STATE OF COLORADO

**Reilley - DNR, Robin <robin.reilley@state.co.us>**

# Copy of Coal Creek sand pit Colorado St Land Board annual report

1 message

**Mark Heifner** <mheifner610@gmail.com> Fri, Jul 14, 2023 at 1:19 PM
To: "Reilley - DNR, Robin" <robin.reilley@state.co.us>

Hi Robin,

Attached is the annual report sent to the State Land Board as a part of the lease requirement. Another requirement is to send a copy to DRMS.

Thank you,

Mark Heifner

**3 attachments**

**2023 Land Board Report final .pdf**
1216K

**2023 Operation Status Map.pdf**
365K

**Transmittal to DRMS 07 14 23.pdf**
61K

# ANNUAL STATUS REPORT
# TO COLORADO STATE BORAD OF LAND COMMISSIONERS
# SAND GRAVEL LEASE: GL-264 (FIFTH AMENDMENT)
# LOWRY RANGE
# COAL CREEK (QUINCY AVE. SOUTH TO COUNTY LINE)
# SCHMIDT CONSTRUCTION COMPANY

## APPLICABLE YEAR: 2023
## DUE DATE: JULY 15, 2023

In accordance with the requirements of Item I.A.5 of the Operation Plan, the following information is provided as a status report for the year preceding the due date stated above. This information updates the previous annual status report information. Any updated maps presented in this report contain not only the information for the current year, but information for prior years as well. If no new map is provided then there was no change in the information provided on the previously submitted map. Thus, as conditions change, the maps are kept up to date on an annual basis without a need to refer back to previous maps. Any maps that were not updated are so indicated in this report so the most current map can be located for reference as needed.

**DATES OF FINAL INSPECTION FOR PREPARATION OF THIS REPORT:** June 28, 2023

**SUMMARY OF THE CURRENT STATUS REPORT YEAR:** The 2022-2023 lease year (July 16, 2022 - July 15, 2023) mining was over and full reclamation was initiated. The site is now in full reclamation status.

## STATUS REPORT FOR CURRENT YEAR

**MAPS:** The status map shows the total area that was backfilled, graded, shaped, topsoiled, and seeded.

**GEOLOGIC CONDITIONS ENCOUNTERED:** No unusual or unexpected geologic conditions were encountered in the last year because no mining was occurring.

**HYDROLOGIC CONDITIONS ENCOUNTERED:** The next section, regarding climate, will show that in 2023 record and near record breaking precipitation occurred from May 10 through the end of June. The effects of this much precipitation are discussed in the section on Reclamation Status.

**CLIMATE IN THE LAST YEAR:** The 2022-2023 lease year, once again, was one of great contrasts in terms of climate and weather. Following are graphs of the daily temperature and precipitation patterns from July 2022 through June 2023 for DIA as well as Englewood, CO. The second half of 2021 was, from a practical point of view, almost without precipitation. The pattern was fundamentally

similar to the 2021 and 2022 patterns reported last year. The second half of 2022 was quite dry, but in December snowfall increased markedly. The first half of 2023 began with precipitation that was a little above normal at DIA but somewhat below normal for Englewood. For DIA a dry spell occurred between late March through April and into the first week of May. But on May 10 that all changed as will be described below.

