Granite			
3. REFER TO (if applicable) 0				8. TYPE OF RESIDENTIAL SEWAGE SYSTEM			
Water court case #		Permit #		<input checked="" type="checkbox"/> Septic tank / absorption leach field <input type="checkbox"/> Central system District name: _____ <input type="checkbox"/> Vault Location sewage to be hauled to: _____ <input type="checkbox"/> Other (attach copy of engineering design)			
Verbal # -VE-		Monitoring hole acknowledgment # MH-		9. PROPOSED WELL DRILLER (optional)			
Well name or #				Name Ground Water Systems Drilling LLC License number 716			
4. LOCATION OF WELL				10. SIGNATURE of applicant(s) or authorized agent			
County Gilpin		Quarter/quarter NW ¼		Quarter SE ¼		The making of false statements herein constitutes perjury in the second degree, which is punishable as a class 1 misdemeanor pursuant to C.R.S. 24-4-104(13)(e). I have read the statements herein, know the contents thereof and state that they are true to my knowledge.	
Section 11		Township N or S 2 <input type="checkbox"/> N <input checked="" type="checkbox"/> S		Range E or W 73 <input type="checkbox"/> E <input checked="" type="checkbox"/> W		Must be original signature Dennis McCoy	
Distance of well from section lines 2765 ft. from <input checked="" type="checkbox"/> N <input type="checkbox"/> S 2230 ft. from <input checked="" type="checkbox"/> E <input type="checkbox"/> W		Principal Meridian 6th		Title Owner		Date 7/12/96	
Well location address, if different from applicant address (if applicable)				OPTIONAL INFORMATION			
For replacement wells only - distance and direction from old well to new well feet direction				USGS map name		DWR map no.	
5. TRACT ON WHICH WELL WILL BE LOCATED				Surface elev.		Office Use Only	
A. You must check one of the following - see instructions <input type="checkbox"/> Subdivision: Name _____ Lot no. _____ Block no. _____ Filing/Unit _____ <input type="checkbox"/> County exemption (attach copy of county approval & survey) Name/no. _____ Tract no. _____ <input checked="" type="checkbox"/> Mining claim (attach copy of deed or survey) Name/no. Placer Survey #364 <input type="checkbox"/> Other (attach legal description to application)				USGS map name		DWR map no.	
B. STATE PARCEL ID# (optional):				USGS map name		DWR map no.	
C. # acres in tract 5.155		D. Are you the owner of this property? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO (if no - see instructions)		USGS map name		DWR map no.	
E. Will this be the only well on this tract? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO (if other wells are on this tract- see instructions)				USGS map name		DWR map no.	

Best Copy Available

USE MD

RESIDENTIAL APPLICATIONS - GENERAL INSTRUCTIONS

There are a variety of uses for ground water in Colorado. This form (GWS-44) can be used when applying for a permit for a new well or replacement of an existing well for the following types of uses:

ORDINARY HOUSEHOLD USE inside one single family residence (NO outside water use allowed)
OTHER RESIDENTIAL USE (sometimes referred to as "domestic" use) which may include use in up to three single-family residences, watering of up to one acre of home gardens and lawns, and watering of domestic animals
LIVESTOCK WATERING on a farm, ranch, range, or pasture

If you are applying for a NEW household use only well, or for a NEW 35+ acre residential well outside the Denver Basin or Designated Basins of eastern Colorado, please use simplified forms GWS-49 or GWS-50. DO NOT use this form for registration of an existing unpermitted well (Use Form GWS-12), monitoring/observation wells (Use Form GWS-46), gravel pit wells (Use Form GWS-27), or for other uses not listed above, including - commercial, industrial, crop irrigation, municipal, etcetera (Use GENERAL PURPOSE Form GWS-45).

FEES Applications must be submitted with the appropriate required non-refundable filing fees. The required filing fee for most well permit applications is \$60. The filing fees for replacement or deepening well permit applications for most previously permitted residential and livestock water wells is \$20. Checks should be payable to the COLORADO DIVISION OF WATER RESOURCES.

Applications are evaluated in chronological order. Please allow approximately six weeks for processing.

APPLICATIONS must be completed clearly, and legibly, in BLACK INK or typed. ALL ITEMS in the application must be completed. Incomplete applications may be returned to the applicant for more information. Do not change or alter the application in any way.

THE LOCATION of the well in item 4 must be correctly and accurately described. The county, quarter/quarter, section, township, range, principal meridian, and distance from section lines must be provided.

NOTE: Distances are not necessarily the same distances as the distances from (your) property lines.

For additional assistance in describing the location of your well, review the publication entitled "How to Determine Well Location" which was provided with your packet, or can be requested from any Colorado Division of Water Resource office.

A LEGAL DESCRIPTION of your lot or parcel of land is required in item 5. For tracts of less than 35 acres approval may depend upon whether the tract was created by a division of land after June 1, 1972. If your lot is less than 35 acres in size, it would be prudent to have a deed or legal description that shows your tract was divided from a larger tract prior to June 1, 1972. This may be accomplished by obtaining a copy of a deed for the tract issued prior to June 1, 1972.

An ORIGINAL signature must be on each application. The applicant's authorized agent may sign the application, if a letter signed by the applicant is submitted with the application authorizing them to act as agent for the purpose of obtaining a well permit.

IF YOU HAVE ANY QUESTIONS regarding any item on the application form, please call the Division of Water Resources Ground Water Information Desk (303-866-3587), or the nearest Division of Water Resources Field Office located in Greeley (970-352-8712), Pueblo (719-542-3368), Alamosa (719-589-6683), Montrose (970-249-8622), Glenwood Springs (970-946-5665), Steamboat Springs (970-879-0272), or Durango (970-247-1846).

DETAILED INSTRUCTIONS ARE AVAILABLE UPON REQUEST

Certificate of Survey #6912-12
SLEEPING GIANT COMPANY
DAVE and RUTH PETERS

RECEIVED

744 3 0 1996

WATER RESOURCES
STATE ENGINEER
DOL.

ENGINEER & SURVEYOR, 1875 WEST TWENTY-THIRD AVENUE
- LAKEWOOD / COLORADO / DELPHI 3441.

NORTH

SCALE: 1"=100'

EXITING: MOON: G
N33292

PETERS
ROLLINS

TRACT
PLACER

5.125 ACRES

CERTIFICATE

I certify that I have surveyed and staked a Tract of land described as being:

That portion of the JOHN J. A.
HOLLINS et al PLACER (Survey No. 364)
in the South Boulder Mining District, in
Gilpin County, Colorado, sometimes called
the Moon Gulch Placer, which begins at Corner
No. 12 of said PLACER; thence North $36^{\circ} 00'$ East
along the line between Corner No. 12 and Corner
No. 13 of said Placer a distance of 30.0 feet;
thence South $54^{\circ} 00'$ East a distance of 330.0 feet
to a Point on the line between Corner No. 6 and Corner
No. 7 of said Placer; thence South $36^{\circ} 00'$ West along the
line between Corner No. 6 and Corner No. 7 of said Placer
a distance of 81.42 feet to Corner No. 7 of said Placer;
thence South $53^{\circ} 27'$ West along the line between Corner No. 7
and Corner No. 8 of said Placer a distance of 649.53 feet to
a Point; thence North $36^{\circ} 33'$ West a distance of 350.0 feet to
a Point on the line between Corner No. 11 and Corner No. 12
of said Placer; thence North $53^{\circ} 27'$ East along the said line
between Corner No. 11 and Corner No. 12 of said Placer a dis-
tance of 600.0 feet to said Corner No. 12, the Point of
Beginning.

The described Tract contains 5.15 Acres, more or less, and is accurately shown on the above Plat.

January 2, 1970.

Kurt O. Rine

ATTACHMENT "A"

Best Copy Available

RECEIVED

JUL 30 1996

WATER RESOURCES
STATE ENGINEER
COLO.

TO THE COLORADO DIVISION OF WATER RESOURCES

I, Dennis McCoy, hereby appoint
Richard R. Wilson of Ground Water Systems, Inc., to act as my Agent
of Record in obtaining a well permit on our land located in Section
11, Township 2S, Range 73W of the 6th P.M., County of
Gilpin, State of Colorado.

I further request that all future correspondence be addressed to
Richard R. Wilson, Ground Water Systems, Inc., 4599 North Broadway,
Boulder, Colorado 80304, until the Statement of Beneficial Use is
submitted to the State with a new and current mailing address.

Dennis McCoy

7/12/96
Date

Colorado Department of Natural Resources

Colorado.gov | Contact Us

Colorado Division of Water Resources

Colorado's Well Permit Search

Well Constructed

[Help] Last Refresh: 11/14/2014 12:01:53 AM

Receipt: 0405183 **Division:** 1
Permit #: 198651-- **Water District:** 6
Well Name / #: **County:** GILPIN
Designated Basin: **Management District:**
Case Number:
WDID:

[-] Applicant/Owners History

Date Range	Applicant/Owner Name	Address	City/State/Zip
Unknown - Present	DUBOSE BEVERLY M	PO BOX 1488	NEDERLAND, CO 80466

[-] Location Information**Approved Well Location:**

Q40	Q160	Section	Township	Range	PM	Footage from Section Lines
NE	NW	14	2.05	73.0W	Sixth	200 N 2510 W

Northing (UTM y): 4414760.6 **Easting (UTM x):** 454908.7
Location Accuracy: Spotted from section lines

Physical Address	Subdivision Name
City/State/Zip	Filing Block Lot

Parcel ID:	Acres in Tract:
	1

[-] Permit Details

Date Issued: 10/02/1996 **Date Expires:** 10/02/1998
Use(s): HOUSEHOLD USE ONLY **Aquifer(s):** ALL UNNAMED AQUIFERS
Special Use:

Area which may be irrigated:
Maximum annual volume of appropriation:

Statute:

Permit Requirements:	Totalizing Flow Meter	Geophysical Log	Abandonment Report
No	No	No	No

Cross Reference	Permit Number	Receipt	Description
Permit(s):			
Comments:			

[-] Construction/Usage Details

Well Construction Date: 08/02/1997 **Pump Installation Date:** 05/29/1998
Well Plugged: **1st Beneficial Use:**

Elevation	Depth	Perforated Casing (Top)	Perforated Casing (Bottom)	Static Water Level	Pump Rate
9520	80	40	80	25	10

Driller	Lic #	Name	Address	Phone Number
Pump	128	SMITH, CALVIN R.	109 GAP ROAD BLACKHAWK, CO 80403	303-642-3339
Installer	1326	SMITH, FRANK	109 GAP ROAD BLACKHAWK, CO 80422	303-642-3339

[-] Application/Permit History

Pump Installation Report Received	06/08/1998
Pump Installed	05/29/1998
Well Construction Report Received	08/11/1997
Well Constructed	08/02/1997
Permit Issued	10/02/1996
Application Received	08/19/1996

[-] Imaged Documents

Document Name	Date Imaged	Annotated
Original File	12/07/2007	No

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FORM NO. 6WS-32 10/94	PUMP INSTALLATION AND TEST REPORT STATE OF COLORADO, OFFICE OF THE STATE ENGINEER	For Office Use only REC'D JUN 08 1998 <small>WATER RESOURCES STATE ENGINEER COLO.</small>
1. WELL PERMIT NUMBER <u>198651</u>		
2. OWNER NAME(S) <u>Bev. Dubose</u> Mailing Address <u>P.O. Box 1488</u> City, St. Zip <u>Nederland. Co. 80466</u> Phone ()		
3. WELL LOCATION AS DRILLED: <u>NE 1/4 NW 1/4, Sec. 14 Twp. 2 S</u> , Range <u>73W 61N</u> DISTANCES FROM SEC. LINES: <u>200</u> ft. from <u>North</u> Sec. line. and <u>2510</u> ft. from <u>West</u> Sec. line. <small>(North or South) (East or West)</small> SUBDIVISION: _____ LOT _____ BLOCK _____ FILING(UNIT) _____ STREET ADDRESS AT WELL LOCATION: _____		
4. PUMP DATA: Type <u>Submersible</u> Installation Completed <u>5/29/98</u> Pump Manufacturer <u>Aermotor</u> Pump Model No. <u>T12501153W</u> Design GPM <u>12</u> at RPM <u>3450</u> , HP <u>1 1/2</u> , Volts <u>115</u> , Full Load Amps _____ Pump Intake Depth <u>75</u> Feet, Drop/Column Pipe Size <u>3/4"</u> Inches, Kind <u>Polypipe</u> ADDITIONAL INFORMATION FOR PUMPS GREATER THAN 50 GPM: TURBINE DRIVER TYPE: <input type="checkbox"/> Electric <input type="checkbox"/> Engine <input type="checkbox"/> Other _____ Design Head _____ feet, Number of Stages _____, Shaft size _____ inches.		
5. OTHER EQUIPMENT: Airline Installed <input type="checkbox"/> Yes <input type="checkbox"/> No, Orifice Depth ft. _____, Monitor Tube Installed <input type="checkbox"/> Yes <input type="checkbox"/> No, Depth ft. _____ Flow Meter Mfg. _____ Meter Serial No. _____ Meter Readout <input type="checkbox"/> Gallons, <input type="checkbox"/> Thousand Gallons, <input type="checkbox"/> Acre feet, <input type="checkbox"/> Beginning Reading _____		
6. TEST DATA: <input type="checkbox"/> Check box if Test data is submitted on Supplemental Form. <div style="display: flex; justify-content: space-between;"> <div> Total Well Depth <u>80'</u> Static Level <u>25'</u> Date Measured <u>8/2/97</u> </div> <div> Date <u>8/2/97</u> Time <u>2:4 PM</u> Rate (GPM) <u>10</u> Pumping Lvl. <u>75'</u> </div> </div>		
7. DISINFECTION: Type _____ Amt. Used _____		
8. Water Quality analysis available. <input type="checkbox"/> Yes <input type="checkbox"/> 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 <u>CR Smith Drilling</u> Phone <u>642-3339</u> Lic. No. <u>1326</u> Mailing Address <u>109 Gap Rd. Boulder Hawk. Co. 80403</u>		
Name/Title (Please type or print) <u>Frank E. Smith</u>	Signature <u>Frank E. Smith</u>	Date <u>6/5/98</u>

INSTRUCTIONS 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 photocopy methods, or by computer generation with prior approval by the State Engineer. Photocopy reproductions must retain margins and print quality of the original form.

