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# Carlsbad Cavern Expedition Report

## New Mexico Room, Guadalupe Room, Chocolate High and Left Hand Tunnel Sections: November 23-30, 2019

*submitted by: Derek Bristol - December 29, 2019*

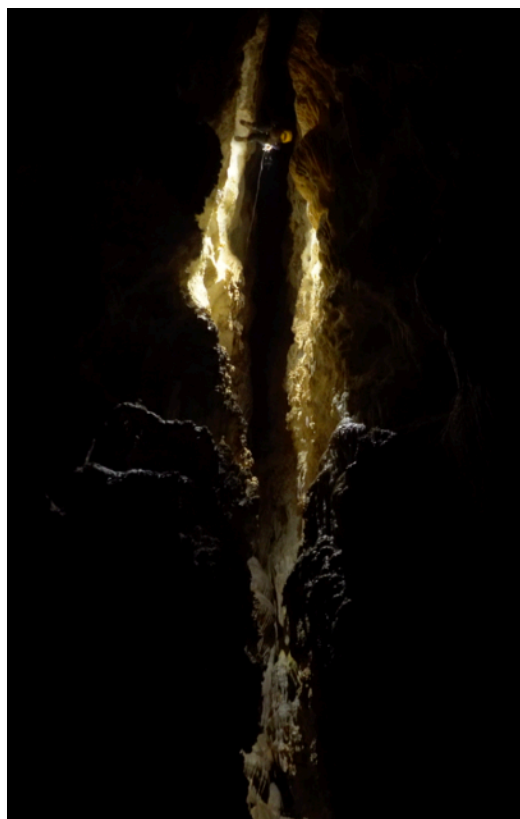
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### Summary

This report summarizes the results of an eight-day expedition to the New Mexico Room, Guadalupe Room, Chocolate High and Left Hand Tunnel sections of Carlsbad Cavern. The expedition was planned and led by Derek Bristol. Most of the focus during the expedition was in the New Mexico Room with several trips to the Western Lower Maze and Ranger Room. There were a few trips to the Guadalupe Room Complex to continue working on the Lil' Lechuguilla area as well as some mop-up efforts along the Sand Passage and FA Maze. There were two trips up to Chocolate High that were both very productive with a focus on cleaning up leads near the top of the ropes. Finally, there was one trip out to the Bell Cord Room to look at climbing leads in the BCH survey and Bifrost Room. The results of the expedition included 6,539.7 feet of total survey; 6,445.3 feet of new survey and 94.4 feet of redundant survey. The expedition added 1.22 miles to the length of Carlsbad Cavern, which now stands at 39.52 miles. Some of the work during this expedition represents the start of a resurvey effort in the Western Lower Maze, and some of the old CF survey has yet to be excluded, which will reduce the surveyed length by approximately 1,000 feet.

### Expedition Goals and Accomplishments

The primary goals for this expedition were to continue working on surveying leads in the Guadalupe Room, New Mexico Room and Chocolate High sections in order to produce more complete maps. In addition to pushing leads, there were a few areas in the Guadalupe Room Complex near Hall of the White Giant and the middle level of the Guadalupe Room where there was a need to clarify and improve the sketch detail. Pre-printed line plots of these areas were brought on the expedition, but time did not allow getting to these tasks. This will be a higher priority



*Sonia Meyer descending the Chocolate Drop.  
(Photo by Derek Bristol)*

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on the next expedition. After attempting to draft the Western Lower Maze, several areas were identified with bad loops and poor sketch quality, and it was determined that the southwest corner of this area would need a resurvey; however, once a few other areas were visited to push leads, it was determined that the sketching and data problems were more widespread than originally thought. The decision was made during the expedition to proceed with a full resurvey of the Western Lower Maze. Much of the CF1-43, CF60-100 and CF300-317 has been surveyed that includes some resurvey and some new. The Ranger Room was visited by teams over five days and has been fully surveyed with the exception of a handful of very tight leads. This area is complex and very well decorated. The survey data shows the southern-most station (NMR8) is only 21 feet from a station in the King's Palace (K33), but there are no leads on either side. Trips to Chocolate High focused on areas surrounding the northern end of Chenille Basin, with hopes of finding a breakout on the western side of Chocolate High. Nearly 100 stations were surveyed in just two trips, but no major breakthroughs were made. A good wide lead was left heading back south that looks promising. A trip was made to the Bell Cord Room and one of the climbing leads reported by Michael Queen was investigated. The lead was easy to get into without technical climbing and has extremely strong airflow on the edge of the cave, but goes into a wide fissure that is less than 7 inches tall. Enlargement of the passage will be necessary to continue. Cartography has been fully updated prior to this expedition, and it will be updated again before returning.

## Team

Team members included Derek Bristol (CO, expedition leader, sketcher, climber), Steve Reames (CO), Marty Reames (CO), Aria Midice (NM, sketcher), Sonia Meyer (CA), Hazel Barton (OH, sketcher), Garrett Jorgensen (NM, sketcher), Kevin Manley (CO, sketcher), Jen Foote (NM), Amy Bern (CO), Carl Bern (CO, sketcher), Ben Smith (CO) and Kelli Housley (NM). Most of these cavers have done volunteer work in Carlsbad Caverns NP in the past. This was the first expedition for Ben. Everyone caved safely, with low impact, and remained focused on generating high quality survey data. All veteran and new team members should be welcomed back.



*The team in Quarters 56, preparing to enter the cave. (Photo by Derek Bristol)*

## Detailed Daily Reports

*Note: daily trip leaders for each team are underlined.*

**November 23, 2019 (New Mexico Room - Mezzanine and Balcony)**

Derek, Sonia, Hazel, Kevin and Jen entered the cave via the elevator at 12:00 and traveled out to the New Mexico Room via the normal route and followed the NMA survey up to the Mezzanine at CM18.