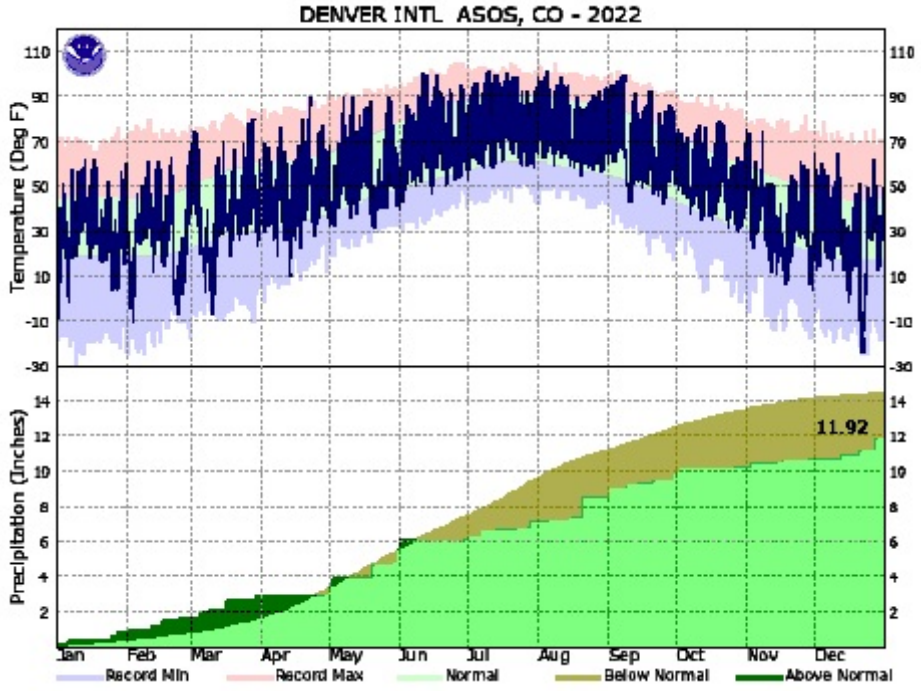



**Figure 1**: Temperature and precipitation for DIA for 2022.

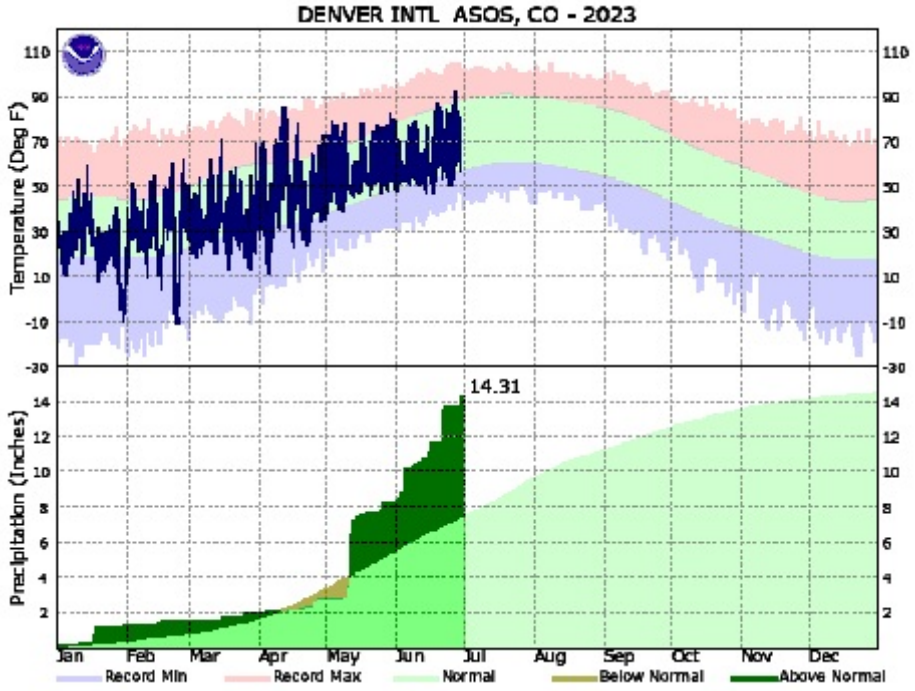



**Figure 2**:Temperature and Precipitation for DIA for 2023

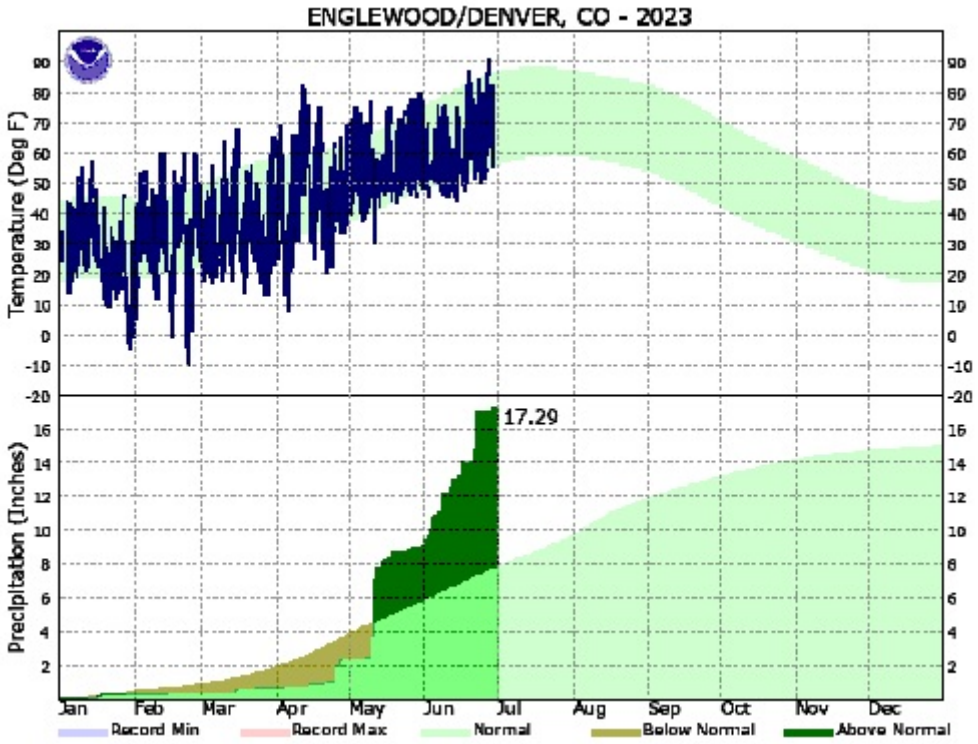



**Figure 3** Temperature and Precipitation for Englewood for 2023. Englewood is closer to the site than DIA. But it is not known which location is actually most representative.