The original 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.

A 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 installed pumping equipment. The report must be signed by the licensed contractor responsible for the installation of pumping equipment.

FORM NO. GWS-31 10/94		WELL CONSTRUCTION AND TEST REPORT STATE OF COLORADO, OFFICE OF THE STATE ENGINEER		For Office Use only RECEIVED AUG 11 1997 WATER RESOURCES STATE ENGINEER COLD.	
1. WELL PERMIT NUMBER <u>198651</u>					
2. OWNER NAME(S) <u>Beverly M. Dubose</u> Mailing Address <u>P.O. Box 1488</u> City, St. Zip <u>Nederland, CO 8466</u> Phone () <u>258-4240</u>					
3. WELL LOCATION AS DRILLED: <u>NE 1/4 NW 1/4, Sec. 14 Twp. 2S</u> , Range <u>73W</u> 6th PM. DISTANCES FROM SEC. LINES: <u>200</u> ft. from <u>North</u> Sec. line. and <u>2510</u> ft. from <u>West</u> Sec. line. OR (north or south) (east or west) SUBDIVISION: LOT _____ BLOCK _____ FILING(UNIT) _____ STREET ADDRESS AT WELL LOCATION:					
4. GROUND SURFACE ELEVATION <u>9520</u> ft. DRILLING METHOD <u>Airpercussion</u> . DATE COMPLETED <u>8/2/97</u> TOTAL DEPTH <u>80</u> ft. DEPTH COMPLETED <u>80</u> ft.					
5. GEOLOGIC LOG: Depth Description of Material (Type, Size, Color, Water Location) <u>0 - 24' Brown downwash</u> <u>24 - 35' Gray granite</u> <u>35 - 47' Gneiss, granite</u> <u>47 - 80' Gray granite</u>			6. HOLE DIAM. (In.) From (ft) To (ft) <u>8 1/2"</u> <u>0</u> <u>20</u> <u>6</u> <u>20</u> <u>80</u>		
			7. PLAIN CASING OD (in) Kind Wall Size From(ft) To(ft) <u>6-5/8"</u> <u>Steel</u> <u>.188</u> <u>-1</u> <u>20</u> <u>4"</u> <u>PVC</u> <u>200 psi</u> <u>15</u> <u>40</u>		
			PERF. CASING: Screen Slot Size: <u>1/8" hole</u> <u>4"</u> <u>PVC</u> <u>200 psi</u> <u>40</u> <u>80</u>		
8. FILTER PACK: Material <u>N/A</u> Size _____ Interval _____			9. PACKER PLACEMENT: Type <u>N/A</u> Depth _____		
REMARKS:			10. GROUTING RECORD: Material Amount Density Interval Placement <u>cement 188# 17# 0-20 pour+vibrate</u>		
11. DISINFECTION: Type <u>Chlorine (dry)</u> Amt. Used <u>1/2 cup</u>					
12. WELL TEST DATA: <input type="checkbox"/> Check box if Test Data is submitted on Form No. GWS 39 Supplemental Well Test. TESTING METHOD <u>Air</u> Static Level <u>25</u> ft. Date/Time measured <u>8/2/97</u> Production Rate <u>10</u> gpm. Pumping level <u>75</u> ft. Date/Time measured <u>2 pm - 4 pm</u> Test length (hrs.) <u>2</u> 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 <u>CR Smith Drilling</u> Phone <u>(303) 642-3339</u> Lic. No. <u>328</u> Mailing Address <u>109 Gap Road, Black Hawk, CO 80403</u> Name/Title (Please type or print) Signature Date <u>Calvin R. Smith</u> <u>[Signature]</u> <u>8/8/97</u>					

INSTRUCTIONS FOR WELL CONSTRUCTION AND TEST REPORT

Rev. Oct. 94

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. Photocopy reproductions must retain margins and print quality of the original form.

The original 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.

A 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.

OFFICE OF THE STATE ENGINEER
COLORADO DIVISION OF WATER RESOURCES

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

328

WELL PERMIT NUMBER 198651

DIV. 1 CNTY. 24 WD 06 DES. BASIN MD

APPLICANT

SUBDIV:

LOT:

BLK:

FLG:

LOT SIZE:

1 ACRES

BEVERLY M DUBOSE
BOX 1488
NEDERLAND CO 80466

(303) 258-4240

APPROVED WELL LOCATION

GILPIN COUNTY

NE 1/4 NW 1/4 SECTION 14

TWP 2S RANGE 73W 6th P.M

DISTANCES FROM SECTION LINES

0200 Ft. from North Section Line

2510 Ft. from West Section Line

PERMIT TO CONSTRUCT A WELL

ISSUANCE OF THIS PERMIT DOES NOT CONFER A WATER RIGHT
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 and Pump Installation 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 37-92-602(3)(b)(II)(A) as the only well on a residential site MORE PARTICULARLY DESCRIBED ON THE ATTACHED EXHIBIT A.
- 4) The use of ground water from this well is limited to ordinary household purposes inside a single family dwelling. The ground water shall not be used for irrigation or other purposes.
- 5) The maximum pumping rate shall not exceed 15 GPM.
- 6) The return flow from the use of this well must be through a non-evaporative waste water disposal system where the water is returned to the same stream system in which the well is located.
- 7) This well shall be constructed not more than 200 feet from the location specified on this permit.

M.M. 10-1-96

Hal D. Simpson

State Engineer

M.A. Malley

By

Receipt No. 0405183

DATE ISSUED OCT 02 1996

EXPIRATION DATE OCT 02 1998

COLORADO DIVISION OF WATER RESOURCES
DEPARTMENT OF NATURAL RESOURCES
1313-SHERMAN ST., RM. 818, DENVER CO 80203
phone - info: (303) 866-3587 main: (303)866-3581

GENERAL PURPOSE

(Please note: other forms are available for specific uses including - residential, livestock, monitoring/observ., gravel pits, registration of old wells)
Review instructions prior to completing form

RECEIVED
198651 SEP 17 1996

RECEIVED
AUG 19 1996

WATER RESOURCES
STATE ENGINEER
COLORADO

WATER RESOURCES
STATE ENGINEER
COLORADO

Water Well Permit Application

Must be completed in black ink or typed

1. APPLICANT INFORMATION				6. USE OF WELL (please attach detailed description)			
Name of applicant <i>Beverly M DuBoe</i>				<input type="checkbox"/> INDUSTRIAL <input type="checkbox"/> OTHER: <i>mouse hold</i>			
Mailing Address <i>P.O. Box 1488</i>				<input type="checkbox"/> COMMERCIAL			
City <i>Nederland</i> State <i>Co</i> Zip Code <i>80466</i>				<input type="checkbox"/> MUNICIPAL			
Telephone number (include area code) <i>303 258-4240</i>				<input type="checkbox"/> IRRIGATION			
2. TYPE OF APPLICATION (check applicable box(es))				<input type="checkbox"/> FEED LOT - number of head :			
<input checked="" type="checkbox"/> Construct new well <input type="checkbox"/> Use existing well				7. WELL DATA			
<input type="checkbox"/> Replace existing well <input type="checkbox"/> Change or Increase Use				Maximum pumping rate <i>15</i> gpm Annual amount <i>3/3</i> acre-feet			
<input type="checkbox"/> Change (source) Aquifer <input type="checkbox"/> Reapplication (expired permit)				Total depth <i>300</i> feet Aquifer <i>Granite</i>			
<input type="checkbox"/> Other:				8. LAND ON WHICH GROUND WATER WILL BE USED			
3. REFER TO (if applicable):				A. LEGAL DESCRIPTION (may be provided as an attachment):			
Water court case #		Permit #		(If used for crop irrigation, attach scaled map that shows irrigated area.)			
Emergency Verbal # <i>-VE-</i>		Monitoring hole acknowledgment # <i>MH-</i>		B. # acres <i>6</i> C. Owner			
Well name or #				D. List any other wells or water rights used on this land:			
4. LOCATION OF WELL				9. PROPOSED WELL DRILLER (optional)			
County <i>GILPIN</i>		Quarter/quarter <i>NE 1/4</i>		Quarter <i>NW 1/4</i>		Name <i>C.R. Smith Drilling</i> License number <i>328</i>	
Section <i>14</i>		Township N or S <i>2</i>		Range E or W <i>73</i>		10. SIGNATURE of applicant(s) or authorized agent	
Distance of well from section lines <i>200</i> ft from <input checked="" type="checkbox"/> N <input type="checkbox"/> S <i>2510</i> ft from <input type="checkbox"/> E <input checked="" type="checkbox"/> W		Principal Meridian <i>6th</i>		The making of false statements herein constitutes perjury in the second degree, which is punishable as a class 1 misdemeanor pursuant to C.R.S. 24-4-104(13)(a). I have read the statements herein, know the contents thereof, and state that they are true to my knowledge.			
Well location address, if different from applicant address (if applicable)				Must be signed by applicant <i>Beverly M DuBoe</i>			
For replacement wells only - distance and direction from old well to new well feet direction				Title <i>Owner</i> Date <i>7-25-96</i>			
5. TRACT ON WHICH WELL WILL BE LOCATED				OPTIONAL INFORMATION			
A. LEGAL DESCRIPTION (may be provided as an attachment):				USGS map name		DWR map no.	
B. STATE PARCEL ID# (optional):				Surface elev.		Office Use Only	
C. # acres in tract <i>1</i>		D. Owner		CHECKS TRN405183 081996 DIV 60.00		DIV <i>1</i>	
E. Will this be the only well on this tract? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO (if other wells are on this tract, see instructions)				DIV OF WATER RESOURCES		CO <i>24</i>	
						WD <i>06</i>	
						BA	
				USE(S)		MD	

GENERAL PURPOSE APPLICATION - GENERAL INSTRUCTIONS

This form (GWS-45) should be used for the following well uses: commercial, industrial, agricultural irrigation, municipal, feed lots, central water supply systems, recreation, snowmaking, geothermal, recovery wells and any other uses not otherwise noted in the following list:

RESIDENTIAL use wells - Use Application Forms GWS-44, GWS-49 or GWS-50
LIVESTOCK watering on a farm, ranch, range, or pasture (not feedlots) - Use Forms GWS-44 or GWS-50
MONITORING/OBSERVATION wells - Use Application Form GWS-46
GRAVEL PITS - Use Application Form GWS-27
REGISTRATION of an existing well - Use Form GWS-12 (must have been in use prior to May 8, 1972)

FEES This application must be submitted with the required \$80 non-refundable filing fee.
Checks should be payable to COLORADO DIVISION OF WATER RESOURCES.

Applications are evaluated in chronological order. Please allow approximately six weeks for processing.

Applications must be completed clearly, and legibly, in BLACK INK or typed. ALL ITEMS in the application must be completed. Incomplete applications may be returned to the applicant for more information. Do not change or alter the application in any way.

THE LOCATION of the well in item 4 must be correctly and accurately described. The county, quarter/quarter, section, township and range location of the well, principal meridian and location of the well in feet from section lines must be provided.

NOTE: Distances are not necessarily the same distances as the distances from (your) property lines.

For additional assistance in describing the location of your well, review the publication entitled "How to Determine Well Locations" which was provided with your packet, or can be requested from any Colorado Division of Water Resources office.

Indicate in item 5 or provide as an attachment a complete LEGAL DESCRIPTION of the tract on which the well will be located. Indicate the total number of acres and the owner of that land.

Check the applicable box(es) in item 6 indicating the GENERAL USE of the well AND provide a detailed description of use of the well as an attachment to the application.

If the well is to withdraw water from the DAWSON, DENVER, ARAPAHOE, LARAMIE-FOX HILLS OR DAKOTA AQUIFERS, documentation of claimed landownership or consent of the landowner may be required. Please contact the Division of Water Resources for further information. A copy of the Statewide Nontributary Ground Water Rules are available upon request for \$3.

Indicate in item 8, or provide as an attachment a complete LEGAL DESCRIPTION of the land area on which water from the well will be used. Indicate the total number of acres described and the owner of that land. If agricultural irrigation is a proposed use, provide an accurate map of the land area with proposed irrigated areas drafted or accurately drawn. Section numbers and section lines must be indicated on the map.