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The team of Hazel, Kevin and Jen followed a lead going east along the lower edge of the room into a series of boneyard crawls. They surveyed several passages to too-tight constrictions using NME1-10. The team of Derek and Sonia followed the CM survey of the Mezzanine past a very delicate constriction at CM14-16 and checked leads at CM10 and 14 that were just blind alcoves. The lead at the pit going down to the NM Room was not a lead, but just the lower part of the pit. They returned to the room at CM18 and surveyed pit connections down to the passage being surveyed by the other team, and finished off all other boneyard leads in the same room. The Hazel, Kevin and Jen team returned to the New Mexico Room and surveyed the boneyard crawl below the rope drop using NMB9-16, tying into NMB3. Derek and Sonia returned to the upper part of the Balcony and surveyed leads near NMA32 using NMA32A-F, and left one very small lead. During this



*Bat skeleton in flowstone on Balcony of the New Mexico Room. (Photo by Hazel Barton)*

survey they remembered that NMA32-46 was accidentally duplicated in December 2017 with another survey in the same area. One of the surveys was entered into Compass using a prime suffix, but the labels were never changed. The team replaced all of the NMA32-48 designations through the Horsehead Pool area using NMG1-17. This avoids any sequences with the prime designator and eliminates duplicate names in the same region. The Compass file has been updated to reflect these new designations, but the original survey notes should have a comment added. The two teams met back in the New Mexico Room and traveled out the Natural Entrance together without incident, exiting at 21:00. A total of 268.5 total feet was surveyed by Derek and Sonia in 15 shots using CMA1-4 and NMA32A-F. A total of 348.9 feet was surveyed by Hazel, Kevin and Jen in 25 shots using NME1-10 and NMB9-16.

### **November 24, 2019 (Guadalupe Room Complex - Sand Passage and Los Cuates Room)**

Derek, Hazel, Kevin, Jen and Sonia entered the cave via the Natural Entrance at 9:30 and traveled out to the Sand Passage via the normal route and went to the F-Fissure, but found that vertical gear is needed to descend, but a rope had been left rigged. Since the team didn't have vertical gear they retreated and the team of Kevin, Jen and Sonia used shoe covers to reach leads at F11 and G201. These were surveyed and resurveyed respectively to completion. Two other leads in the area were found to be too tight. The team of Hazel and Derek went down the trail a short distance and surveyed a few leads off of G60 and G61. These all ended or looped back to known passage. Jen was escorted out to the tour trail because she needed to leave early, and the teams went back in together to the Los Cuates Room where they surveyed a lead at F134 and F107. The breakdown collapse at F107 was inspected, with two tight leads found that blow a lot of air. The lower lead is a too-tight dig, but the upper lead

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can be entered by climbing up some breakdown blocks and making an awkward move past an old piece of white flagging tape. Derek scouted this passage for about 60 feet and it is a 10-12 foot high fissure that is ~18 inches wide and coated in slippery mud. It is a meandering fissure that blows a ton of air that feels slightly cold and smells a bit like the entrance area. This is a good lead to return to and may eventually connect up to Bat Cave. The team traveled out together without incident, exiting via the Natural Entrance at 20:30. A total of 612.5 feet was surveyed in 38 shots using G60A-F, G61A-E, F92A, F107A-E, F134A-E, F11A-D and G202-205. 535.7 feet was new survey, and 76.8 feet was redundant.

### **November 25, 2019 (Chocolate High and Ranger Room)**

Derek, Sonia and Hazel entered the cave at 10:00 along with Kevin, Marty and Steve via the elevator and traveled out to the New Mexico Room via the normal route. Derek, Sonia and Hazel went to the Chocolate Drop rope and ascended without incident. Shoe covers were used to reach the rope and cross Chenille Basin. Chenille Basin is quite tracked up and in need of restoration. Traveling across the



*Derek Bristol on the first rebelay of Liberty Dome. (Photo by Hazel Barton)*

area in clean shoes causes those clean shoes to get a bit dirty and then this makes the tracking of dirt worse. Vertical gear was left at the entrance to Chocolate High and the team followed the CDHC survey through a low crawl area to reach a lead at CDHC11. This was found to be an easy climb up without going passage above. The upper and lower level near CDHC11 was surveyed with CDHC11A-E. The team then traveled a short distance to CDHC13 and surveyed a low area to the north using CDHC13A-H. This entire area had been previously scooped, but no

going leads were left. The team then surveyed a descending passage, also off of CDHC13 but going west using CAT1-17. There were two places where the passage connects back into the west side of Chenille Basin. Most of this CAT1-17 area is low and decorated, and had also been previously scooped. The team then climbed up to a higher level and surveyed a lead going south from CDHC15 using CAT18-21 through an area with a heavy concentration of soda straws, and eventually tied into CDA4. Several side leads were left in this broad area that will likely tie into other parts of Chocolate High. The team traveled back to the rope and descended without significant problems and met the team that had been working in the Ranger Room. A total of 527.9 feet was surveyed in 35 shots using CDHC11A-E, CDHC13A-H, and CAT1-21.

Meanwhile, Kevin, Marty and Steve crossed the New Mexico Room on the flagged trail to reach the Ranger Room. They rigged some webbing at the climb to the Ranger Room to make the climb safer.

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From there, they made their way to NMB8 and rigged the drop to begin the survey. There is a large stalagmite next to the rope that is broken and may fall. This drop led to a well-decorated room that was named the Junior Ranger Room. They surveyed through the room until reaching the drop at a fissure at NMB23. Being out of rope and time, they stopped there for the day. The two teams met in the New Mexico Room and traveled out together without incident, exiting the Natural Entrance at 21:30. A total of 124.6 feet was surveyed in 7 shots using NMB17-23.