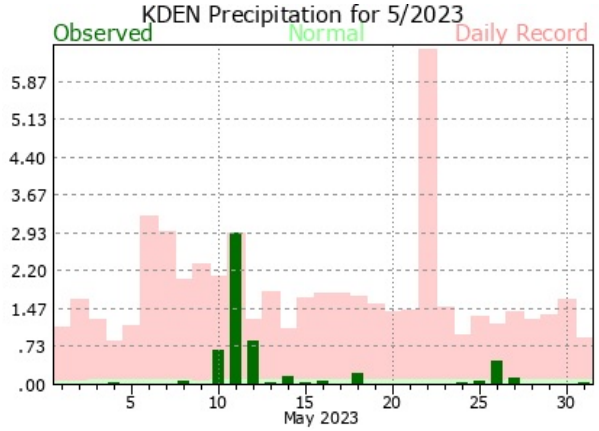



**Figure 4** Precipitation for DIA (KDEN) for May 2023.

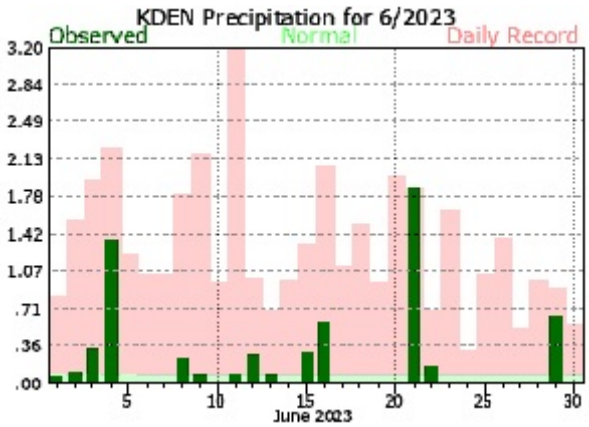



**Figure 5** Precipitation for DIA in June 2023.

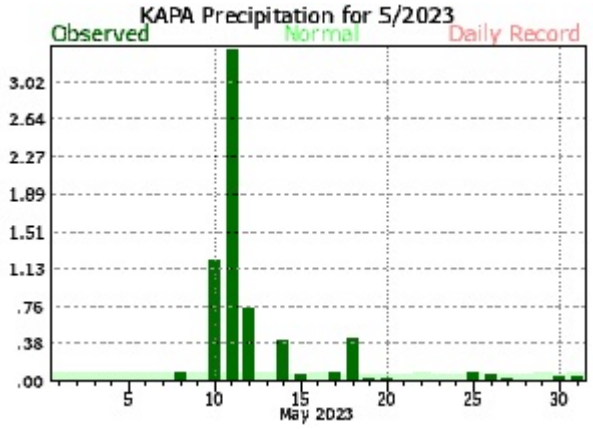



**Figure 6** May precipitation for (KAPA) Centennial, CO.

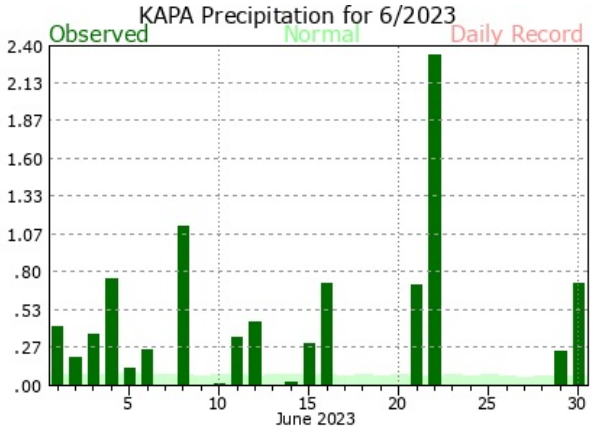



**Figure 7** June precipitation for Centennial, CO.

It is important to note that for both locations by the end of June 2023 precipitation had already reached or exceeded the average annual precipitation for each site with Englewood (KAPA) equal to what would be considered a somewhat wet year. Yet an additional six months of precipitation will still occur. If this pattern continued both locations would receive close to 30" of precipitation for the year. It is not likely to occur, but it is a possibility for 2023 being the wettest year on record.

At both locations daily temperatures were often above normal during the drier periods and slightly below normal during the wet periods. This is consistent with the frequent cloudy and humid days other weather records indicate was the case. The precipitation and temperature records during 2023 can be an indication of a possible shifting climate as this kind of pattern is frequently seen worldwide. More heat generates more evaporation which loads up the atmosphere with moisture and results in intense periods of precipitation and minor to major flooding which has also been occurring over much of the planet.

This kind of climatic shifting can induce strong shifts in vegetation communities that result in some added stress on species that prefer a drier environment than wet or cause increases in the density of species that prefer a wetter environment. This is all due to the changes in environmental factors that produce a differential advantage for some species whose environmental tolerance curves are favored by the new conditions. Other species may be at a disadvantage. This tends to create instability in the population characteristics of vegetation communities. Rapid vegetation community changes can occur over a single growing season such that a wet year produces prodigious growth and expansion of those species and a reduction of more dryland species such that it is possible for normally well balanced and adapted communities to become invaded with an increase in opportunistic species during the wetter periods. Thus, even though this seems to be a good thing to have a wet year with the lush growth it is only an advantage if the vegetation community is adapted to prefer those growing conditions.

This spectacular growth also increases the risk for intense grass fires when the local climate dries out. However, those fires can also end up being a plus because it often reduces the occurrence of weedy species and releases large amounts of nutrients tied up in dead plants. The point is that this very wet early summer of 2023 may end up doing considerable damage to the current vegetation communities or it could actually end up being advantageous to the current vegetation. At this site it is certain that the

local environment is undergoing change with an unknown future as to whether it will return to "normal" or develop long term shifts in composition that alters the current character of the land.

Another significant but currently somewhat hidden factor is that as of about June 8 several agencies and research bodies declared that the La Niña is now gone and El Niño has officially begun and that this episode could be moderate to strong in intensity. For this area that often means wetter summers with more strong storms and drier winters with frequent small storms and only a few larger winter storms. However there is no general agreement among experts as to what will happen because climatic patterns have shifted to such a degree probability prediction becomes very challenging.

**RECLAMATION PERMIT STATUS:** No changes were made to the permit in the last year. All the physical reclamation work was finished in 2022 and the site was seeded in the usually favorable September-October period. That period is favorable because if there is good autumn moisture the grasses can germinate and develop enough root mass to be well prepared for a return of moisture the next March. But if the autumn is dry then the seeds will generally not germinate to any great degree. They will lie dormant in the soil until the spring moisture comes and meanwhile the soil can be charged with moisture to some extent from snowmelt in the winter.

This is actually the very best time to plant sites like this just like this period is the best time to plant winter wheat. The environmental needs of winter wheat and these native grasslands have a large amount of similarity. However, winter wheat is an annual while most of the native grassland plants are perennial. In the first year though those differences have no great importance.

Unfortunately, in the 2022-2023 winter period the weather was rather dry in 2022 and therefore the soil began 2023 with a large moisture deficit. That is not good for producing high grass productivity in the following year, especially for the native grass species which do not have the rapid response ability of winter wheat.

Furthermore, for this project most of species being seeded are found in the overall vegetation and those tend to be drought tolerant, warm season grasses with a lesser amount of species adapted to mesic (medium range) moisture and cool season grasses. This mixture has produced excellent results over more than a decade, showing rapid development and early community closure with high productivity in most years, all with native species. Unfortunately this mixture is not very suitable for a year like 2023 so far and the results so far partially show evidence of this mis-match. Everything seems to be "confused" as to what to do with all this cool, wet weather.

**MINING ACTIVITY IN THE LAST YEAR:** **None**. All physical reclamation and seeding has been completed. All that is needed now is successful revegetation and erosion control.

**RECLAMATION ACTIVITY IN THE LAST YEAR:**

1. ***Climatic summary of previous year -*** Please see earlier discussion on the climate. That pretty well sums it up. It was quite dry and then it became extraordinarily wet. This is not a normal pattern for this land and its environment. It can have severe impacts on the land reclamation success depending on exactly what pattern occurs in the variation of the physical environment that supports the revegetation and the subsequent vegetation community. For those who are familiar with the vegetation on this site and elsewhere the impacts of species success has been considerable and appears to be somewhat related to the permeability of the soils and what was growing there before this year came.

2. ***Topsoiling -*** All of the affected land was topsoiled in 2022.

   A. **Locations of topsoiling -** Everywhere that operations occurred in the past at both the pit and the processing plant. It even included some very old remnants of operations south of the processing plant.

   B. **Depth of topsoiling -** The topsoil was spread to a depth of at least 6 inches and many places received considerably more than that. In fact, at one point the stockpiled topsoil seemed to be more than was really needed to complete the reclamation. There was a tendency to spread a variable depth of the plant growth medium and soils taken from the large main stockpiles at the pit and the plant as well as windrowed soil around the edges of the pit area. These variations are more common with truck and dozer soil spreading rather than using graders that can spread a somewhat more uniform layer of this material. However, this variability can occur no matter what equipment is used. It is often a variable that cannot be easily controlled.

3. ***Final grading of topsoiled lands -*** As reported last year, all slopes were graded to no steeper than 5:1 grade, as required by the permit and the lease. Much of the graded land is even less steep than that. The land was shaped to fit in with the surrounding topography with rounded transitions to undisturbed land and gradual transitions at the toe of slopes so it smoothly grades into the adjacent ground. Deep pits were completely filled and graded. Most of this work was done by simply redistributing the surface material left after mining to form gradual slopes with a gentle, prairie-like topography. That then was covered with a plant growth medium (soil and other materials containing organics).