Completely describe all OTHER WATER RIGHTS, including wells and surface water rights, used on the described land area. Describe the total land areas irrigated by other wells or water rights. Applicable well permit, well registration or water court case numbers must be indicated. This information may be provided in an attachment.

An ORIGINAL signature must be on each application. The applicant's authorized agent may sign the application if a letter signed by the applicant is submitted with the application authorizing them to act as agent for the purpose of obtaining a well permit.

IF YOU HAVE ANY QUESTIONS regarding any item in the well permit application form, please call the Division of Water Resources Ground Water Information Desk at (303) 866-3587, Ground Water Management District or the nearest Division of Water Resources Field Office located in Greeley (970-352-8712), Pueblo (719-542-3358), Alamosa (719-589-6683), Montrose (970-249-6622), Glenwood Springs (970-945-5665), Steamboat Springs (970-879-0272) or Durango (970-247-1845).

DETAILED INSTRUCTIONS ARE AVAILABLE UPON REQUEST

COLORADO DIVISION OF WATER RESOURCES, 1313 SHERMAN STREET, ROOM 821, DENVER CO 80203
PHONE: (303) 866-3587 (Information), (303) 866-3581 (Main), (303) 866-3447 (Well and Water Rights Records); (303) 866-3589 (Fax)

SCHEDULE A

RECEIVED

Order No. FG10231

Policy No. J 6383526 AUG 19 1996

Amount of Insurance \$40,000.00

PREMIUM: \$309.00

WATER RESOURCES
STATE ENGINEER
COLO.

Date of Policy JUNE 19, 1996 at 4:30 P.M.

1. Name of Insured:

BEVERLY M. DUBOSE IV

2. The estate or interest in the land which is covered by this Policy is:

FEE SIMPLE

3. Title to the estate or interest in the land is vested in:

BEVERLY M. DUBOSE IV

4. The land referred to in this Policy is described as follows:

THAT PORTION OF THE JOHN Q. A. ROLLINS PLACER, U.S. SURVEY NO. 340, WHICH IS ALSO KNOWN AS THE GAMBLE GULCH PLACER, AND THAT PORTION OF THE MILLSITE U.S. SURVEY NO. 15895, WHICH BEGINS AT A POINT ON THE LINE BETWEEN CORNERS NO. 2 AND 3 OF SAID SURVEY NO. 340, FROM WHICH POINT OF BEGINNING CORNER NO. 2 OF SAID SURVEY NO. 340 LIES SOUTH 55°15' WEST A DISTANCE OF 384 FEET; THENCE SOUTH 34°45' EAST A DISTANCE OF 140 FEET TO A POINT ON THE NORTHWESTERLY LINE OF THE EXISTING PERIGO COUNTY ROAD; THENCE NORTHEASTERLY ALONG THE NORTHWESTERLY LINE OF SAID COUNTY ROAD, A DISTANCE OF 241 FEET; THENCE NORTH 34°45' WEST A DISTANCE OF 108 FEET TO A POINT ON THE LINE BETWEEN CORNER NO. 2 AND NO. 3 OF SAID SURVEY NO. 340; THENCE CONTINUING NORTH 34°45' WEST INTO SAID SURVEY NO. 15895 A DISTANCE OF 54 FEET; THENCE SOUTH 55°15' WEST A DISTANCE OF 240 FEET; THENCE SOUTH 34°45' EAST A DISTANCE OF 54 FEET TO THE POINT OF BEGINNING.
COUNTY OF GILPIN,
STATE OF COLORADO

Issued on: JULY 5, 1996

Issued at: CLEAR CREEK-GILPIN ABSTRACT & TITLE CORP.

619 FIFTH ST. P.O. BOX 545 GEORGETOWN, CO 80444

(303) 569-2391 DENVER METRO: (303) 623-4869 FAX: (303) 569-2670

This Policy is valid only if Schedule B is attached

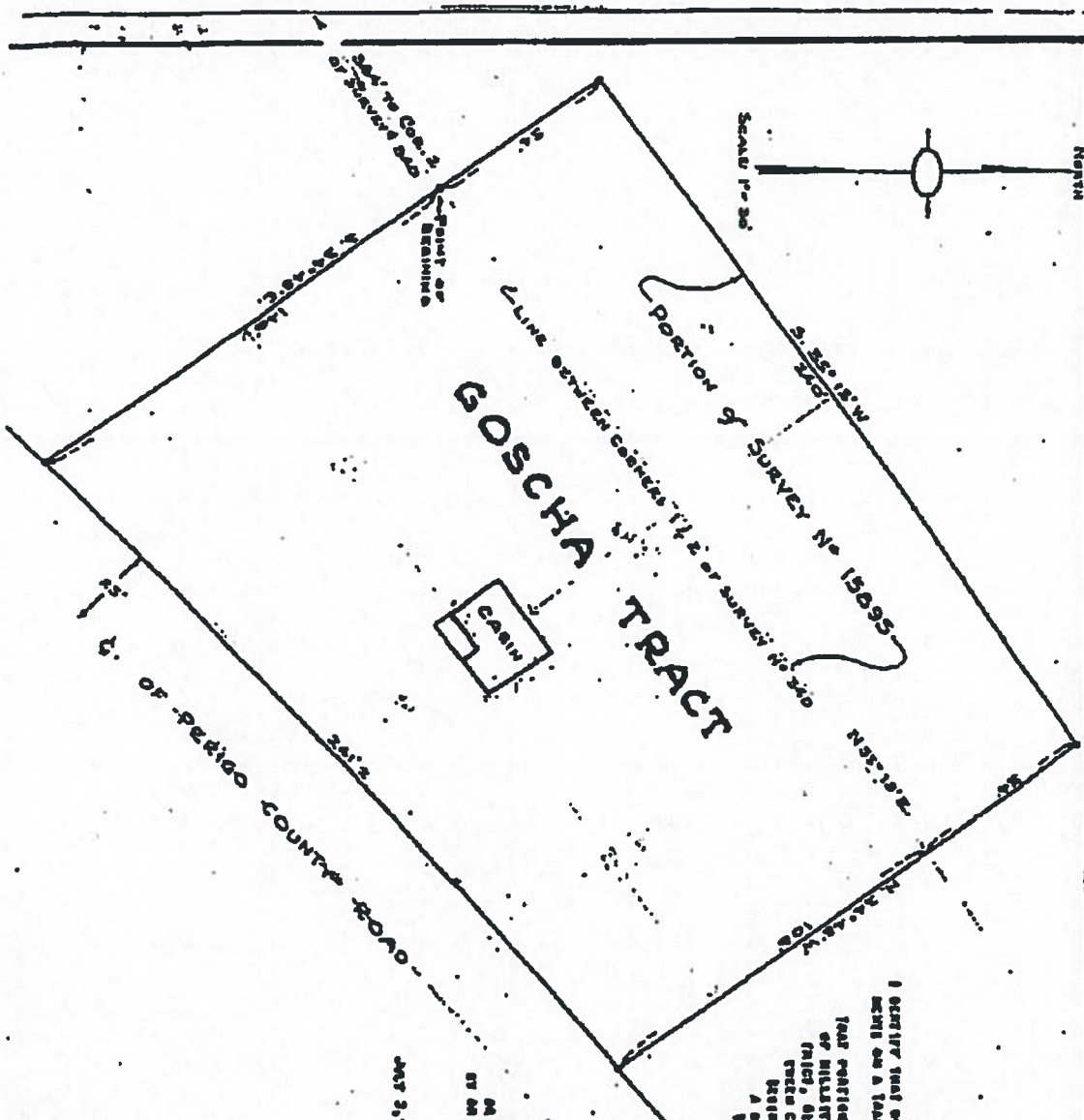
**WATER RESOURCES
STATE ENGINEER
COLO.**

Bob's
0562

8:30 Fri 7/5

1st brewery on left before
upstairs

Jack 3786



1 DEPARTY THAT ON JULY 2, 1952, I RECEIVED AND STATED, AND FURTHER THE INFORMATION THAT ON A TRACT OF LAND ACQUIRED AS OF 1901

RENTAL LIBRARY

DECLASSIFICATION OF BUREAU NO. 1007-0
RECEIVED (DATE) COMPANY
(SECRET FAVOR)

ਅੰਤਰਰਾਸ਼ਟਰੀ

The accompanying Pass accurately represents the recipient's order, which requires an area of 1.6 acres, more or less. The neighborhood shown therein did in fact correspond with the property lines. Any discrepancy in terms of size is attributed on such to me, and consequently I am not the primary one at fault.

JUL 3, 1963

Hust. O. Pina
Rust O. Pins

SURVEY NO - 307-06

Best Copy Available

Colorado Department of Natural Resources

Colorado.gov | Contact Us

Colorado Division of Water Resources

Colorado's Well Permit Search

Well Constructed

[Help](#) Last Refresh: 11/14/2014 12:01:53 AM

Receipt: 0451554 **Division:** 1
Permit #: 221918 **Water District:** 6
Well Name / #: **County:** GILPIN
Designated Basin: **Management District:**
Case Number:
WDID:

[-] Applicant/Owners History

Date Range	Applicant/Owner Name	Address	City/State/Zip
Unknown - Present	POHL, TROY G	PO BOX 848	CENTRAL CITY, CO 80427

[-] Location Information

Approved Well Location:

Q40	Q160	Section	Township	Range	PM	Footage from Section Lines
SW	SE	11	2.0S	73.0W	Sixth	750 S 1750 E

Northing (UTM y): 4415044.6 **Easting (UTM x):** 455191.5
Location Accuracy: Spotted from section lines

Physical Address	Subdivision Name
City/State/Zip	Filing Block Lot

Parcel ID: **Acres in Tract:** 5

[-] Permit Details

Date Issued: 11/18/1999 **Date Expires:** 11/18/2001
Use(s): HOUSEHOLD USE ONLY **Aquifer(s):** ALL UNNAMED AQUIFERS
Special Use:

Area which may be irrigated:
Maximum annual volume of appropriation:

Statute:

Permit Requirements:	Totalizing Flow Meter	Geophysical Log	Abandonment Report
No	No	No	No

Cross Reference	Permit Number	Receipt	Description
Permit(s):			
Comments:			

[-] Construction/Usage Details

Well Construction Date:	Pump Installation Date:
12/14/1999	
Well Plugged:	1st Beneficial Use:

Elevation	Depth	Perforated Casing (Top)	Perforated Casing (Bottom)	Static Water Level	Pump Rate
225	145	225	70	6	

Driller	Lic #	Name	Address	Phone Number
	1215	BERGLUND, PETER R.	2127 ELDERBERRY RD GOLDEN, CO 80401	303-421-8766

[-] Application/Permit History

Ownership Change	02/08/2001
Well Construction Report Received	02/09/2000
Well Constructed	12/14/1999
Permit Issued	11/18/1999
Application Received	09/28/1999

[-] Imaged Documents

Document Name	Date Imaged	Annotated
Original File	12/08/2007	No
Change in Owner Name/Address/Location	12/01/2007	No

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THE EFFECTS OF THE 1975 FEDERAL RESERVE ACT

DAVID J. BERNARD

JOHN H. COCHRAN

Abstract. The effects of the 1975 Federal Reserve Act on the money stock and the velocity of circulation are examined. The results show that the money stock increased significantly, while the velocity of circulation decreased. The effects of the Act on the money stock and the velocity of circulation are discussed in terms of the underlying economic theory.

1. Introduction. The 1975 Federal Reserve Act (FRA) was a major piece of legislation that had a significant impact on the money stock and the velocity of circulation. The FRA was designed to provide a more stable monetary environment and to reduce the volatility of the money stock. The FRA was passed by the U.S. Congress in 1975 and signed into law by President Gerald R. Ford.

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FORM NO.
GWS-31
11/90

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

For Office Use only

RECEIVED

FEB 09 2000

WATER RESOURCES
STATE ENGINEER
COLORADO

1. WELL PERMIT NUMBER 221918

2. OWNER NAME(S) Lawrence Builders
Mailing Address 168 Divide View Dr.
City, St. Zip Golden CO 80403
Phone (303) 883-5841

3. WELL LOCATION AS DRILLED: SW 1/4 SE 1/4, Sec. 11 Twp. 2 S, Range 73 W

DISTANCES FROM SEC. LINES:

750 ft. from S Sec. line. and 1750 ft. from E Sec. line. OR
(north or south) (east or west)

SUBDIVISION: _____ LOT _____ BLOCK _____ FILING(UNIT) _____

STREET ADDRESS AT WELL LOCATION: _____

4. GROUND SURFACE ELEVATION _____ ft. DRILLING METHOD Air Percussion

DATE COMPLETED 12/14/99 TOTAL DEPTH 225 ft. DEPTH COMPLETED 225 ft.