**November 26, 2019 (Western Lower Maze and Ranger Room)**

Derek, Hazel and Sonia entered the cave at 10:30 along with Kevin, Steve and Marty via the elevator and traveled out to the New Mexico Room via the normal route. Derek's team went to the Sand Room on the west side of the New Mexico Room. They brought a 100-foot static rope and this was used to make a rope toss over a stalagmite on a ledge that is about 15-feet above the floor. This was ascended to the ledge and the top was free climbed up an additional 10 feet, but the top of the dome pinched and there was no going passage. The rope was used to rappel back to the ground, the rope was pulled down, and the dome was surveyed using a single shot. The team traveled back to NMC2 and surveyed down a small hole in the floor that is behind a breakdown block and missed on a previous survey trip to the area. This descending passage is very delicate and it was surveyed to a window above the north wall of the New Mexico Room and tied into NMB2. The team then went to a passage that descends into the north end of Western Lower Maze using the CF300- survey sequence. For some reason this survey did not leave recoverable survey stations, despite the fact that leads were left. Due to loop closure errors and inaccurate sketches the decision was made to start a full resurvey of the area. A new survey designation (CG) was used by tying into station NMB2. Several side passages in the first descending room / passage were surveyed using CG1-23. The pit below CG14 was rigged and scouted, but the 100-foot rope was found to be about 30-40 feet too short to reach the bottom of the drop, though there are multiple intermediate levels. The team met back with Kevin's survey team in the New Mexico Room. A total of 609.7 feet was surveyed in 30 shots using NMC37-42 and CG1-23.



*Aria Mildice in the Western Lower Maze. (Photo by Hazel Barton)*

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Kevin, Steve and Marty crossed the New Mexico Room on the flagged trail to reach the Ranger Room. They surveyed from NMB20-NMB20G and were stopped in a deep fissure when it became too wide. They retrieved some rope and rigged a traverse line that allowed them to continue to NMR20J, which was another large pit. They also surveyed from NMB18 to NMB18B. The team returned to the New Mexico Room to meet up with Derek's team. The teams traveled out to the Big Room to watch a rehearsal of the Rock of Ages performance being produced by the interpretive division, but that caused a small disturbance so the cavers left and used the elevator to exit the visitor center at 21:30. A total of 285.7 feet was surveyed in 14 shots using NMB20A-J and NMB18A-B.

### **November 27, 2019 (New Mexico Room, Western Lower Maze and Ranger Room)**

The team entered the cave at 10:30 via the elevator and traveled out to the New Mexico Room via the normal route. Derek, Amy, Ben and Garrett went to the Western Lower Maze on the west side of the New Mexico Room. They brought a 100-foot static rope that was rigged to a natural anchor at CG14.



*Soda straws in Chocolate High. (Photo by Derek Bristol)*

The survey was started at the top of this pit and the team went down about 20 feet and traversed into a room that goes off the side of the pit. The survey was taken down into a lower room and tied into station CF32 and back towards the area below CF1. The rest of the day was spent surveying boneyard with four different routes found that ascend up through holes in the floor to connect back up to the New Mexico Room. The rope

rigged at CF1 was determined to be unnecessary since all of these other routes are free-climbable so it was derigged and placed on the trail so that it can be reinstalled at CG14 later. Many, many leads were left and the team traveled out and met with the the other teams. A total of 853.2 feet was surveyed in 60 shots using CG24-80.

Hazel, Aria and Sonia traveled to the maze on the far west of the New Mexico Room and located CF60 to begin a resurvey of the southwest portion of the Western Lower Maze. This was done using a new CP designation beginning with CF60=CP1. The team began the CP survey, leaving a lead to the north and following an orange, double-flagged trail through a really decorated area full of bat bones. The area was pretty heavily impacted and there were lots of pits heading down, which all appeared to be heading to a lower level maze. The team pushed a couple of side leads, but tried to stick to the main trail, and there is still much to do out there. The flagged route brought them back in a loop to CP1, so it looks like the orange-flagged trail is just to tour the formations. The team needed to be out of the cave early, so they headed out at 16:40, making it to the elevators by 17:10. A total of 381.4 feet was surveyed in 21 shots using CP1-15, CP8A-B and CP14A-B.

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Kevin, Marty and Steve crossed the New Mexico Room on the flagged trail to reach the Ranger Room. They tied into NMB20H and surveyed using NMR1-13. This took them from the upper level into a perched middle level. Here they found a pool and a back way into the Ranger Room. Approximately half of the incredibly decorated Ranger Room was surveyed before running out of time for the day. A lead at NMR5 was not pushed, though it looked to go at least a few stations. The team travelled out and met Derek's team in the New Mexico Room. The teams all traveled out of the cave together, exiting via the Natural Entrance at 21:30. A total of 277.0 feet was surveyed in 13 shots using NMR1-13.

### **November 28, 2019 (Big Room - Liberty Dome and Ranger Room)**

Derek, Ben, Garrett, Carl, Hazel, Kevin, Sonia and Jen entered the cave via the Natural Entrance at 12:00. Derek, Ben, Garrett, Carl and Hazel hiked out to the southern end of the Big Room where they took turns climbing the ropes up to the top of Liberty Dome. At the first natural anchor a carabiner was left in July. This was replaced with a stainless steel maillon to reduce the concern of corrosion. The carabiner was still in good condition, but replacing it was still wise. The entire team went to the top of the dome at BLD2 and had a good scout for potential leads. A low passage that is only 20 feet south of BLD2 was observed to have sloping sediment common out of it, and a close look into it shows it opening back up after 6 feet. A short video clip of this potential dig was captured and the team descended one at a time. The team hiked back out the Natural Entrance, exiting at 17:00.



*Stalactites above the Balcony of the New Mexico Room. (Photo by Derek Bristol)*

Kevin, Sonia and Jen traveled out to the New Mexico Room via the usual route. They rigged the drop at NMB23, but this took long enough that there wasn't time to add any survey. They headed out of the cave via the Natural Entrance, exiting at 16:00, and enjoyed a group Thanksgiving dinner.