   A. **Accommodation for drainage -** As noted last year, an outlet from the main pit was established which connected to a nearby natural drainage, the one that this land originally drained into. The bottom of the pit was designed to produce a sinuous flow line that is very gradual with some nearly level areas where sediment can accumulate. The outlet may require some additional work in the future depending upon what the drainage from the pit wants to do. Such adjustments are normal with this kind of reclamation - a natural shape is created on the surface with gentle swales where the water can do what it wishes. Then, if something needs to be corrected it can be done

before the flow gets out of hand and severe gullying forms. This is adaptive reclamation - one creates a reasonable baseline and then adjusts it as needed rather than trying to control everything.

B. One drainage feature at the Plant Site was added that was never planned for. Nearing the end of the grading it was realized that the long slope from the top to the bottom of the hill had nothing on it to stop or control heavy runoff. We examined the possible use of concentrating the water to a specific exit point on the side of the main road and then using the culverts to carry the water to the other side of the road. But not only was the volume of the water too great to do that the gradients to culverts were in the wrong direction from feasible exit locations.

So it was decided to divert the water to the north with a berm at the bottom of the hill. This diversion would carry a lot of water to the north parallel but well away from the road to the edge of the reclamation area and then turn it to the northeast and down a short slope to the old reclamation area north of the Plant Site where it could flow out and water the vegetation there. Thus most of the water will never even get close to entering the roadway.

Later when moisture arrived for some short period an additional diversion was added on the north side of the road to keep water from flowing down the road and out on to the main road with a deposition of sand. This reduced the flow onto the main road but increased the outflow to the north some. That area was then subsequently seeded in early Spring.

4. ***Revegetation -*** Although the entire site was prepared for seeding by the time the topsoiling was finished it was a bit too late to seed the area as climate predictions appeared to be indicating another exceptionally dry summer. It was! So seeding was delayed until either suitable moisture arrived or until after the soil temperature declined to less than what the germination requires. Seeding in late September and early October was done. Very little moisture came so the seed sat dormant all winter long.

As noted in the climate review, the Englewood weather station, the one closest to this site, showed winter and early spring was quite a bit drier than this period at DIA. It was essentially a continuation of the autumn and early winter dry period. But that all changed on May 10. At this location the wetness of spring and the onset of essentially an El Niño shift in the overall large scale climatic pattern arrived. It was similar to the arrival of a monsoon wind shift that occurs here usually in mid to late July or even August.

## May 18, 2023 Inspection by DRMS

Robin Reilley, Environmental Protection Specialist II, with the Colorado Division of Reclamation, Mining and Safety, did a complete inspection of the site. This is one of their periodic inspections to check up on the condition of the site, look for any possible violations, and discuss remedies to problems with the permittee.

It was a rather cold and damp day and all the rain in the preceding week (see Climate Information) had rather thoroughly saturated the soils and created some mild sheet erosion on sandy areas as well as a small scale braiding of the flow to produce shallow, interconnected rivulets down gentle slopes. It was apparent that a lot of surface material had been displaced, especially at the Processing Plant Area. However, there was still good evidence that vegetation was making a recovery, but that included only a few grass seedlings and much more recovery from plants, roots, and rhizomes of grasses derived from the spreading of the soil stockpiles.

The Pit Area where all the sand came from was in the best condition with only minor rilling in areas where the soil was mostly sand. It appeared that soil that had been spread there partially blew off in winter winds thus exposing some sand and the rest, a minor proportion, washed off in the rains and was carried mostly down into the regraded pit. Undoubtedly much of what washed off was the soil topping that had spread in the summer of 2022. So a good deal of the soil, including much of that which may have been lost to wind erosion was not actually lost. Rather it was redistributed into the pit. But this did leave a significantly barren but narrow boundary between the adjacent vegetation and pit area which, with regard to soil, was still in good condition with only very minor rilling.

As for the vegetation, the pattern was interesting. At both the Plant and the Pit the seed drill rows were still quite apparent with very shallow swales between tiny ridges between the drill rows. The total topographic relief was rarely more than about 10 mm. It gave much of the land the look of a washboard. This would be completely expected with drilling seed about 6 months earlier and some erosion of the surface. It also provided a measure of just how much material was displaced by water and wind. Where the soil surface was smooth or nearly so and the drill rows faintly visible in small patches the most material was shifted around or blown away. In most areas it was clear that not a great deal of material was actually shifted around as drill rows, although shallow, were quite apparent. What was not expected was the presence of dense growths of *Salsola iberica* (Russian Thistle, a tumbleweed) seedlings growing in most of the drill rows.

New grass seedlings were unexpectedly sparse and many areas showed none. By mid May the cool season grasses should be making a good showing. This is attributed to a rather cold winter which froze the soil to considerable depth. Even in Denver where conditions at this time were warmer than here, regrowth of perennial plants in gardens was delayed by two to four weeks. Even some bulbs that are normally moderately resistant to cold soils were blooming late and in the shadows of trees had barely broken the surface of the soil. So with that in mind it seemed reasonable that low soil temperature and high soil moisture was hindering grass seed germination and growth of seedlings.

On the other hand, grasses that had come up the previous summer were doing well. However, these are mostly grasses coming from grass rhizomes that had come from the soil stockpiles.

As noted above, Russian Thistle was very dense in the drill rows, but because of the density of the seedlings competition for water and nutrients was fierce with very few plants showing any notable success in the battle for resources. *Kochia scoparia* (kochia, common name) was having no difficulty growing in this environment. In places it was quite dense, but the plants were far enough apart to limit intense competition between individuals. The fact that these weeds were so abundant and the kochia doing exceptionally well over large areas shows that the growth medium ("topsoil" blended with other materials in the stockpiles and on the surface where distributed) had suitable nutritional value, although perhaps a bit too much nitrogen in the soil which these opportunistic weeds were taking advantage of. The only exception to this was where the surface was essentially quartz sand; that usually requires added nitrogen to get much of anything to grow, even these two weeds. So that was not surprising. However the extent of the sandy topped ground was of concern.

In conclusion to this discussion of the May 18 inspection, it was apparent that something odd was happening as plenty of grass seed was planted but for the most part all that was growing in great abundance were the two tumbleweeds. That is not a bad thing to happen except when they are this dense. At lower densities these weeds can actually be beneficial as they provide shade for the tender grass and forb seedlings that will compose the desired vegetation. These annual weeds also add a great deal of organic matter to the soil over the second season so the perennial species can live in a slightly more mature soil environment and hopefully gain dominance in the second, third, and subsequent growing seasons.