5. GEOLOGIC LOG:

Depth	Description of Material (Type, Size, Color, Water Location)
<u>0-2</u>	<u>backfill</u>
<u>2-35</u>	<u>weathered + decomposed granite</u>
<u>35-167</u>	<u>granite</u>
<u>167-175</u>	<u>weathered granite</u>
<u>175-225</u>	<u>alternating weathered granite + granite</u>

6. HOLE DIAM. (in.)	From (ft)	To (ft)
<u>8 3/4</u>	<u>0</u>	<u>41</u>
<u>6 1/8</u>	<u>41</u>	<u>225</u>

7. PLAIN CASING

OD (in)	Kind	Wall Size	From (ft)	To (ft)
<u>6 5/8</u>	<u>steel</u>	<u>.188</u>	<u>+1</u>	<u>41</u>
<u>4 1/2</u>	<u>pvc</u>	<u>.214</u>	<u>10</u>	<u>145</u>

PERF. CASING: Screen Slot Size:			
<u>4 1/2</u>	<u>pvc</u>	<u>.214</u>	<u>145 225</u>

8. FILTER PACK: NA

Material _____
Size _____
Interval _____

9. PACKER PLACEMENT

Type _____
Depth _____

10. GROUTING RECORD:

Material	Amount	Density	Interval	Placement
<u>Cement</u>	<u>4 sacks</u>	<u>6 gals/sack</u>	<u>0-41</u>	<u>vibration</u>

REMARKS: _____

11. DISINFECTION: Type HTH Amt. Used 6 oz

12. WELL TEST DATA: ☒ Check box if Test Data is submitted on Supplemental Form.

TESTING METHOD Air

Static Level 70 ft. Date/Time measured 12/14/99 Production Rate 6 gpm.

Pumping level 220 ft. Date/Time measured 12/14/99 Test length (hrs.) 1 1/2

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 Arrow Drilling Phone (303) 421-8766 Lic. No. 1215
Mailing Address 3127 Elderberry Rd. Golden CO 80401

Name/Title (Please type or print)

Signature

Date

Peter L. Berglund / Driller

Peter L. Berglund

12/15

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

LIC

APPLICANT

WELL PERMIT NUMBER **221918**

DIV. 1

WD 6

DES. BASIN

MD

LAWRENCE BUILDERS
168 DIVIDE VIEW DR
GOLDEN, CO 80403-

(303) 883-5841

APPROVED WELL LOCATION

GILPIN COUNTY

SW 1/4 SE 1/4 Section 11

Township 2 S Range 73 W Sixth P.M.

DISTANCES FROM SECTION LINES

750 Ft. from South Section Line

1750 Ft. from East Section Line

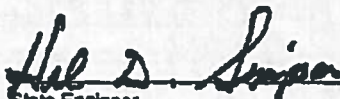
PERMIT TO CONSTRUCT A WELL

ISSUANCE OF THIS PERMIT DOES NOT CONFER A WATER RIGHT
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 this 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 37-92-602(3)(b)(II)(A) as the only well on a residential site of 5.00 acre(s) described as the Hatfield Lode Mining Claim, U.S. Survey no. 16456, Gilpin County, more particularly described on the attached exhibit A.
- 4) The use of ground water from this well is limited to ordinary household purposes inside one single family dwelling. The ground water shall not be used for irrigation or other purposes.
- 5) The maximum pumping rate of this well shall not exceed 15 GPM.
- 6) The return flow from the use of this well must be through an individual waste water disposal system of the non-evaporative type where the water is returned to the same stream system in which the well is located.
- 7) This well shall be constructed not more than 200 feet from the location specified on this permit.

JMW 11/17/99

APPROVED
JMW

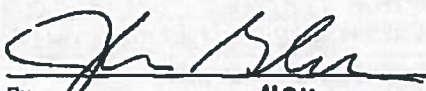

State Engineer

Receipt No. 0451554

DATE ISSUED

NOV 18 1999

By



EXPIRATION DATE

NOV 18 2001

COLORADO DIVISION OF WATER RESOURCES
DEPARTMENT OF NATURAL RESOURCES
1313 SHERMAN ST., RM. 818, DENVER CO 80203
phone - info: (303) 866-3587 main: (303) 866-3581

NEW HOUSEHOLD USE ONLY

Review instructions prior to completing form

Pres. Received
9/28/99
(on other form)

RECEIVED
NOV 02 1999
WATER RESOURCES
STATE ENGINEER
COLO

Water Well Permit Application

Must be completed in black ink or typed

1. APPLICANT INFORMATION				6. USE OF WELL	
Name of applicant <u>LAURENCE Builders L.L.C.</u>				ORDINARY HOUSEHOLD PURPOSES INSIDE ONE SINGLE FAMILY DWELLING (NO OUTSIDE USE)	
Mailing Address <u>168 Divide View DR</u>					
City <u>GOLDEN</u> State <u>CO</u> Zip code <u>80403</u>					
Telephone Number (include area code) <u>303 883 5841</u>				7. WELL DATA	
2. TYPE OF APPLICATION				MAXIMUM PRODUCTION RATE OF THE WELL WILL NOT EXCEED 15 GPM	
CONSTRUCT A NEW HOUSEHOLD USE ONLY WELL ON LESS THAN 35 ACRES				8. TYPE OF RESIDENTIAL SEWAGE SYSTEM	
3. REFER TO (if applicable):				<input checked="" type="checkbox"/> Septic tank / absorption leach field	
Monitoring hole acknowledgment # <u>MH-</u>				<input type="checkbox"/> Central system	
4. LOCATION OF WELL				District name: _____	
County <u>GOLDEN</u>		Quarter/quarter <u>S1/4</u>	Quarter <u>S1/4</u>	<input type="checkbox"/> Vault	
Section <u>11</u>	Township N or S <u>2</u>	Range E or W <u>73</u>	Principal Meridian <u>6th</u>	Location sewage to be hauled to: _____	
Distance of well from section lines <u>750</u> ft. from <input type="checkbox"/> N <input checked="" type="checkbox"/> S <u>1750</u> ft. from <input type="checkbox"/> E <input type="checkbox"/> W				<input type="checkbox"/> Other (attach copy of engineering design)	
Well location address, if different from applicant address (if applicable) <u>HATFIELD ROAD CO. RD. 15 ROLLINSVILLE CO 80403</u>				9. PROPOSED WELL DRILLER (optional)	
5. TRACT ON WHICH WELL WILL BE LOCATED				Name <u>ARROW DRILLING</u>	
A. You must check one of the following - see instructions				License number	
<input type="checkbox"/> Subdivision: Name _____				10. SIGNATURE of applicant(s) or authorized agent	
Lot # _____ Block # _____ Filing/Unit# _____				The making of false statements herein constitutes perjury in the second degree, which is punishable as a class 1 misdemeanor pursuant to C.R.S. 24-4-104(13)(a). I have read the statements herein, know the contents thereof and state that they are true to my knowledge.	
<input type="checkbox"/> County Exemption (copy of county approval & survey must be attached)				Must be original signature <u>Ken Jansen</u>	
Exempt. name/# _____ Tract # _____				Title <u>Owner</u>	
<input type="checkbox"/> Mining claim (attach copy of deed or survey)				Date <u>10-31-99</u>	
Claim name/# <u>16456</u>				Office Use Only <u>WLV</u> <u>Cur. br</u> <u>CR</u> Rec# 451554	
<input type="checkbox"/> Other (attach legal description to application)				DWR Map No.	
B. STATE PARCEL				DIV <u>1</u>	
ID# (optional): <u>16</u>				CO <u>24</u>	
C. # of acres in tract				WD <u>6</u>	
<u>5</u>				BA _____	
D. THIS WILL BE THE ONLY WELL ON THIS TRACT				USE MD	

HOUSEHOLD USE ONLY - GENERAL INSTRUCTIONS

There are a variety of uses for ground water in Colorado. This form (GWS-49) is to be used when applying for a permit for a NEW well that would be USED FOR ORDINARY HOUSEHOLD USE IN ONE SINGLE-FAMILY DWELLING. This type of well CANNOT be used for outside uses such as the watering of domestic animals and the watering of home gardens and lawns.

This form should not be used in the following cases:

REPLACEMENT of an existing well - Use form GWS-44
If OUTSIDE use is proposed - Use form GWS-44

FEES The application must be submitted with the required \$60 non-refundable filing fee.

Checks should be payable to the COLORADO DIVISION OF WATER RESOURCES.

Applications are evaluated in chronological order. Please allow approximately six weeks for processing.

APPLICATIONS must be completed clearly, and legibly, in BLACK INK or typed. ALL ITEMS in the application must be completed. Incomplete applications may be returned to the applicant for more information. Do not change or alter this application in any way.

THE LOCATION of the well in item 4 must be correctly and accurately described. The county, quarter/quarter, section, township, range, principal meridian, and distance from section lines must be provided.

NOTE: Distances are not necessarily the same distances as the distances from (your) property lines.

For additional assistance in describing the location of your well review the publication entitled "How to Determine Well Locations" which was provided with your packet, or can be requested from any Colorado Division of Water Resource office.

A LEGAL DESCRIPTION of your lot or parcel of land is required in item 5. If your lot is not in a recorded subdivision, attach a copy of a deed or legal description that shows your tract was split from a larger tract prior to June 1, 1972.

An ORIGINAL signature must be on each application. The applicant's authorized agent may sign the application, if a letter signed by the applicant is submitted with the application authorizing them to act as agent for the purpose of obtaining a well permit.

IF YOU HAVE ANY QUESTIONS regarding any item on the application form, please call the Division of Water Resources Ground Water Information Desk (303-866-3587), or the nearest Division of Water Resources Field Office located in Greeley (970-352-8712), Pueblo (719-542-3368), Alamosa (719-589-6683), Montrose (970-249-6622), Glenwood Springs (970-945-5685), Steamboat Springs (970-879-0272), or Durango (970-247-1845).

DETAILED INSTRUCTIONS ARE AVAILABLE UPON REQUEST

COLORADO DIVISION OF WATER RESOURCES, 1313 SHERMAN STREET, ROOM 821, DENVER, CO 80203
PHONE 303-866-3587 (Information), 303-866-3581 (Main), 303-866-3447 (Well & Water Rights Records), 303-866-3589 (Fax)

RECEIVED

SEP 28 1999

WARRANTY DEED

THIS DEED, Made this day of April 14, 1998, between

MARY R. REINKE

of the County of ^{Bay (MR)} ~~Essex~~ in the State of MICHIGAN, grantor, and

WILLIAM A. HILLAS AND JUDITH E. HILLAS

whose legal address is of the County of In the State of COLORADO, grantees:

WATER RESOURCES
STATE ENGINEER
COLORADO

\$6.00
+.80 OF

Gilpin County
State Documentary Fee

\$.80

WITNESSETH, that the grantor, for and in consideration of the sum of Eight thousand exactly (\$ 8,000.00) DOLLARS, the receipt and sufficiency of which is hereby acknowledged, has granted, bargained, sold and conveyed, and by these presents does grant, bargain, sell, convey and confirm unto the grantees, HIS heirs and assigns forever, not in tenancy in common but in joint tenancy, of the real property, together with improvements, if any, situate, lying and being in the County of GILPIN and State of COLORADO, described as follows:

THE HATFIELD LODGE MINING CLAIM, U.S. SURVEY NO. 16458, DESCRIBED IN UNITED STATES PATENT RECORDED IN BOOK 320 AT PAGE 481, EXCEPTING THEREFROM ANY PORTION IN CONFLICT WITH SURVEY NO. 337, AS EXCEPTED IN SAID PATENT.

Best Copy Available

also known by street and number as VACANT LAND GILPIN COUNTY, COLORADO

TOGETHER with all and singular the hereditaments and appurtenances thereto belonging, or in anywise appertaining and the reversion and reversions, remainder and remainders, rents, issues and profits thereof; and all the estate, right, title, interest, claim and demand whatsoever of the grantor, either in law or equity, of, in and to the above bargained premises, with the hereditaments and appurtenances.

TO HAVE AND TO HOLD the said premises above bargained and described, with the appurtenances, unto the said grantees, HIS heirs and assigns forever. And the grantor, for themselves, HER heirs and personal representatives, does covenant, grant, bargain and agree to and with the grantees, HIS heirs and assigns, that at the time of the enrolling and delivery of these presents, he is well seized of the premises above conveyed, ~~has good, sure, perfect, absolute and undisturbed estate of inheritance in law in fee simple and has good right, full power and lawful authority to grant, bargain, sell and convey the same in manner and form aforesaid, and that the same are free and clear from all former and other mortgages, liens, taxes, assessments, encumbrances and restrictions of whatever kind or nature so ever, EXCEPT FOR TAXES FOR THE CURRENT YEAR AND SUBSEQUENT YEARS, EASEMENTS, RESTRICTIONS, RESERVATIONS, COVENANTS AND RIGHTS-OF-WAY OF RECORD, IF ANY,~~

The grantor shall and will WARRANT AND FOREVER DEFEND the above-bargained premises in the quiet and peaceable possession of the grantees, HIS heirs and assigns, against all and every person or persons lawfully claiming the whole or any part thereof. The singular number shall include the plural, the plural the singular, and the use of any gender shall be applicable to all genders.

IN WITNESS WHEREOF the grantor has executed this deed on the date set forth above.

MARY R. REINKE

STATE OF COLORADO

COUNTY OF GILPIN

The foregoing instrument was acknowledged before me on April 14, 1998 by:

MARY R. REINKE

My commission expires: June 5, 2000

Witness my hand and Official seal.