### **November 29, 2019 (Bell Cord Room, Guadalupe Room and Ranger Room)**

Derek, Garrett, Hazel and Sonia entered the cave via the elevator at 9:30 and traveled out to Left Hand Tunnel using the standard route. The rope rigged along the north side of the room at BCH1 was bounce-tested and Derek ascended, passing 3 rebelay and a redirect. Most of these anchors were composed of corroding aluminum carabiners and steel bolts. Derek descended and took a bolt kit, a new 9mm x 173-foot Cancord rope, and stainless hardware back to the top of the climb and replaced

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the ropes and rigging using only 2 rebelayes. The old hardware and ropes were removed and taken out of the cave. At the top of the climb the leads at BCH6 and BCH14 were checked but there is no going passage. The lead above BCH7 was entered with easy free-climbing and was found to be previously scooped but had excellent air coming out of it. The team surveyed into the CR coated hole for 5 stations until a very tight constriction. Garrett scouted ahead into an extremely tight fissure with tons



*Carl Bern ascending the rope in Liberty Dome. (Photo by Hazel Barton)*

of blowing air and pushed as hard as possible but the fissure became too tight. It would require micro-shaving to enlarge it further, but the strong airflow and location on the edge of the cave might make this worth doing. The team descended and traveled to the other side of the room to investigate the Bifrost Room climb, which has a missing set of sketch notes. The climb had been de-rigged and a cord left in place. Quite a bit of time was spent trying to use the cord to thread a static rope back up the climb, but this was futile due to too much friction. Sonia re-lead the climb with Derek belaying using screws. All of the screws were then removed and a 2-bolt anchor was installed at the top of the climb and a 100-foot static rope installed. There is a lead in the Bifrost Room that is delicate and has not been climbed. Not enough time remained to conduct the resurvey so the team descended, but left the rope fixed, and exited the cave via the Natural Entrance without incident at 21:00. A total of 64.9 feet was surveyed in 5 shots using BCH15-19.

Kevin, Jen, Kelli and Steve entered the cave via the elevator at 9:30, traveled out to the New Mexico Room via the usual route and crossed the New Mexico

Room on the flagged trail to reach the Ranger Room. They tied into NMR9 and surveyed NMR14-26. This finished the survey of the Ranger Room. They continued the trend through the fissure until reaching a pair of pits. These had good air and were left as leads. A climbing lead was also left at NMR22 and a tight hammer lead at NMR26. The team travelled out via the elevator since Kelli had a code, exiting at 21:00. A total of 229.5 feet was surveyed in 13 shots using NMR14-26.

Aria, Ben, Amy and Marty entered the cave via the Natural Entrance at 9:30. A webbing hand-line was rigged around a small flowstone thread-through. The survey began at GRG35 by going down



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through the small hole. The climb was not difficult although it was awkward, and the hand-line was helpful on the way back up. There appeared to be some fairly extensive, if not small and terrible, passage just beyond the end of the hand-line. The survey was continued by following the old trail flagging that led to a large standing fissure, with high ceilings. A 40' shot surprised the sketcher, and Ben, Marty, and Amy spent some time checking leads. At the far end of this fissure, there is a large breakdown block which was not checked well and may have passage extending under a low ceiling on top of the block, or may have passage extending from under the block. The survey continued into a very pretty gypsum area with thick gypsum crust, selenite needles, and large gypsum flowers. A red flagging sign near the start of the survey said "To Flower Gardens and Beyond," so this may well be the Flower Gardens. After a couple more shots the passage and the trail flagging just ended. There are a few easy climbs above these last few stations that were left as leads. The team returned to leads near the start of the survey and the first of these leads ended after a handful of shots. On the way back Aria and Ben checked out the pit in the 62/180 Room and confirmed that it will require rigging. Future



*Sonia Meyer aid climbing in the Bell Cord Room to reach the Bifrost Room. Derek Bristol belaying. (Photo by Hazel Barton)*

trips will need a 60' rope, webbing, and vertical gear, and some interesting rigging since most of the breakdown is loose and most other rocks are gypsum. A lead off of GRG14 was surveyed through a small constriction, around the corner, and down a slope, where there is another pit which will need rope. Red or orange trail flagging was seen at the bottom of the pit, so this potentially could connect to the pit near GRG 28 in the 62/180 Room. The team packed up and traveled out via the elevator, exiting at 20:00. A total of 443.6 feet was surveyed in 27 shots using GRG35-53, GRG37A-B, GRG42A-C and GRG14A-C.

**November 30, 2019 (Chocolate High, Western Lower Maze and Guadalupe Room Complex)**

Derek, Carl, Ben and Aria entered the cave via the elevator at 9:00, traveled out to the New Mexico Room via the usual route and used the flagged trail to reach the rope at the Chocolate Drop. The team traveled up to Chocolate High and traveled out to a lead at CDA5 that was surveyed to tie-ins at CDH39 and CDHC15. A few lower level cut-arounds were also surveyed in the same area. The team then went to leads at CDHC14A-B but all of the leads in that area were too tight or too delicate. The team then traveled out to the north end of Chenille

basin and surveyed two alcoves off of CDH30, but both terminated. The team then traveled out to CDHA7 and CDHA11 and surveyed leads in this area. The CDHA7 lead ended in a couple of shots, but the CDHA11 lead went to a very wide room / passage with much to be surveyed but not enough time. A tie-in was made to the CDJ survey and the team descended the ropes back to the New Mexico

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Room. The team headed out without incident, taking the elevator with Aria, and exiting the cave at 21:00. A total of 763.3 feet was surveyed with 35 shots using CAT22-56.