It is important and relevant to note that the natural grasslands were thriving with robust grass and forb growth. But these are living in a situation where nutrition and energy cycling in the soil has achieved a much more mature development. At this early stage in the reclamation none of that mature pattern exists at this time.

The only difference that appeared to be present when comparing the early development of this area with the older reclaimed sites is that annual weed density was extraordinarily high due to the prodigious moisture that had been received in the preceding week. That had never happened on the previous reclamation areas, at least at this time of the year. It is important to remember that with revegetation when precipitation comes can be even more important than how much falls. When both timing and quantity varies greatly from the norm the location is essentially in a different climatic environment and strange things can occur that are quite unexpected.

## May 31 First Critical Ecological Inspection of the Site

On May 31, Mark Heifner, the author of this report and a specialist in the ecology of drastically disturbed land, spent several hours going over the site looking for more defined clues as to what was possibly going on here that seemed to be hindering the usual development pattern. Several previously mined areas within this lease had been very successfully reclaimed using the same techniques and seed mixtures applied here. And yet here it seemed that almost everything that could go wrong was going wrong. The only clearly defined variables were a rather cold previous winter and a sudden onslaught of prodigious rain. On May 10, 11, and 12 close to 5 inches of rain fell and saturated the soil probably to considerable depth. Warm days were rare after those rains and more rain fell between May 12 and May 31 keeping the soil saturated or nearly so.

This inspection examined the vegetation at that time relative to the various physical factors of the environment of the site. These included soil temperature and moisture, surface erosion, clues that might indicate some kind of mild toxicity (highly unlikely, but needed to be considered), vertical structure in the soil, the depth of seed location for growing seedlings, and subsoil competition produced by root density, plus any other clues that might be found such as distinct variability in the species density in the vegetation mosaic developing on the site. It is important to note that the period between May 18 and May 31 was considered short enough that a totally different character to the vegetation would not likely develop but more subtle and potentially more rapid small scale changes might be detected. All of these could provide clues as to what hidden processes are hindering or promoting the vegetation development. This was primarily a visit to collect more definitive data and gain some understanding of the ecology of the vegetation that was obviously having difficulty developing along the usual pathways.

The site showed many more young grass seedlings, so on May 18 seeds were just beginning to germinate and could not be seen yet. However, in most places grass seedling density was still barely adequate to result in reasonable success (about 1 seedling per 4 square feet at the minimum). But some places had up to about 6 times that density which is very good for a starting point. The weakest growth of seedlings was in the very sandy soils. Seedlings could be found there but they were not thriving as the new leaves were much thinner and narrower than they should have been if the plants were healthy.

The relationship between the weeds and the desired grasses is important in determining the future path in revegetation. On the Plant site grass germination was greater than was found in the Pit area. The kochia in the Pit was thick in many places and already a foot tall. No grass seedlings were noted in those areas, but adjacent areas where Russian Thistle was abundant in drill rows, but not showing much growth and in many places showing a good deal of nitrogen deficiency, there were more grass seedlings, especially between the drill rows. Small grass seedlings could also be found where the Russian Thistle had been partially or totally buried by sand. In effect, the thin layer of sand was acting as a “mulch” to keep the Russian Thistle to a minimum while allowing the grass to rise above the sand while keeping its roots in the better soil under the sand. This layering, if not too deep, is known to be beneficial in most instances in

reducing weed competition and preserve moisture in the soil to supply the young seedlings. In other instances such layering can be detrimental and kill the young seedlings.

**Figure 8** A clump of Russian Thistle with the subsoil root mass.

In Figure 8 the cross section of a clump of dense Russian Thistle is shown. Many seedlings are bunched together which produces a dense mass of roots below the ground. All the seedlings are about the same size and competing with each other intensely. There is hardly any room for anything else to grow. This may be a reason why so little new grass growth is found within the drill rows - the grass seedlings have difficulty penetrating the dense thistle root growth. The root mass goes up to about 2" below the ground surface. But grass seed is usually planted about 3/4" to 1" deep which would put the seeds in the root masses.

**Figure 9** A young grass plant showing roots, underground sheath and new leaves.

In Figure 9 a young grass plant that was carefully extracted from the ground is shown. The seed was located very near the location where the sheath and the roots join. The ground level was at about 3/4" above the seed location and where the first small green leaf (the cotyledon) is located. Above that are the new leaves. This plant was growing between drill rows that were packed with small Russian Thistle seedlings as in Figure 8. A few other grass plants were similarly extracted and were found to have had the seed planted at the correct depth and were growing away from nearby dense growths of the thistle.

The central drainageway was in excellent condition in nearly all places, in spite of the prodigious rains. The channel was well contained by adjacent dense growths of primarily kochia and in many places it was obvious that the drainage water had covered the existing vegetation in a thin layer of clayey silt that did not bury the plants but just made their leaves dirty. Water had collected in several spots but did not stay for long; that was the intent of the design of the drainageway in the pit. The outlet on the north end was showing some minor erosion in the form of developing a shallow main channel; also an intent of the plan. Once it is known where the water "wishes" to go then a more finished outlet can be established.

**Figure 10** North end of pit looking south. Needlegrass growth on slope just south of the pit drainage outlet. The understory is mostly composed of dense growths of small Russian Thistle plants that are somewhat chlorotic due to severe competition for nutrient resources as a result of great plant density.

However, upon reaching the north end of the pit which was not visited on May 18, the vegetation on the slopes abruptly changed in its character. This zone was encountered about 300 to 400 feet south of the pit outlet and it was apparent this change reached high onto the side slopes essentially to the edge of the pit. Here Needlegrass was already 12 to 18 inches tall and wheatgrass seedlings that were probably 6 inches tall were locally abundant and had very healthy and robust leaves. A few other much smaller grasses were just beginning to appear, but gave me the impression they were very small *Bouteloua gracilis* (Blue Grama) seedlings; however I could not be certain as they are just cotyledons.

Throughout this area the vegetation appeared to be much closer to what was expected over the entire Pit and Plant area. I estimated the area at between 4 and 6 acres. Boundaries between this northern area and the adjacent areas to the south that had little grass growth tended to be quite abrupt. The density of these grasses however was not high enough, at this time, to consider it on the way to success, but this location was the most promising growth on the entire site. This was much closer to normal than anywhere else.