Notary Public

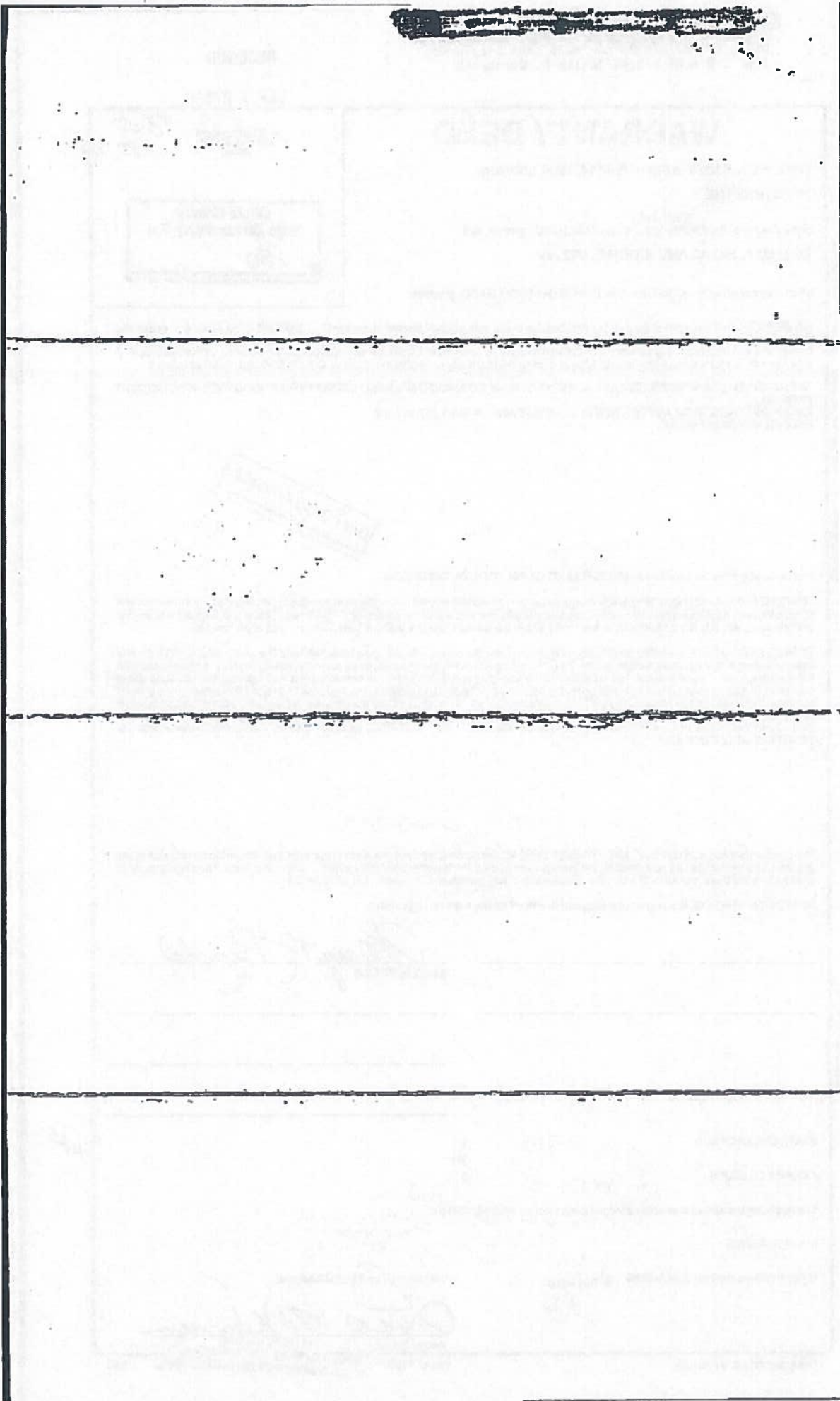
LYNN M. HANSEN

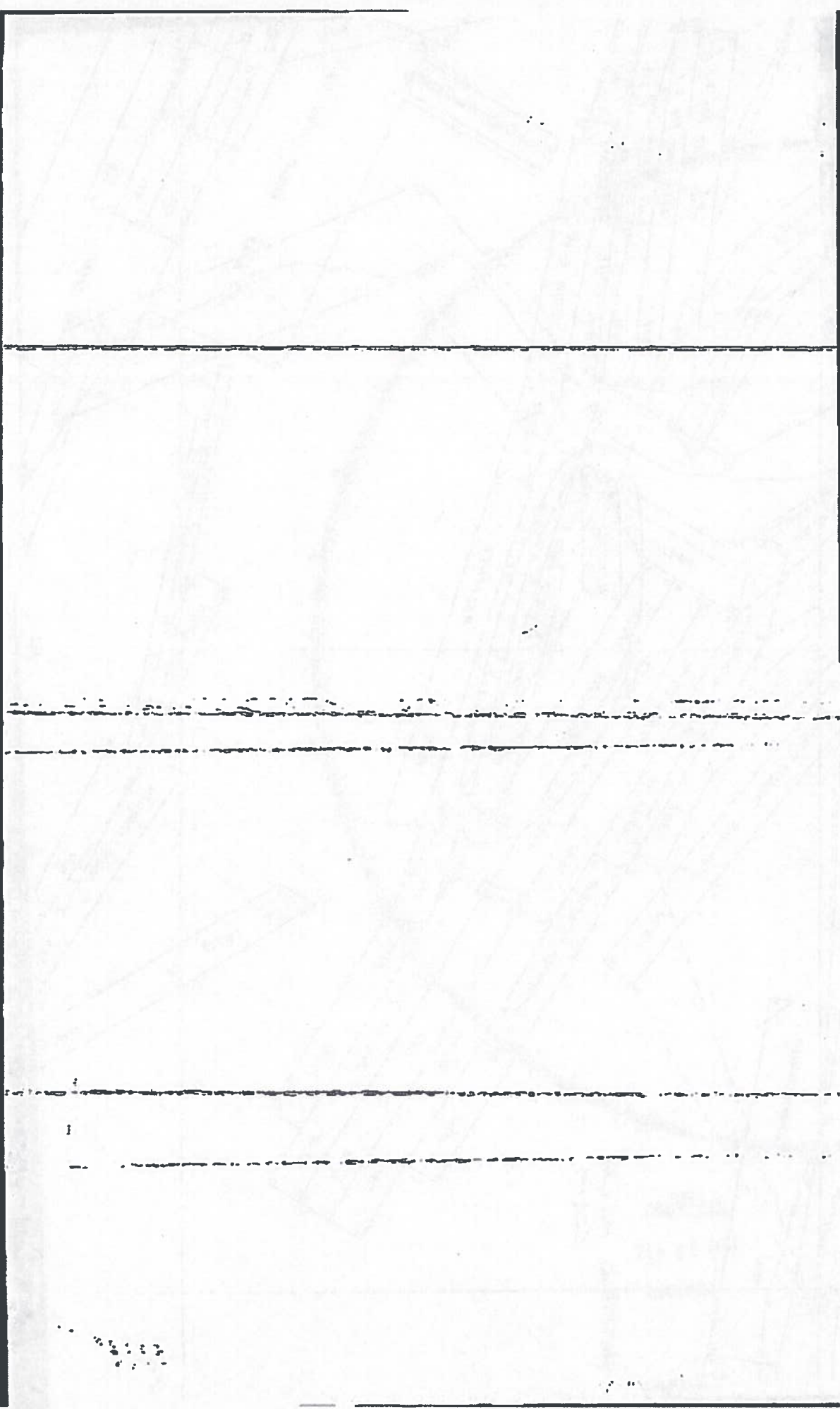
Case# 11998

NOTARY PUBLIC, GILPIN COUNTY, MICHIGAN
MY COMMISSION EXPIRES AUGUST 25, 2000

1998
11998
Doc Recd
CPLNRES
Address : Montvale, N.J. 07645

URS





Appendix II

Core Logs and Photos

PROJECT:

ROCK CORE LOG

BORING NO. P5		PROJECT NO.		LOCATION Perigo Mts		SHEET 1 OF 1	
TIME START		DRILLING CONTRACTOR Precision		DRILLING EQUIPMENT CME 55		DATE 10/23/13	
TIME STOP		DRILLER Tim		DRILLING METHOD Core		SAMPLING METHOD HR core	
TOTAL DEPTH		BACKFILL MATERIAL		WATER FIRST ENCOUNTERED		FINAL DEPTH TO WATER	

DEPTH (FT)	CORE RUN (IN)	RECOV. CORE LENGTH (IN)	TOTAL CORE RECOVERY (%)	SOLID CORE RECOVERY (%)	ROD (%)	FRICT. DENSITY (# PER FT)	PENETRATION RATE (FT/HR)	SAMPL. FOR TEST	GRAPHIC LOG	DESCRIPTION/LITHOLOGY/COMMENTS
41										
42										
43										
44										
45										
46										
47										
48										
49							11%			
50										Gneiss, w/ pegmatite zones, unaltered
51	2.7'	2.7'	100%		2.5/2.7'	93%				Gneiss, w/ pegmatite lenses
52	0.3	0.3	100%		0		156			Most fairs appear holed
53										
54	5.0'	5.0'	100%		2.45/5.0	90%	415'	0.8/ft		
55										
56										Core much broken
57							125			
58							340			
59	5.0'	5.0'	100%		4.8/5.0	96%	315'	0.6/ft		rough, irregular, Fr, Py (more nodular)
60										healed, cemented

LOGGED BY

OFFICE

DATE

PROJECT:

ROCK CORE LOG

BORING NO.		PROJECT NO.		LOCATION		SHEET OF				
TIME START		DRILLING CONTRACTOR		DRILLING EQUIPMENT		DATE				
TIME STOP		DRILLER		DRILLING METHOD		SAMPLING METHOD				
TOTAL DEPTH		BACKFILL MATERIAL		WATER FIRST ENCOUNTERED		FINAL DEPTH TO WATER				
DEPTH (FT)	CORE RUN (in)	RECOV. CORE LENGTH (in)	TOTAL CORE RECOVERY (%)	SOLID CORE RECOVERY (%)	ROD (%)	FRCT. DENSITY (# PER FT)	PENETRATION RATE (FT/MIN)	SMPL. FOR TEST	GRAPHIC LOG	DESCRIPTION/LITHOLOGY/COMMENTS
60										irregular, rough, many Fe
61										
62							1355 1412			
63										
64	5.0'	5.0'	100%		5.0/5.0	100%	1/5'	0.2/ft		
65										very rough, irregular, many Fe, may be rock break
66										
67							1422 1456			Fe-SiO ₂ coating
68										Fe, smooth
69	5.0'	5.0	100%		5.0/5.0	100%	3/5'	0.6/ft		
70										
71										
72							1505 1514			
73										
74	5.0'	5.0'	100%		5.0/5.0	100%	no fractures	0/ft		
75										
76										
77							1524 1530			slong filaments smooth, some SiO ₂
78	5.0'	5.0'	100%		4.8/5.0	96%	3/5'	0.6/ft		possible fract along filament / smooth / iron staining
79										
80										

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OFFICE

DATE

PROJECT:

ROCK CORE LOG

BORING NO.		PROJECT NO.		LOCATION		SHEET OF		
TIME START		DRILLING CONTRACTOR		DRILLING EQUIPMENT		DATE		
TIME STOP		DRILLER		DRILLING METHOD		SAMPLING METHOD		
TOTAL DEPTH		BACKFILL MATERIAL		WATER FIRST ENCOUNTERED		FINAL DEPTH TO WATER		
DEPTH (FT)	CORE RUN (IN)	RECOV. CORE LENGTH (IN)	TOTAL CORE RECOVERY (%)	SOLID CORE RECOVERY (%)	ROD (%)	FRCT. DENSITY (# PER FT)	PENETRATION RATE (FT/HR)	DESCRIPTION/LITHOLOGY/COMMENTS
80								
81								Same
82							1541 1228	Gneiss
83								disseminated Py / Steep 80-90° healed fracture
84	5.0'	5.0'	100%	100%	100%	no fractures 0/ft		granitic banding
85								
86							downed	
87							1238 1248	
88								
89	5.0'	5.0'	100%		4.4/5.0 88%	(4/5) 0.8/ft		Zone w/ high angle fractures (smooth, minor sh. & scale, Py clay)
90								Py zone (epidote alteration)
91								
92							1257 1309	steeply healed fracture healed fracture set (stepped, Fe) smooth, SiO ₂ cementing, replace smooth, SiO ₂ healed smooth
93								
94	5.0'	5.0'	100%		3.8/5.0 76%	(3/5) 1.8/ft		healed sandy, smooth, Fe rough, stepped, minor Fe (both)
95								
96								rough - grain smooth, Fe
97							1318 1331	
98	5.0'	5.0'	100%		5.0/5.0 100%	(2/5) 0.4/ft		Py (slightly altered)
99								SiO ₂ cement, chl. minor Py, smooth
100								

LOGGED BY _____ OFFICE _____ DATE _____

PROJECT:

ROCK CORE LOG

BORING NO.		PROJECT NO.		LOCATION			SHEET OF	
TIME START		DRILLING CONTRACTOR		DRILLING EQUIPMENT			DATE	
TIME STOP		DRILLER		DRILLING METHOD			SAMPLING METHOD	
TOTAL DEPTH		BACKFILL MATERIAL		WATER FIRST ENCOUNTERED			FINAL DEPTH TO WATER	
DEPTH (FT)	CORE RUN (in)	RECOV. CORE LENGTH (in)	TOTAL CORE RECOVERY (%)	SOLID CORE RECOVERY (%)	ROD (%)	FRCT. DENSITY (# PER FT)	PENETRATION RATE (F/HR)	DESCRIPTION/LITHOLOGY/COMMENTS
100								Healed fracture, chert alteration
101								Angular Gneiss
102							1313 1448	Rough, no coating
103								Wavy along foliation, minor SiO ₂
104	5.0'	5.0'	100%	4.3/5.0'	86%	(5/5')	1/ft	Minor py. stringers 2mm
105								very smooth, x foliation, minor SiO ₂
106							Drilling stand	very smooth, along foliation, siliceous foliation
107							1500 1504	smooth, along foliation, SiO ₂ /Fe
108								smooth, stepped, minor SiO ₂
109	5.0'	5.0'	100%	4.0/5.0'	80%	(5/5')	1/ft	py string in peg. 10mm
110								very smooth, x foliation
111								rough, irregular, minor SiO ₂
112							1519 1526	very smooth, through peg. somewhat, SiO ₂ /sp. chert
113								appears to be broken by drill action
114	5.0	5.0	100%	4.6/5.0	92%	(5/5')	0.6/ft	smooth, along foliation, clayey, ferr. (greasy)
115								smooth, x foliation, sp. chert/SiO ₂
116								
117							1541 1545	peg. bottom 1'
118								wavy, stepped, smooth, minor Fe
119	5.0	5.0	100%	3.5/5.0	70%	(7/5')	1.4/ft	smooth, x foliation, SiO ₂
120								

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DATE

PROJECT:

ROCK CORE LOG

BORING NO.		PROJECT NO.		LOCATION		SHEET OF				
TIME START		DRILLING CONTRACTOR		DRILLING EQUIPMENT		DATE				
TIME STOP		DRILLER		DRILLING METHOD		SAMPLING METHOD				
TOTAL DEPTH		BACKFILL MATERIAL		WATER FIRST ENCOUNTERED		FINAL DEPTH TO WATER				
DEPTH (FT)	CORE RUN (IN)	RECOV. CORE LENGTH (IN)	TOTAL CORE RECOVERY (%)	SOLID CORE RECOVERY (%)	ROD (%)	FRCT. DENSITY (# PER FT)	PENETRATION RATE (FT/HR)	SMPL. FOR TEST	GRAPHIC LOG	DESCRIPTION/LITHOLOGY/COMMENTS
120										very smooth, xfoliation, SiO ₂ /epidote
121										smooth, xfoliation, SiO ₂
122							1623 1609			smooth, xfoliation, SiO ₂
123										rough, xfol, SiO ₂
124	5.0'	5.0'	100%		9.1/50 (92%)	10/5'	2/ft			smooth, SiO ₂ /epidote/Ry smooth, SiO ₂ stepped smooth SiO ₂
125										semi smooth - along fol. SiO ₂ xfol, smooth, SiO ₂ (frag)
126										
127							1621			
128										
129										
130										
131										
132										
133										
134										
135										
136										
137										
138										
139										
140										

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DATE

PROJECT:

ROCK CORE LOG

BORING NO.		PROJECT NO.		LOCATION				SHEET OF		
TIME START		DRILLING CONTRACTOR		DRILLING EQUIPMENT				DATE		
TIME STOP		DRILLER		DRILLING METHOD				SAMPLING METHOD		
TOTAL DEPTH		BACKFILL MATERIAL		WATER FIRST ENCOUNTERED				FINAL DEPTH TO WATER		
DEPTH (FT)	CORE RUN (IN)	RECOV. CORE LENGTH (IN)	TOTAL CORE RECOVERY (%)	SOLID CORE RECOVERY (%)	ROD (%)	FRICT. DENSITY (# PER FT)	PENETRATION RATE (F/HR)	SUPL. FOR TEST	GRAPHIC LOG	DESCRIPTION/LITHOLOGY/COMMENTS
1										
2										
3										
4										
5										
6										
7										
8										
9										
0										
1										
2										
3										
4										
5										
6										
7										
8										
9										

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Gamble Gulch, Perigo Mine, HQ Core from Boring P5



Boring P5: 49.0'-52.0'



Boring P5: 52.0'-65.9'



Boring P5: 65.9'-74.3'



Boring P5: 74.3'-83.0'

Perigo Mine

Boring P5, HQ Core



Boring P5: 83.0'-91.5'



Boring P5: 91.5'-99.0'



Boring P5: 99.0'-109.0'



Boring P5: 109.0'-117.8'



Boring P5: 117.8'-126.2'

Appendix III

Rock Mass Ratings

The input data given and the calculated results



Project: Perigo

Date: 10-Feb-15

Tunnel: Lower Crosscut

Location: Gamble Gulch, Gilpin County, Colorado

Observer: Jeff Graves

Note: Data based on recovered core from Boring P5

Rock(s): Biotite Gneiss, Granite Migmatite

Input parameters		Input values and ratings used		
		RMR 1989	Q 1993	RMI 2008
Tunnel data	Tunnel span (m)	Span = 2.13	Span = 2.13	DI = 2.13
	Wall height (m)	Wall = 2.13	Wall = 2.13	WI = 2.13
A. Rock	A1 Compressive strength of intact rock:	A1 = 7	-	$\sigma_c = 100$ MPa
B. Degree of jointing	B1 Rock Quality Designation (RQD):	A2 = 20	RQD = 91	-
	B2 Block volume:	-	-	Vb = 0.105 m3
	B3 Joint spacing:	A3 = 10	-	-
C. Jointing pattern	C1 Block shape factor:	-	-	$\beta = 27$
	C2 Number of joint sets:	-	Jn = 6	NJ = 1.2
	C3 Orientation of main in roof:	B = -2	-	Co = 1
	C4 Joint set in walls:	-	-	Co = 1
D. Joint characteristics	D1 Joint smoothness:	A4c = 1	Jr = 2	Js = 1
	D2 Joint undulation:	-		Jw = 2
	D3 Joint alteration weathering:	A4e = 6	Ja = 1	JA = 1
	D3 Joint alteration filling:	A4d = 6		-
	D4 Joint length or persistence:	A4a = 4	-	JL = 1.5
	D5 Joint separation or aperture:	A4b = 5	-	-
E. Interlocking	E Compactness of rockmass:	-	-	IL = 1
F. Ground water	F Ground water inflow:	A5 = 10	Jw = 1	GW = 1
G. Rock stresses	G1 Stress level:	-	SRF = 2.5	SL = 0.1
	G2 Stress ratio/ground competency:	-		Cg = -
H. Weakness zones	H1 Type of weakness zone:	-	-	-
	H2 Thickness or width of zone:	-	-	Tz = -
	H3 Orientation in roof:	-	-	Co = -
	H4 of zone in walls:	-	-	Co = -

Note that swelling rock is not included

RESULTS FROM CALCULATIONS (for conditions in tunnel or cavern)

		RMR	Q	RMI
Continuity of rockmass (related to tunnel) →		-	-	Continuous // discontin.
Interlocking of rockmass structure →		-	-	Tight structure
Rock mass quality (approx. strength, σ_{cm})		-	-	$\sigma_{cm} \approx$ RMI = 17.7 High
Ground quality (related to stability)	in roof	RMR = 67 Good	Q = 12.13333 Good	Gc = 1.77 Fair
	in walls	RMR = 67	Q _{wall} = 60.66667	Gc _{wall} = 8.87
Blockiness (related to block instability)	in roof	-	-	Sr = 3.8 Very favourable
	in walls	-	-	Sr _{wall} = 3.8 Very favourable
Weakness zone		-	-	-
Rockmass stresses	Potential stress problems →	-	Very low stress level (in portals)	Poor interlocking
		-	-	-
Limitations		-	-	-

Sr = Size ratio (geometrical factor involving block diameter, tunnel span, plus number of joint sets and orientation of joints)

Gc = Ground condition factor

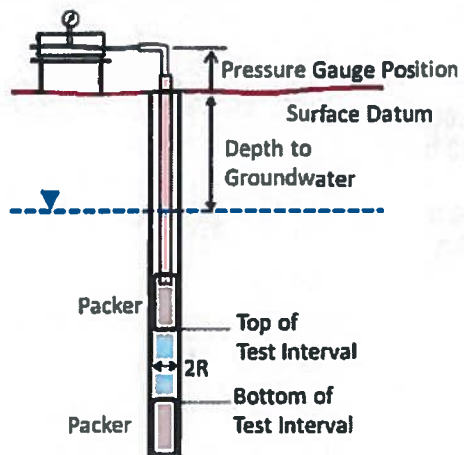
Cg = Competency of ground ($Cg = \sigma_{cm} / \sigma_0 = RMI / \sigma_0$)

Reference: A. Palmström, Q-RMR-RMI, version 3, RockMass AS, November 2012

Appendix IV

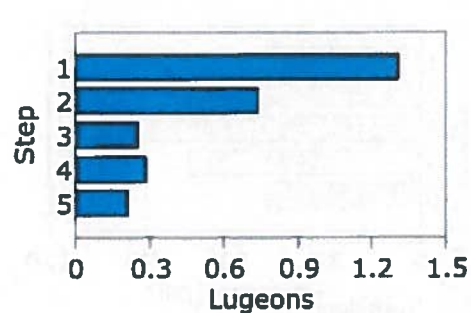
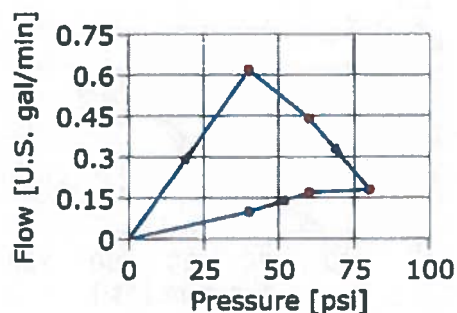
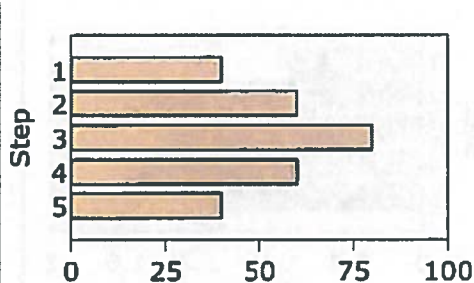
Packer Tests

Location: Adjacent to Perigo Crosscut	Lugeon Test: Lugeon Test 1	Tested bore: P5
Test Conducted by: JTG		Test Date: 10/24/2013
Analysis Performed by: JTG		Analysis Date: 11/4/2014
Lithology: Granite Gneiss		



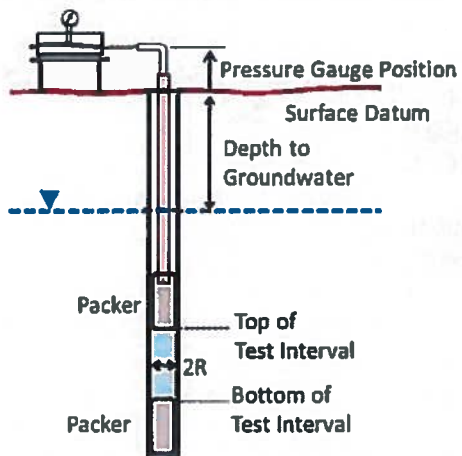
Top of Test Interval: 71.000 ft
 Bottom of Test Interval: 82.000 ft
 Length of Test Interval: 11.000 ft
 Gauge Position: 4.000 ft
 Depth to Groundwater: 83.000 ft
 Radius of Test Section: 0.158 ft

Step	Pressure [psi]	Flow Meter Readings [U.S. gal]						Average Flow Rate [U.S. gal/min]	Hydraulic Conductivity		
		1	2	3	4	5	6		[cm/s]	[ft/d]	Lugeon
1	40	8892.40	8893.20	8893.80	8894.40	8894.90	8895.50	0.62	1.44×10^{-5}	0.041	1.3
2	60	8896.70	8897.10	8897.50	8897.90	8898.40	8898.90	0.44	8.14×10^{-6}	0.023	0.7
3	80	8902.30	8902.50	8902.65	8902.80	8903.00	8903.20	0.18	2.77×10^{-6}	0.008	0.3
4	60	8903.40	8903.60	8903.75	8903.90	8904.10	8904.25	0.17	3.15×10^{-6}	0.009	0.3
5	40	8904.40	8904.50	8904.60	8904.70	8904.80	8904.90	0.10	2.33×10^{-6}	0.007	0.2
Average									6.16×10^{-6}	0.017	0.6



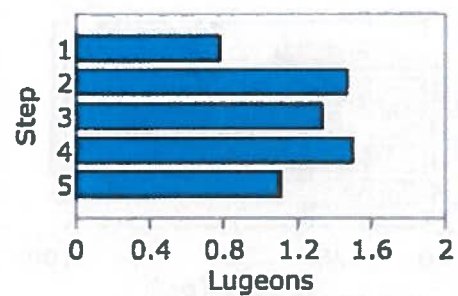
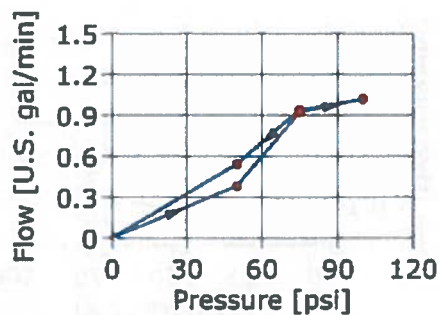
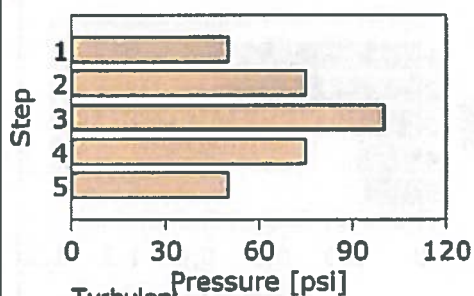
Void filling
 Lugeon: 0.2
 Hydraulic Conductivity: 2.33×10^{-6} cm/s
 Hydraulic Conductivity: 0.007 ft/d