Hazel, Steve and Marty entered the cave via the elevator at 9:00, traveled out to the New Mexico Room via the usual route and used the flagged trail to reach the beginning of the Western Lower Maze. The team started by heading down the passage at CP14, which immediately reached the edge of a big pit. A small crawl to the south allowed a bypass of the edge of the pit and went up onto a series of bridges. These couldn't be crossed without a rope, but the team was able to tie into a station on the far side of the pit. Hazel climbed up around and was able to make a light connection with station CP11. The team decided to keep surveying at the same level, around the upper ledge of the pit. They connected into a number of passages, including one at CP23, that started heading



*Garrett Jorgensen in the Bell Cord Room. (Photo by Hazel Barton)*

down to the main maze level; the team surveyed a couple of stations down this passage (ending at CP25) before returning to the main level. A couple of side rooms were surveyed, including a room that contained a reasonably-sized pool that had over a dozen bat skeletons in it. Photos were taken in here, before surveying another side passage, which had a dome heading up to CP2. The team then returned to the main level and headed along a passage heading north, into a really nice boneyard maze that had a number of carbide arrows pointing up to CP3, suggesting this was the main route into the lower level. A passage was found heading off that had un-disturbed sediments in it, suggesting that it was virgin cave, which went for about 10 stations before getting too tight. The team then headed back to grab the rope to rig the pit at CP11, allowing them to head down and use the station that was found across the pits from CP20. This was tied in (as CP52) and the passages at this level sketched in, before the team connected back into CP11. The team met with Derek's team and traveled out together without incident, taking the elevator with Aria at 21:00. A total of 474.7 feet was surveyed in 41 shots using CP16-55.

Kevin, Jen and Sonia entered the cave via the natural entrance at 9:00, traveled out to the Guadalupe Room via the usual route to Hall of the White Giant. They continued on to the Chess Room and started the survey. Many of the leads should have been sketched-in or finished by the prior teams as they went only a very short distance or were far too tight. After many tight crawls, the team ended the day with some survey through passage that was originally drawn as a wall. No new leads were

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generated and the team headed out via the Natural Entrance without incident, exiting at 21:00. A total of 270.9 feet was surveyed in 27 shots using FD1-20 and FD9A.

## Conservation

- Nylon shoe covers or clean shoes (e.g. Pro Shoe Covers, aqua-socks or 5-Fingers) were worn to reach some areas in and around the New Mexico Room, the Western Lower Maze, and to cross areas such as Chenille Basin.
- Low impact aid climbing techniques were used successfully and will be used again in the future to maintain minimum safe standards for climbing while also minimizing impact to the cave. Screw anchors, designed for use in concrete, can be placed with a shallow, 1/4-in hole, and fully removed.



*An airplane passes over Natural Entrance in front of starry sky. (Photo by Derek Bristol)*

The hole that remains is nearly invisible and there is no hardware left to corrode. A total of six of these screws were placed and then later removed to re-climb to the Bifrost Room out of the Bell Cord Room.

- There are designated clean shoe zones across Chenille Basin, and through the old CF60-80 section of the Western Lower Maze that have been heavily impacted. These flowstone areas are good candidates for restoration because crossing them in clean shoes just transfers dirt to the clean shoes and further worsens the tracking issue.

## Rigging

- Two fixed ropes and several old bolts and carabiners were removed from the Bell Cord Room BCH dome. A new stainless bolt was placed for a rebelay, and a new 173-foot, 9 mm Cancord static rope was installed.
- The climb from the Bell Cord Room to the Bifrost Room had been de-rigged and a thin cord installed for pulling up a rope. Pulling up a static rope was attempted for more than two hours, but it was learned later that it was an impossible task because the cord went 40 feet back from the edge of the climb, around a column and through a forest of popcorn. There was simply too much friction

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to pull a static line back up. Because the original survey notes were lost, the climb was repeated with Sonia Meyer leading and Derek Bristol belaying. A 2-bolt stainless anchor was placed in the ceiling above the climb, and a 100-foot, 9 mm Cancord rope was installed.

- There previously was a ~100-foot x 11 mm static rope rigged into a pit at CF1 that drops from the New Mexico Room into the Western Lower Maze. This rope probably dates to ~1995 when CF1-13 was originally surveyed. During the expedition at least four alternative routes were discovered that make the same connection but don't require SRT. This rope was not in the CRO rope log, but it was de-rigged and used on the pit below CG14. The rope was de-rigged again at the end of the week and left coiled at CG1 for use on a future expedition to the Western Lower Maze.
- A 30-foot white webbing hand-line was rigged in Lil' Lechuguilla to assist in a slightly overhung down-climb at GRG30-35. It's rigged to a natural anchor and was left in place for use on future trips to the area.
- There were several vertical pitches rigged in the Ranger Room to access a middle and lower level. All ropes were rigged using natural anchors. At the end of the expedition all of these ropes were de-rigged except for a 20-foot piece of webbing at the entry to the area that is used as a hand-line (white webbing), and a 100-foot x 11 mm static rope rigged to a natural anchor that provides access from the middle level to the lower level (Junior Ranger Room to the Ranger Room).
- There are several old fixed ropes in Chenille Basin and the Mezzanine that should probably be de-rigged and removed from the cave. Several anchors in the Mezzanine are constructed from plated steel bolts and aluminum carabiners and there is significant corrosion. A traverse line on the northern end of Chenille Basin is unnecessary because there is an alternative non-technical route that can be followed through Chocolate High to reach the same area.
- An aluminum carabiner that was used to rig a loop around a natural anchor near the top of Liberty Dome was replaced with a stainless maillon. No other changes were made to this rigging and the diagram can be found in the July, 2019 expedition report.