The question however is why is the transition from the essentially grass free areas to good growth in this area often no more 15 to 20 feet wide? Furthermore, it appears that grasses in this transition area were growing less well than the grasses a few feet further to the north. This may very well provide hints as to why the grass is doing poorly toward the south end of the pit area and fairly well on the north end of the pit. But more development of the vegetation is needed to allow time for the transition zone to become more defined and see if the boundary remains.

Investigating this boundary and its cause right now was deemed unnecessary as these unusual growing conditions are likely introducing variables that would likely confuse any conclusions formulated at this time.

Physical factors on the site found that the soil at 3" depth was now up to about 55° F which was high enough that grass seed germination should have been occurring. But under normal weather conditions the soil at that depth should have been between 5° and 10° higher by this time. So it was clear that the deep freeze of the winter and the recent heavy rains have had considerable impact on the subsurface environment. At this point in time, those conditions are almost the defining conditions that control the development of young vegetation.

Thus, this concludes the report of the observations made on May 31 which is well before a complete view of the revegetation status can be examined. Better information will be available in about a month.

## June 28 Followup Ecological Inspection of the Site

After another month of vegetation development a second inspection was performed to see what had happened during that time. Did the grasses come up or were the weeds working as an even more restrictive factor in the growth of the desired vegetation cover? What was happening with the site with regard to erosion? As Figures 6 and 7 show, the precipitation continued with even greater abundance than in May. And the unusually cool weather continued as well. Signs of a return to a more normal weather and climate for this time of year were fleeting at best. Drying conditions simply did not last more than a day before the wetness returned. In fact, by the end of June the Denver Metropolitan Area had reached its average ANNUAL precipitation level, but there was 6 months more to go in the year. Most days were cloudy and humid or partly cloudy and humid with frequent drenching and sometimes violent thunderstorms in the later parts of the day that would sweep across the land producing stream overflows, urban flooding, and sometimes considerable destruction.

What was found on this day was, in a word, considerably more of what had been seen a month earlier. The kochia was about twice as large and presented little evidence that the plants were competing in the least bit. The Russian Thistle however was of about the same stature and were competing fiercely for resources. There was a bit more yellowing of the thistle plants, but a die-back of this species was almost never seen. However, even less grass growth was found with this inspection, except on the northern end of the pit where the grass was flourishing like nowhere else in this project area.

More redistribution of sand hand occurred at the Plant Site, but that had also actually filled in a good deal of the erosion that was present a month earlier. Unfortunately, the fixes of previous erosion damages was done with sand and the sand was inhibiting growth of grasses and even weeds. The total amount of land covered with sand was about the same as in May or slightly greater. In effect, at the Plant Site, the soil surface was so unstable from the frequent heavy rains nothing could actually occur to effectively stop the stripping of the previous surface and

replace it with a new surface layer that could remain in place long enough to allow whatever seeds were there, grass or weed, to germinate and thus have at least a chance to stop the constant surface renewal process.

In contrast the Pit Area was incredibly stable with the abundant weed growth effectively limiting surface erosion except in sandy spots where the same process seen at the Plant Site was occurring on a far, far less amount of land. The central drainage path, for the most part, was in excellent condition with virtually no erosion except near the outlet where the grade of the channel slope increases slightly. Significant portions of the channel across the bottom of the pit was even vegetated although in some places depressed to the ground and covered with some brown silt that was not sufficient to even kill the plants; instead, they were just compressed to the ground and with a gentle rain could be washed off so they were fully exposed to the sunlight.

With regard to vegetation establishment, the Plant Site was now the problem area because the gradual redistribution of sand was slowly burying the site with essentially a sterile growth medium - white quartz sand. On the other hand, at the Plant Site the success in establishing the desired vegetation was well on its way where the migration of the sand was not occurring. Here if weeds and/or grass became fairly established then the sand redistribution could be controlled well enough so the vegetation could develop no doubt by having the roots imbedded in the soil below the sand. But this process is a very slow one so long as the precipitation continues to be strong frequently enough that the plants can grow enough to impose some control on the instability of the surface of the ground.

The Pit Area was, in some ways, the opposite of the Plant Site. Here redistribution of soils was minimal simply because at least 95% of the land surface was densely vegetated. The vegetation was mostly weeds though and in the dense kochia areas knee high or higher. However, the Russian Thistle here was also small and was growing very poorly with far too great of a density. If this continues this species may not even produce much new seed which could result in a partial depletion of seed source to the level where this species can barely survive on the site in high abundance. However the short-term future of the kochia is more assured and, at this point, appears to have a fruitful future, unfortunately.

The critical question at this time is how much of the desired grass seed is still alive in the ground? That is a question that is almost impossible to answer. The major question is whether the coolness of the soil and the high moisture content worked to allow the seed to remain alive or was it killed by fungus and bacteria that invaded the seeds and basically ate them?

## Conclusion and the Future Path of Development

It should be quite obvious at this point that this reclamation project, unlike all previous reclamation projects at this site, is having some difficulties getting started. It appears that everything that is a problem stems from or is related to the record breaking or near record breaking moisture that has fallen between May 10, 2023 and June 30, 2023. The total rainfall

received in that period was about 14" in both big thunderstorms and gentle drizzle or rain that lasted for hours and hours.

The soils, at times, were saturated with water and as a result there was the potential for prodigious runoff. On the Plant Site this created the slow redistribution of the sand through segregation of the sand from the soil that was a sandy loam when laid down. Also the plant site is where the sand was processed and although most of the sand washed from the raw mined material was sold, stockpiling of washed sand was done. That product tends to blow around in strong winds as well as spilled sand was carried into other areas of the Plant Site during rain storms. After many, many years of such processing the amount of sand in the soil profile becomes greater. Thus, in reclamation this material becomes a significant part of the reclamation soil even with the topsoil covering it.

Under normal weather conditions that plant growth medium (replaced original soil on top of sand charged material below that) should have supported most of the species in the seed mix quite well. And because of the sandy subsoil created in the total plant growth medium should have been resistant to becoming saturated. Instead the heavy rains would have moved some of the fine material on top into the sand through vertical movement of fines downward (iluviation) causing the soil to be more prone to saturation and sheet erosion which is what has happened.

In the Pit Area the soils are less sandy and have a bit more of the clay sized particles because in mining the sand the sandiest material was hauled away to be processed and sold as a sand product. Thus the reclamation soils here would be less prone to erosion but much more prone to saturation.