Location: Adjacent to Perigo Crosscut	Lugeon Test: Lugeon Test 2	Tested bore: P5
Test Conducted by: JTG		Test Date: 10/24/2013
Analysis Performed by: JTG		Analysis Date: 11/4/2014
Lithology: Granite Gneiss		



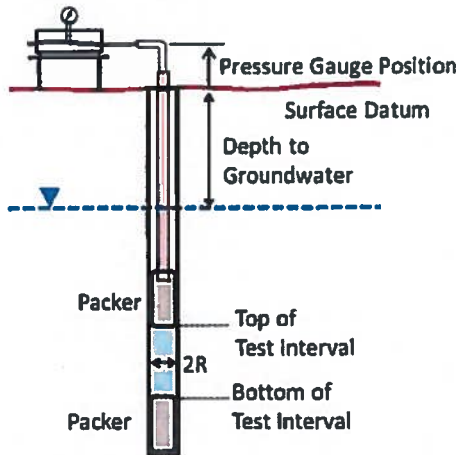
Top of Test Interval: 92.00 ft
Bottom of Test Interval: 102.00 ft
Length of Test Interval: 10.00 ft
Gauge Position: 4.00 ft
Depth to Groundwater: 83.00 ft
Radius of Test Section: 0.16 ft

Step	Pressure [psi]	Flow Meter Readings [U.S. gal]						Average Flow Rate [U.S. gal/min]	Hydraulic Conductivity		
		1	2	3	4	5	6		[cm/s]	[ft/d]	Lugeon
1	50.0	8908.70	8909.05	8909.45	8909.75	8910.15	8910.60	0.38	8.43×10^{-6}	0.02	0.8
2	75.0	8911.50	8912.45	8913.30	8914.20	8915.25	8916.10	0.92	1.59×10^{-5}	0.05	1.5
3	100.0	8917.00	8918.10	8919.20	8920.05	8921.10	8922.10	1.02	1.44×10^{-5}	0.04	1.3
4	75.0	8923.00	8923.90	8924.80	8925.90	8926.80	8927.70	0.94	1.62×10^{-5}	0.05	1.5
5	50.0	8928.80	8929.05	8929.70	8930.30	8930.90	8931.50	0.54	1.20×10^{-5}	0.03	1.1
Average									1.34×10^{-5}	0.04	1.2



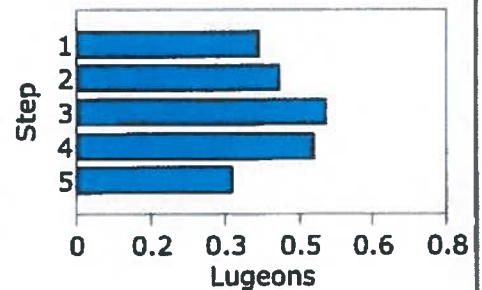
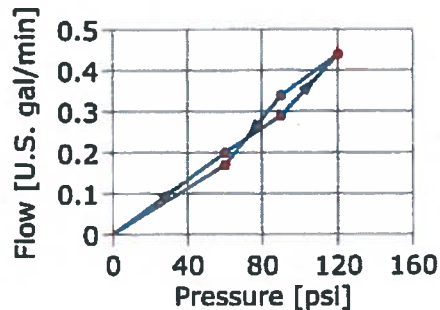
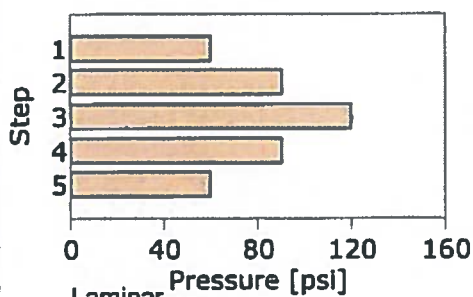
Turbulent
Lugeon: 1.5
Hydraulic Conductivity: 1.59×10^{-5} cm/s
Hydraulic Conductivity: 0.05 ft/d

Location: Adjacent to Perigo Crosscut	Lugeon Test: Lugeon Test 3	Tested bore: P5
Test Conducted by: JTG		Test Date: 10/24/2013
Analysis Performed by: JTG		Analysis Date: 11/4/2014
Lithology: Granite Gneiss		



Top of Test Interval: 117.000 ft
 Bottom of Test Interval: 127.000 ft
 Length of Test Interval: 10.000 ft
 Gauge Position: 4.000 ft
 Depth to Groundwater: 83.000 ft
 Radius of Test Section: 0.158 ft

Step	Pressure [psi]	Flow Meter Readings [U.S. gal]						Average Flow Rate [U.S. gal/min]	Hydraulic Conductivity		
		1	2	3	4	5	6		[cm/s]	[ft/d]	Lugeon
1	60.0	8947.300	8947.600	8947.800	8948.000	8948.200	8948.300	0.200	3.98×10^{-6}	0.01	0.4
2	90.0	8948.800	8949.100	8949.400	8949.700	8950.000	8950.250	0.290	4.42×10^{-6}	0.01	0.4
3	120.0	8950.600	8951.000	8951.500	8951.900	8952.400	8952.800	0.440	5.43×10^{-6}	0.02	0.5
4	90.0	8953.000	8953.500	8953.800	8954.100	8954.400	8954.700	0.340	5.18×10^{-6}	0.01	0.5
5	60.0	8954.800	8955.000	8955.150	8955.650	8955.500	8955.650	0.170	3.38×10^{-6}	0.01	0.3
Average									4.48×10^{-6}	0.01	0.4



Laminar
 Lugeon: 0.4
 Hydraulic Conductivity: 4.48×10^{-6} cm/s
 Hydraulic Conductivity: 0.01 ft/d

Appendix V

Subsurface Geophysics Report



November 15, 2013

Matt Grizzell
Senior Geologist
Shannon & Wilson, Inc.
1321 Bannock Street, Suite 200
Denver, Colorado 80204
Phone: (303) 825-3800, Direct: (720) 258-4110, Fax: (303) 825-3801, Cell: (720) 202-9081
mtg@shanwil.com

Re: Project Deliverables – Final Letter Report for Geophysical Sonar Survey Mapping of Water-Filled Mine Void, Perigo Mine Crosscut, Rollinsville, Colorado. Project No. 0060300

Dear Mr. Grizzell:

Zapata Incorporated (ZAPATA) is pleased to submit this letter report, including three hard copies, and one electronic copy on DVD including figures and borehole video records for the above-referenced project. The sonar survey was conducted in the abandoned Perigo Mine Crosscut (drift) located southwest of Rollinsville, Colorado. ZAPATA performed the work under a subcontract agreement to Shannon & Wilson, Inc., in support of the Colorado Division of Reclamation Mining and Safety (DRMS). The objective of the sonar survey was to determine the drift void space size, orientation, and volume. The survey was performed in a borehole designated as P4. The borehole coordinates were provided by Jeff Graves of DRMS and listed below. This borehole intersected an open, water-filled drift, the top of which was measured at 116 feet below ground surface (bgs), and the bottom of the tunnel measured at 123 feet bgs. This survey was performed on October 31, 2013. Figure 1 presents photographs of the mine site, and field setup of the sonar survey.

Sonar Borehole Coordinates (UTM Zone 13 N NAD83)

Borehole ID	Coordinates		Elevation*
	Easting, m	Northing, m	
P4	454568	4414642	
*Not available			

Borehole Video Camera

Before the deployment of the downhole sonar into borehole P4, a borehole video camera was deployed to assess mine conditions and ensure the safe retrieval of sonar equipment. The camera encountered groundwater at 106 feet bgs, and then entered into the drift at 116 ft. bgs. The water within the drift contained quite a bit of suspended material, limiting visibility to within a few feet

of the camera. A video of the tunnel roof was recorded at this time, and is included on the accompanying DVD.

The borehole camera was deployed deeper into the drift to assess the limits of sonar deployment. Two feet above the bottom of the tunnel, the camera encountered a layer of soft material, presumably the same material that was suspended in the water column above. The camera was able to penetrate into this layer, but visibility was reduced to zero. The camera hit solid rock at 123 feet bgs.

Borehole Sonar Survey

The borehole sonar survey was conducted using an Imagenex Model 881A Digital Multi-frequency Profiling Sonar System which consists of a digital sonar unit, internal magnetic compass, and an end-mounted tether connector. The unit is capable of taking distance measurements up to 300 feet (line of sight) in 360-degree horizontal planes, referred to as scans. Scans are referenced using the depth from the ground surface, borehole surface coordinates, and the internal magnetic compass (azimuth from magnetic north (MN)). All sonar images were adjusted for geographic north (GN) using a magnetic declination of 8.9° E.

After some experimentation with the borehole sonar at different levels within the mine drift, it became evident that the line of sight down the tunnel was obstructed on either side by piles of debris (rubble). This, in conjunction with the soft layer of material lying on the floor of the tunnel, restricted the range where the sonar could see long distances on either side of the drift. This narrow window occurred at roughly 117 feet bgs, at which point the sonar produced and received returns measuring nearly 60 feet from the sonar instrument.

Figure 2 shows an example of the sonar scan field record, and processed data corrected to true north at depth of 117 feet bgs. Sonar data was recorded using scan range of 12 ft/division, as is noted in the figure.

Figures 3 and 4 show two plot windows of the AutoCad drawings representing the boundaries of the Perigo Mine Crosscut (Roosevelt Crosscut and the Canterbury Tunnel). Figure 3 shows only the polygons "composite sonar scans" for each depth slice at 116.75, 116.9, 117, and 117.5 feet bgs. Figure 4 shows the data point clouds representing high reflectivity in the sonar data and the layer polygons defining the boundary of the visible open void space for each depth slice. As shown in the figures, the alignment of the Roosevelt Crosscut and Canterbury Tunnel and from the sonar data compares well with the historic map (USGS Professional Paper 235, Plate 11). The alignment of the drift/tunnel was determined to be approximately 310° (50° NW).

The volume of the drift was determined based on the maximum and minimum areas mapped by the sonar, which are calculated to be:

Total drift length 60 ft

Maximum drift volume = drift plan view area 5,404 ft² x 7 ft = 37,828 ft³ (4,203 yd³)

Minimum drift volume = 37,828 ft³ x 50% = 18,914 ft³ (2,102 yd³)

A brief error analysis of the sonar data includes two main sources of error: angular error and ranging error. Angular error occurs in the azimuth measurement of the sonar unit which uses an internal magnetic compass to delineate magnetic north. The range of angular error is the sum of contribution of error from the inherent accuracy of the internal compass, effect of magnetic minerals/ferrous metal present in close proximity to the sonar tool, and error due to small movement of the sonar tool suspended on a wireline during scan recording. Ranging error is the sum of the contribution of error from water velocity time-to-distance conversion, timing/event picking accuracy and the effects of scattering typically due to rugosity and incidence angle of the reflecting surface, and the beam width which increases with distance from the sonar head. Based on an analysis of the data, the angular error is on the order of approximately $\pm 1^\circ$ and the ranging error is on the order of ± 0.5 ft. Due to the type of error involved, the absolute accuracy is highest in close proximity to the sonar unit and decreases with distance from the sonar unit.

The deliverables include three hard copies of the report and one electronic copy of the report, figures, and video record on DVD.

We appreciate the opportunity to be of service to Shannon & Wilson, Inc., in support of the DRMS project. Please feel free to contact us if you have any questions.