*Marty Reames observes dozens of dead bats in a pool in the Western Lower Maze. (Photo by Hazel Barton)*

## Safety

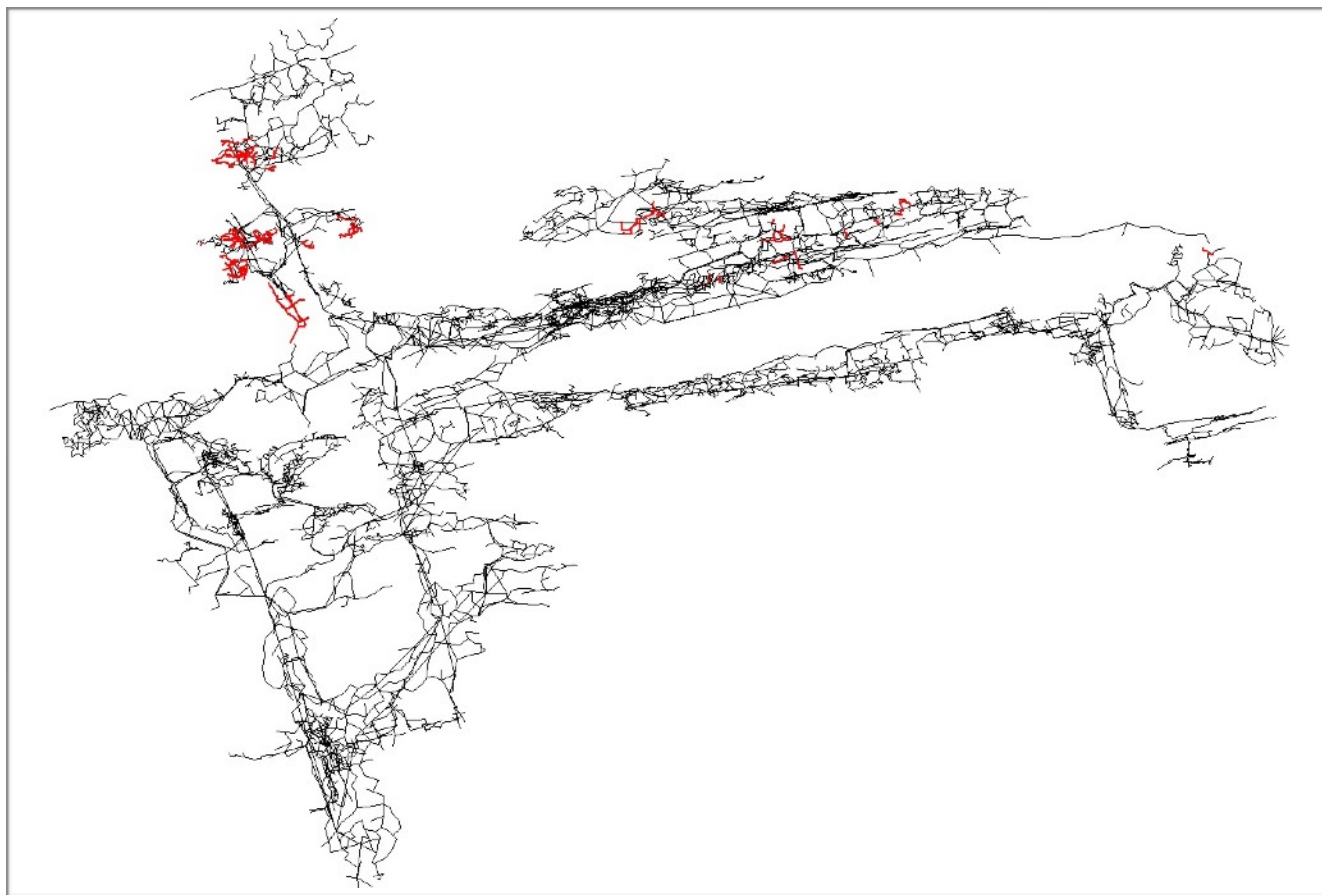
There were no significant safety incidents of note. Team members exited the cave in the same condition they entered.

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## Maps

The cartography for the Guadalupe Room Complex, Chocolate High and the New Mexico Room was updated just prior to the expedition. An attempt was made to draft the notes of the Western Lower Maze, despite six bad loops that remained. Most of the survey in the Western Lower Maze uses CF survey designations, even though the original surveys used alternative designations. It's apparent that there was an attempt to change the survey tags for some of these older surveys, but mistakes were obviously made with the wrong tags placed on the wrong stations. This means that the labels in the cave don't always match the data in the Compass file. Additionally, during the drafting of the notes it was found that there are many areas with poor sketches that don't align with one another. It was also discovered during this expedition that there are areas (e.g. CF300-317) where recoverable stations do not exist, despite leads being marked in the sketch notes. For all of these reasons it was decided that a full resurvey of the Western Lower Maze is needed. This is a difficult and unfortunate conclusion. There are 19 old surveys in the Western Lower Maze that will be scrapped. That's a lot of wasted time, effort and impact to the cave. This could have been avoided if a cartographer was actively working on drafting the map during the survey and exploration. Without an active cartographer it's nearly impossible to identify these types of issues. It is strongly recommended that the CRO not issue permits to survey teams for areas where a cartographer isn't actively checking for data and sketch problems.

Below is a plan view line plot showing the newly surveyed passages (new survey in red).



## Lead Lists

A list of completed leads from the November, 2019 expedition, and notes on how the leads were surveyed, is shown in Table 1.