So what has happened? At the Plant Site there has been more success with the grass growth which would have been aided by having the more porous soil there. However because the soil is more sandy its potential for supporting sheet erosion was higher and that is what has happened which has removed some of the colloidial sized particles leaving a sandy medium lacking in fines needed to support rich growth. But rich growth has occurred where this alteration of the soil has not occurred - unfortunately, like at the Pit Area, most of that growth was robust kochia and densely packed Russian Thistle plants. The thistle simply cannot achieve much height because the competition is so intense.

In the Pit Area the replaced soil generally contained much more colloidial soil particles derived from the soil stockpile which underwent some segregation of fine particles from larger particles to produce some layering before the next soil is added to the top perhaps one to three or even four years later when more land is stripped of soil so the sand could be mined.

Much of the reclamation subsoil is composed of sand that had too much clay to feasibly process. Thus over time the surface material here becomes more clayey while the mineral layer at the Plant Site becomes more sandy. Both are topdressed with a fairly sandy natural soil that has been stockpiled.

But even with that the extreme precipitation events would have altered the soil particle distribution to create a more erodible soil at the Plant Site and a much finer soil at the Pit Area.

The remaining fines at both areas become saturated with water and that supports plants that are capable of taking advantage of that situation. The annual weeds are Masters at latching on to an opportunity and growing profusely and out-competing the more reasonable perennials for water and nutrient resources. But water availability in these prairie environments is very commonly the limiting factor in determining what succeeds and what fails.

Thus for the most part what has happened can be explained by simply imposing a situation where someone forgot to turn the hose off for about seven weeks. That created a totally unexpected growth environment which resulted in what has happened and what is there today. The match between the seed mixture which is designed for more normal conditions rather than something that became semi-wetland could be overwhelmed by the opportunists - the annual weedy species. The climatic data shows that up until May a fairly normal year was occurring - and then it changed drastically.

Is there still seed in the ground yet to germinate if it dries out? Probably not, but it is possible for sufficient seed to survive to continue the reclamation process under drier conditions. Not even half of the growing season is over so there is still plenty of time to recover from what has happened by no fault of us humans. We are in a time of a rapidly changing world climate - that is no longer in doubt. Failures are happening all over world with massive flooding, unimaginably severe droughts, and all the other phenomena associated with an unstable world climate that is changing to a "new normal." Here at this site much of the area may need to be replanted, but it is far too soon to determine that. It is important to continue monitoring this site well into the later parts of this summer. This Seattle-like climate may change into something more like Albuquerque. In fact, as this is being written that seems to be the case for the foreseeable future. But a month from now we could be back in the swamp if there is strong North American Monsoon this year. With El Niño here that is entirely possible and some of the experts think there could be very strong monsoonal shift this year simply because there is more energy available in the atmosphere to drive a strong monsoonal wind shift. That would return the site to a wetter but not necessarily cooler condition. After a month of dry and hot that might not be a bad thing. It cannot reliably be predicted.

All of this is well and good and nobody knows what the future will be. However, perhaps the reader has noticed there is a fly swimming in this soup. It is a curious and quite pretty little butterfly. It is those few acres on the north end of the Pit Area where, to a fairly high degree, what is happening is almost in the range of being acceptably normal. It is an island of reasonable normality in a wild and crazy sea where everything seems to be going wrong. This is the area that could very well provide answers to why so much of this project is currently developing along the wrong track. That is where the attention now should be given. Why is that area and the rest of the site so very different? In some ways it is like two worlds.

Another follow-up inspection will be done in early August and, depending on what is found in August perhaps September. In particular the transition between the successful grass on the north end of the Pit Area and the less successful (at this time) grass to the south will be critically examined to help determine why they are so different with regard to success. Plans for any corrective actions needed will be done in the Fall and Winter months. That will all depend on what the end of season conditions are on the site at the end of the 2023 growing season.

5. ***Status of Prior Revegetation Areas-***

A. ***Status of newest seedings as of report date -*** Already discussed above.

B. ***Status of older revegetation as of report date (describe growth rates, cover, invasive species, native invasion, and difficulties) -*** The only changes in the last year was due to the dramatic increase in precipitation. The productivity and the height of the grasses make the reclaimed areas look like a Mid-Grass Prairie in central Kansas than a Short-Grass Prairie in central Colorado just east of the Front Range Urban Corridor. This applies to both the former reclamation sites and the undisturbed but grazed natural grasslands. This year the Needle-grasses have done exceptionally well and have dominated the revegetation areas this year. But wheatgrass has also done well and the scattered clumps of Panic grass (*Panicum virgatum*) are close to "spectacular."

***Individual Reclamation Areas:*** None noted that are really unique.

F. ***Description of animal impacts on revegetation:*** No significant animal impacts were noted. Grazing appears to be continuing in some areas in a well managed fashion.

**WEED STATUS:**

1. ***General overview of weed status on site:*** This has been discussed on the new reclamation areas already. Elsewhere the big spiny thistle plants continue to pop us here and there as seed blows in from lands far away. Density is low.

**OTHER INFORMATION THAT MIGHT BE USEFUL FOR FUTURE REFERENCE:** No particular information was gathered in the last year that would be relevant to future operations.