Sincerely,
Zapata Incorporated

By: _____
Steve Hodges
Senior Geophysicist

By: _____
Kanaan Hanna
Senior Mining Engineer

Enclosures

Mine Site and Sonar Data Acquisition Equipment



Borehole 4-inch PVC and Sonar Void Imaging Tool



301 Commercial Road, Suite B 303-278-8700 Phone
Golden, Colorado 80401 303-278-0789 Fax
zapata@zapatainc.com www.zapatainc.com

Shannon and Wilson
Denver, Colorado

Project No.
00603-00

Date
November, 2013

Drawn By
JMN

Checked By
KH

Scale
NOT TO SCALE

Figure
1

Geophysical Sonar Survey
Mine Site and Sonar Field Setup Survey
Perigo Mine Crosscut
Rollinsville, Colorado

Field Record

Borehole P4 Coordinates

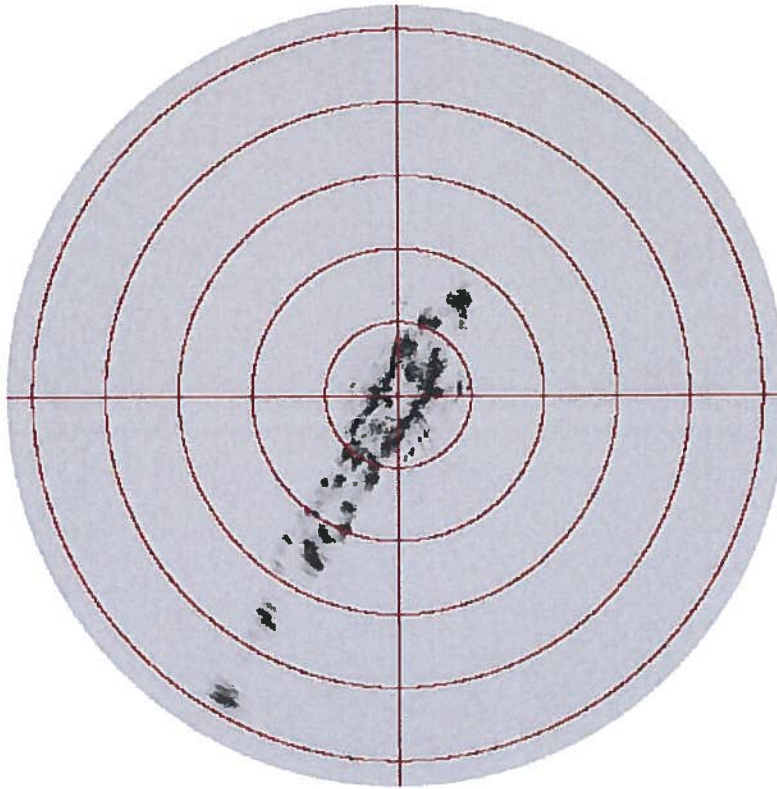
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N=4414642 m

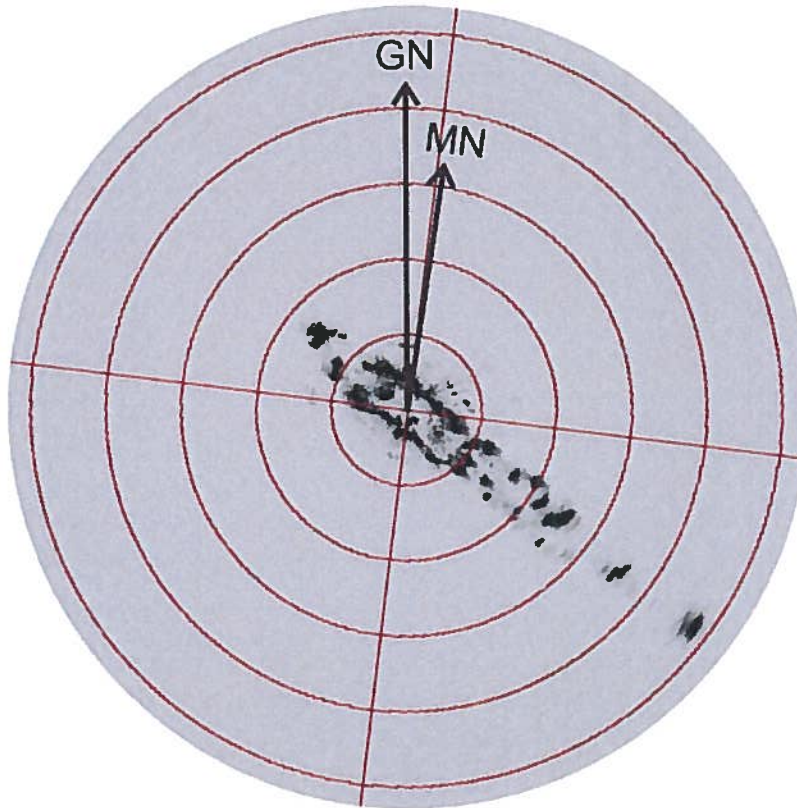
UTM Zone 13N NAD83

Scan Depth = 117' bgs

Scan Division = 12'



Processed Scan



301 Commercial Road, Suite B 303-278-8700 Phone
Golden, Colorado 80401 303-278-0789 Fax
zapata@zapatainc.com www.zapatainc.com

Shannon and Wilson
Denver, Colorado

Project No
00603-00

Date
November, 2013

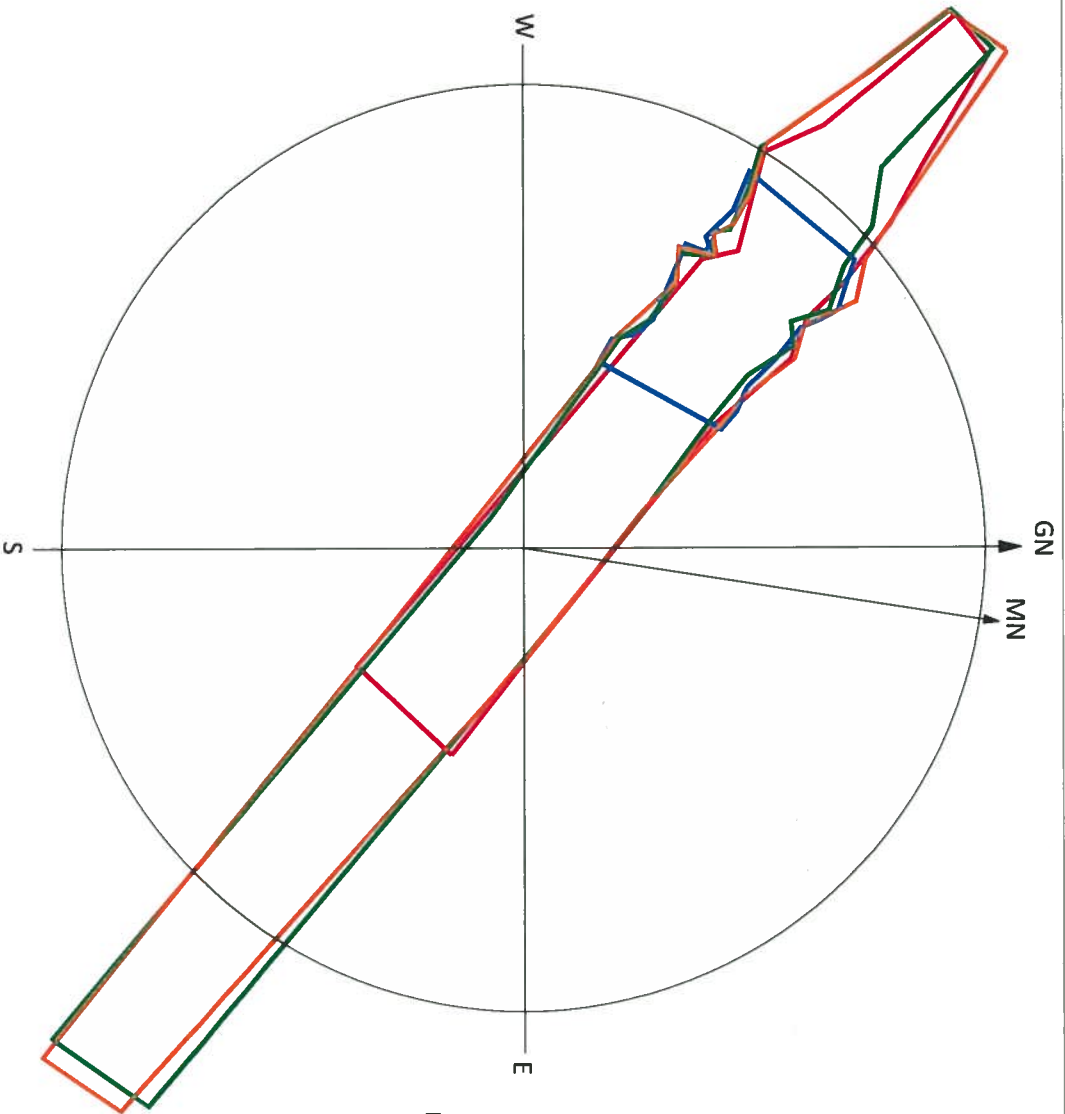
Drawn By
JMN

Checked By
KH

Geophysical Sonar Survey
Field Record & Sonar Scan
Perigo Mine Crosscut
Rollinsville, Colorado

Scale
NOT TO SCALE

Figure
2



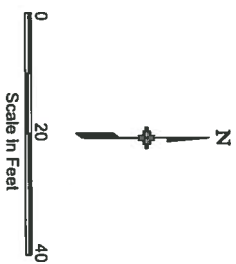
Borehole P4 Coordinates

E=454568 m
N=4414642 m
UTM Zone 13N NAD83

Horizontal Scans Depth Below Ground Surface

116.75 ft - bgs
116.9 ft - bgs
117 ft - bgs
117.5 ft - bgs

Maximum Mapped Area (orange line)
5403.5 sqft



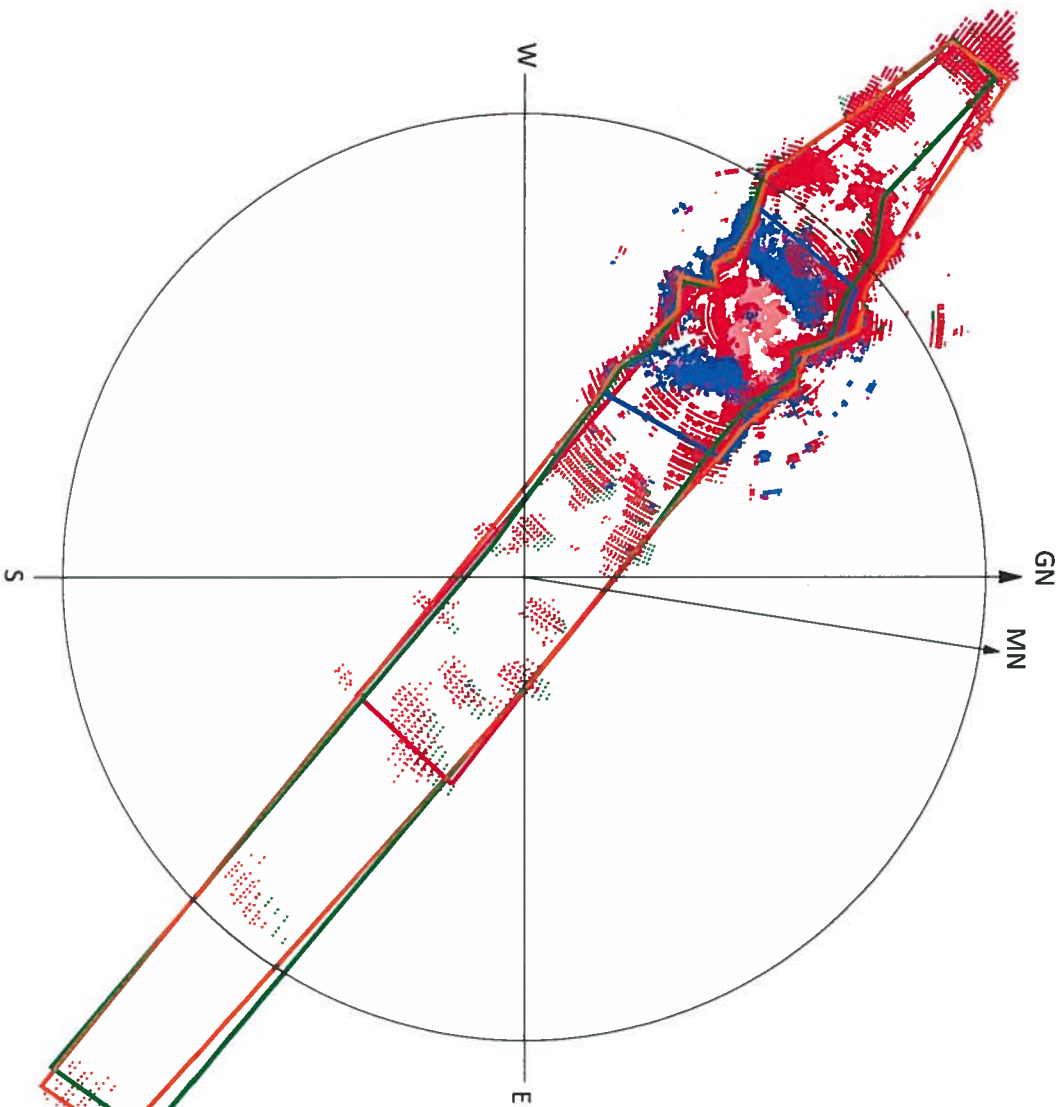
Shannon & Wilson, Inc. Denver, Colorado		Composite Scan Data Plot Borehole P4 Perigo Mine Crosscut Ridgelyville, Colorado	
PROJECT #	DATE	DRAWN BY	CHECKED BY
00003-00	11/20/2013	JAM	JP
SCALE		FIGURE	
1"=20'		3	



PROJECT #	DATE	DRAWN BY	CHECKED BY	SCALE	FIGURE
00003-00	11/09/2013	JMM		1"=20'	4

Shannon & Wilson, Inc.
Denver, Colorado

Composite Sonar Data Plot
Borehole P4
Rollinsville, Colorado



Borehole P4 Coordinates

E=454568 m
N=4414642 m
UTM Zone 13N NAD83

Horizontal Scans Depth Below Ground Surface

116.75 ft - bgs
116.9 ft - bgs
117 ft - bgs
117.5 ft - bgs

Maximum Mapped Area (orange line)
5403.5 sqft