**Table 1. Completed Leads**

Completed Leads November, 2019 Carlsbad Cavern Expedition						
Section	Area	Nearest Tie-In	Directions from Tie-In		Dimensions	Comments
			Distance (ft)	Bearing		
Chocolate High	Chenille Basin	CDH30	27	W	20Wx9H	Surveyed with CAT28-36
Chocolate High	Chocolate High	CDA5	15	NE	20Wx3H	Surveyed with CAT22-27, CAT37-47
Chocolate High	Chocolate High	CDHA11	20	E	14Wx5H	Surveyed with CAT53-56
Chocolate High	Chocolate High	CDHA7	11	E	14Wx6H	Surveyed with CAT48-52
Chocolate High	Chocolate High	CDHC11	10	up	15Wx3H	Surveyed with CDHC11A-E
Chocolate High	Chocolate High	CDHC13	5	N	25Wx2H	Surveyed with CDHC13A-H
Chocolate High	Chocolate High	CDHC13	25	SW	10Wx2H	Surveyed with CAT1-17
Chocolate High	Chocolate High	CDHC14B	5	S	5Wx2H	Checked - No leads and very delicate
Chocolate High	Chocolate High	CDHC15	5	S	10Wx7H	Surveyed with CAT18-21
Guadalupe Room Complex	FA Maze	FA14	9	SW	20Wx15H	Surveyed with FD5-7
Guadalupe Room Complex	FA Maze	FA34	5	SE	4Wx10H	Surveyed with FD8-11, FD9A
Guadalupe Room Complex	FA Maze	FA40	17	NW	8Wx6H	Surveyed with FD12-20
Guadalupe Room Complex	FA Maze	GA14	10	S	3Wx2H	Surveyed with FD1-4
Guadalupe Room Complex	Lil' Lechuguilla	GRG14	7	N	9Wx4H	Surveyed with GRG14A-C
Guadalupe Room Complex	Lil' Lechuguilla	GRG30	5	NE, down	2x2	Surveyed with GRG35-53, GRG37A-B, GRG42A-C
Guadalupe Room Complex	Los Cuates Room	F107	60	S	15Wx7H	Surveyed with F107A-E
Guadalupe Room Complex	Los Cuates Room	F134	15	S	4Wx2H	Surveyed with F134A-E
Guadalupe Room Complex	Sand Passage	F11	5	W	4Wx3H	Surveyed with F11A-D
Guadalupe Room Complex	Sand Passage	F92	10	W	2Wx2H	Surveyed with F92A
Guadalupe Room Complex	Sand Passage	G117	10	NE	3Wx3H	Surveyed with G117A-B
Guadalupe Room Complex	Sand Passage	G201	0	E	10Wx3H	Surveyed with G202-205, G205A
Guadalupe Room Complex	Sand Passage	G60	10	S	6Wx6H	Surveyed with G60A-F
Guadalupe Room Complex	Sand Passage	G61	30	SE	4Wx4H	Surveyed with G61A
Guadalupe Room Complex	Sand Passage	G61	20	NE	15Wx2H	Surveyed with G61A-E
Left Hand Tunnel	Bell Cord Room	BCH8	20	W	2Wx12H	Surveyed with BCH15-19
New Mexico Room	New Mexico Room	NMB3	10	SE	10Wx2H	Surveyed with NMB9-16
New Mexico Room	Ranger Room	NMB8	15	SE	35Wx60H	Surveyed with NMB17-23, 20A-J, 18A-B, NMR1-26
New Mexico Room	Sand Room	NMC10	20	up	8Wx15H	Surveyed with NMC37
New Mexico Room	Sand Room	NMC2	15	N	3Wx3H	Surveyed with NMC38-42
New Mexico Room	The Balcony	NMA33	8	SE	10Wx6H	Surveyed with NMA32A-D
New Mexico Room	The Balcony	NMA33	8	S, up	4x4, up	Surveyed with NMA32E-F
New Mexico Room	The Mezzanine	NMA46	10	SE	4Wx10H	Surveyed with CMA1-4
New Mexico Room	The Mezzanine	NMA46	10	SE	4Wx10H	Surveyed with NME1-10, NME5A, NME4A-D, NME1A-B
New Mexico Room	Western Lower Maze	CF60	0	SW	20Wx15H	Surveyed with CP1-55, CP8A-B, CP14A-B
New Mexico Room	Western Lower Maze	CG14	10	down	8Wx6H	Surveyed with CG24-80
New Mexico Room	Western Lower Maze	NMB1	55	N	20Wx8H	Surveyed with CG1-23; resurvey of old CF301-

A list of new leads from the November, 2019 expedition, and notes on the size, nearest tie-in station, and general observations, is shown in Table 2.