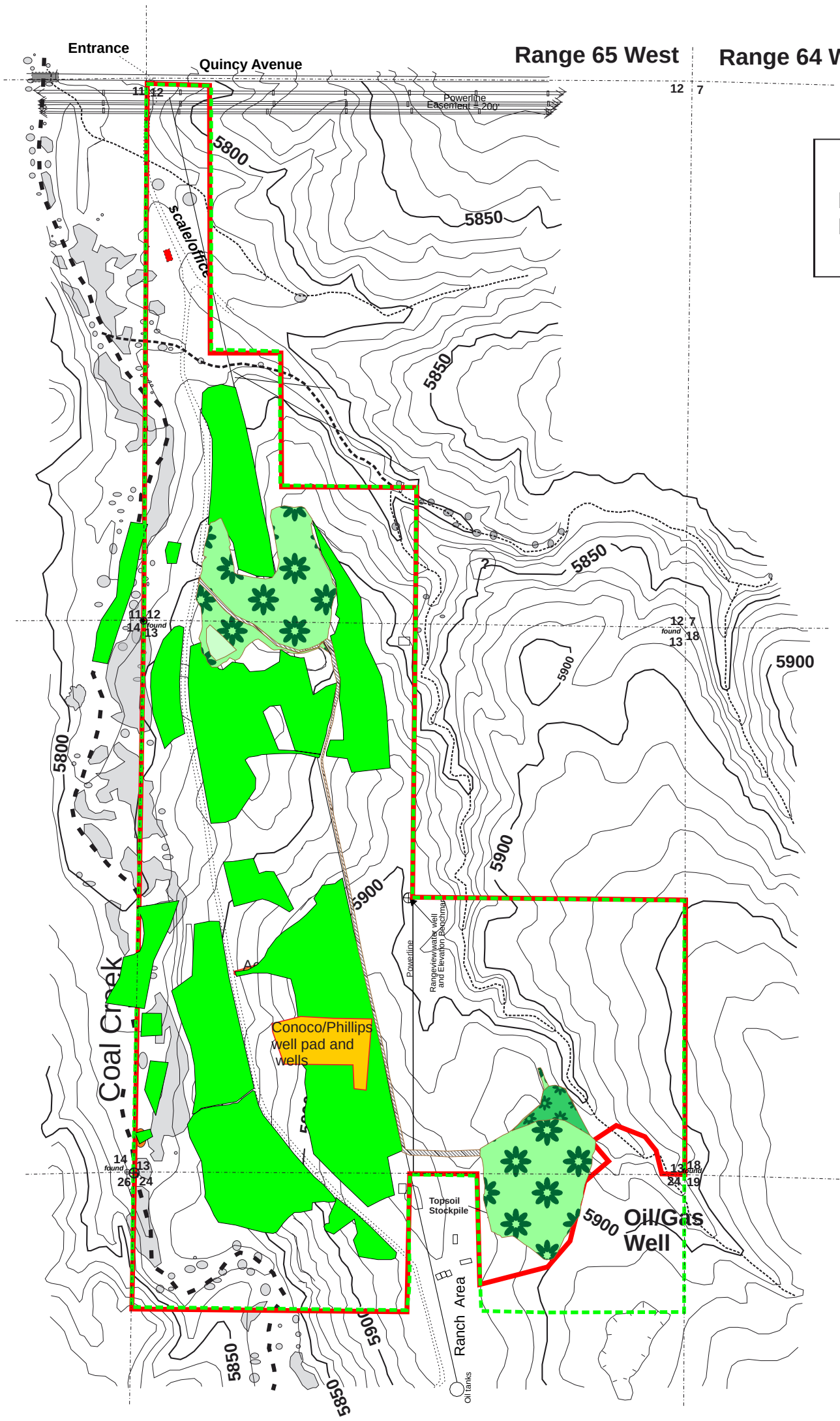
**DESCRIPTION OF UNUSUAL CONDITIONS OR EVENTS:** No unusual events or conditions were encountered in the last year, other than the record breaking rainfall in May and June. Everything else remained quite stable, although most grasses and other plants in the natural as well as reclamation vegetation is super-sized this year due to all the rain. ***However that can create a very high fire risk in September and beyond after all that growth dries out.***

***EXTRA CAUTION SHOULD BE EXERCISED IN A COUPLE OF MONTHS!***

**PHOTOGRAPHIC DOCUMENTATION:** The photo-CD mailed under separate cover contains the photos from the May 31 and June 28 reclamation inspections.

(Note: A copy of this report, less photodocumentation CD's, must also be provided to the Colorado Division of Reclamation, Mining and Safety to be included in the Reclamation Permit file as well as the United States Army Corps of Engineers. However, the Corps has stated that they do not want a copy.)

Operation: COAL CREEK RESOURCES
Permit: M-1988-044
Lease: GL264-5th Amendment
Operator: Schmidt Construction Company
Land Owner: State of Colorado




## *Vital Statistics*

| | |
|---|---|
| New Lease Area: | 780 acres |
| New Permit Area: | 715 acres |

(see report narrative for details)

New Lease Boundary

New Permit Boundary

Land reclaimed and released from Reclamation Bond

Revegetation in progress (55.2 acres)

Roadway from Main Road through Plant Site to Pit. (will remain)

Small area where work was not done because of good vegetation already present. (1.6 acres)

Location of most successful growth of grasses as of 06/28/2023.

Tributary streams

Coal Creek stream channel

Main on-site roads

Minor on-site roads

## Summary of 2022/2023 Operating Year

1. All land prepared for reclamation in 2021/2022 was planted in the September/October period by drill seeding grass mixture

2. Due to dry soil conditions no significant germination occurred in 2022.

3. May and June 2023 were extraordinarily wet which resulted in tremendous germination of weed species (kochia and Russian Thistle) but successful growth of grasses primarily on north end of former sand pit and fair grass growth in places on the former processing plant area. Elsewhere, as of July, there was little grass growth due to excessive competition from annual weeds. That may improve later.

N

True North

Magnetic North (10.1E)

0 500 1000 1500 2000

1" = 1,200'

**2023 Operation Status Map**

Report Map Revised as of: July 14, 2023

By MAH base date: Nov '05
This map prepared by MAH: July 2019

Mark A. Heifner

37 East Colorado Avenue • Denver, Colorado 80210-3105 • (303) 906-8096

July 14, 2023

Robin Reilley
Division of Reclamation, Mining and Safety
Room 215
1313 Sherman Street
Denver, CO 80203

RE: Copy of annual report to Colorado State Board of Land Commissioners for Coal Creek Resource Permit: M-1988-044

Dear Robin:

As required by the mining lease issued to Schmidt Construction Company from the Colorado State Board of Land Commissioners, a copy of the annual report made to the Land Board must be provided to the Division of Reclamation, Mining and Safety. Attached is that annual report.

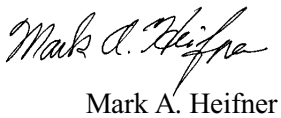
Please place this copy in the Reclamation Permit file for this operation. The permit number is shown above.

This report, unlike the ones in the past, is quite long and complex. With the sudden change in the weather/climate that began on May 10, a great deal has happened at the site unlike anything that has ever been experienced before. As the site is in the first year of revegetation the local conditions are very influential in creating the desired results. But an unusually cool to even cold Spring that was also extraordinarily wet with frequent episodes of soil saturation, much of the site appears to have suffered a problematic start. Yet there is one area that strangely is performing almost like nothing has happened.

I am not ready to call it a failure as there is plenty of time left this season for some kind of recovery. So I am monitoring the site closely to see what happens. There are no serious erosion problems other than some sheet erosion that is redistributing some surficial materials around the site. The greatest problem is an abundance of weeds in some places that is presenting a great deal of competition for the grasses that are desired. I will keep you informed as the summer proceeds and drier weather arrives, at least for awhile. No telling what the monsoon will do this year, but some experts think it may be strong.

Thank you.

Respectfully,



Mark A. Heifner

cc: Colorado State Land Board
Scott Davis
Dan Chavez