Table 2. New Leads

New Leads (November, 2019 Carlsbad Cavern Expedition)						
Section	Area	Nearest Tie-In	Directions from Tie-In		Dimensions	Comments
			Distance (ft)	Bearing		
Chocolate High	Chocolate High	CAT18	5	SW	3Wx2H	Delicate
Chocolate High	Chocolate High	CAT19	5	SW	3Wx2H	Delicate
Chocolate High	Chocolate High	CAT53	10	E	25Wx3H	Big, wide gypsum maze
Chocolate High	Chocolate High	CAT53	10	NW	4Wx1H	Small
Chocolate High	Chocolate High	CAT55	5	E	10Wx3H	Big, wide gypsum maze
Guadalupe Room Complex	Lil' Lechuguilla	GRG35	6	E	3W	Lots o Leads
Guadalupe Room Complex	Lil' Lechuguilla	GRG35	8	W	4W	Lots o Leads
Guadalupe Room Complex	Lil' Lechuguilla	GRG35	8	NW	2W	Lots o Leads
Guadalupe Room Complex	Lil' Lechuguilla	GRG37	0	down	4x6	Pit
Guadalupe Room Complex	Lil' Lechuguilla	GRG39	15	up	?	Climb
Guadalupe Room Complex	Lil' Lechuguilla	GRG39	15	SW	8W	?
Guadalupe Room Complex	Lil' Lechuguilla	GRG40	6	N	4W	?
Guadalupe Room Complex	Lil' Lechuguilla	GRG40	10	SW	?	6-foot pit
Guadalupe Room Complex	Lil' Lechuguilla	GRG41	10	N	25W	?
Guadalupe Room Complex	Lil' Lechuguilla	GRG41	0	down	4x4	Pit
Guadalupe Room Complex	Lil' Lechuguilla	GRG41	8	SW	6W	?
Guadalupe Room Complex	Lil' Lechuguilla	GRG42	5	SW, down	4x4	6-foot pit
Guadalupe Room Complex	Lil' Lechuguilla	GRG42C	4	W	2x2	Pit down
Guadalupe Room Complex	Lil' Lechuguilla	GRG42C	4	SW	4W	Upper ledge
Guadalupe Room Complex	Lil' Lechuguilla	GRG43	4	NE	4x4	Pit
Guadalupe Room Complex	Lil' Lechuguilla	GRG44	8	S	6W	?
Guadalupe Room Complex	Lil' Lechuguilla	GRG44	10	NE	2W	?
Guadalupe Room Complex	Lil' Lechuguilla	GRG44	10	N	2W	?
Guadalupe Room Complex	Lil' Lechuguilla	GRG44	12	NW	2W	?
Guadalupe Room Complex	Lil' Lechuguilla	GRG45	10	N	2W	Small
Guadalupe Room Complex	Lil' Lechuguilla	GRG45	15	NE	2W	Small
Guadalupe Room Complex	Lil' Lechuguilla	GRG47	0	down	2x4	Pit
Guadalupe Room Complex	Los Cuates Room	F107A	15	up, E	1Wx12H	Great air, sinuous canyon with mud
Left Hand Tunnel	Bell Cord Room	BCH19	5	N	2Wx1H	Dig with extremely strong air
New Mexico Room	Ranger Room	NMR19	15	NE	2Wx2H	Dirty
New Mexico Room	Ranger Room	NMR22	90	up	8x8	Climbing lead
New Mexico Room	Ranger Room	NMR24	5, down	SW	8x8	Pit lead, air
New Mexico Room	Ranger Room	NMR25	5, down	SW	8x8	Pit lead, air, easy way down
New Mexico Room	Ranger Room	NMR26	5	W	1Wx1H	Hammer lead, opens up, no air
New Mexico Room	Ranger Room	NMR5	10	SE	3Wx2H	Goes at least 40'
New Mexico Room	The Balcony	NMA32B	5	S	4Wx1H	Doesn't look good.
New Mexico Room	Western Lower Maze	CG26	0	down	6Wx20H	Pit - Needs 150' rope to reach bottom
New Mexico Room	Western Lower Maze	CG28	10	N	10Wx15H	Boneyard maze leads
New Mexico Room	Western Lower Maze	CG28	15	up	2x2	Ceiling climbing lead
New Mexico Room	Western Lower Maze	CG29	8	NW	15Wx40H	Big pit. Probably connects to pit below CG26.
New Mexico Room	Western Lower Maze	CG29	20	SE	6Wx2H	Goes up into small boneyard
New Mexico Room	Western Lower Maze	CG30	5	N	2Wx2H	Boneyard
New Mexico Room	Western Lower Maze	CG33	0	down	4Wx25H	Pit to lower level at old CF34
New Mexico Room	Western Lower Maze	CG33	12	SE	10Wx2H	Wide lead
New Mexico Room	Western Lower Maze	CG34	5	SE	10Wx20H	Big pit.
New Mexico Room	Western Lower Maze	CG34	6	NW	2Wx2H	Boneyard
New Mexico Room	Western Lower Maze	CG35	4	N	2Wx2H	Boneyard
New Mexico Room	Western Lower Maze	CG36	4	S	2Wx2H	Boneyard
New Mexico Room	Western Lower Maze	CG36	8	N	3Wx2H	Boneyard
New Mexico Room	Western Lower Maze	CG37	6	SE, down	2x1	Boneyard
New Mexico Room	Western Lower Maze	CG55	5	SW	12Wx2H	Boneyard
New Mexico Room	Western Lower Maze	CG63	8	W	4Wx2H	Boneyard
New Mexico Room	Western Lower Maze	CG64	5	S	8Wx2H	Boneyard
New Mexico Room	Western Lower Maze	CG68	0	up	4x8	Boneyard climb
New Mexico Room	Western Lower Maze	CG69	4	E	4Wx2H	Boneyard
New Mexico Room	Western Lower Maze	CG69	4	SW, down	2x2	Pit to lower level boneyard
New Mexico Room	Western Lower Maze	CG71	4	down	2x2	Small pit in floor
New Mexico Room	Western Lower Maze	CG72	8	N	10Wx4H	Above ledge
New Mexico Room	Western Lower Maze	CG8	4	E	2Wx1H	Crawl lead
New Mexico Room	Western Lower Maze	CG8	4	W	2Wx1H	Crawl lead
New Mexico Room	Western Lower Maze	CP1	16	NW	1Wx2H	Crawly boneyard in wall
New Mexico Room	Western Lower Maze	CP1	21	N	1.5Wx2H	Crawly boneyard in wall
New Mexico Room	Western Lower Maze	CP20	6	NE, down	20 deep	Big pit in middle of room to lower level
New Mexico Room	Western Lower Maze	CP20	10	SE	4Wx2H	?
New Mexico Room	Western Lower Maze	CP20	15	SW	2Wx2H	?
New Mexico Room	Western Lower Maze	CP25	8	SE	6W	More maze
New Mexico Room	Western Lower Maze	CP52	12	S	6Wx2H	?
New Mexico Room	Western Lower Maze	CP53	0	down	4x6	Pit
New Mexico Room	Western Lower Maze	CP8	10	NE	2Wx4H	Climb up flowstone into boneyard. Clean gear.

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## Conclusions

The expedition was very successful in working towards completion of high quality maps of both the New Mexico Room/Chocolate High and Guadalupe Room section maps. More than a mile was added to the length of the cave in eight days of work while also completing some rigging and climbing objectives in the Bell Cord Room. All of this was made possible through the efforts of highly skilled and experienced cavers/surveyors and careful pre-planning of survey objectives and logistics. These goals were accomplished while maintaining the priorities of safety and resource protection.

Thanks to all of the expedition team members for their drive, humor, flexibility and hard work.

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