Homestake Grants NM

OVERVIEW OF PROJECT GOALS

- Environmentally Safe Evaporation Process
    - All changes to the site and its operation of evaporation as a water mitigation method must take into consideration its impacts to the environment.
- Changes recommended must consider a timeline of being operational in April of 2018.
- Optimize Evaporation
    - All equipment presently onsite shall be evaluated for its inclusion into the April 2018 start of water evaporation
    - Changes to the impoundment infrastructure must take into consideration the same timeline
    - A target goal of the water balance is not established yet, but it being contracted out. The present goal is to set out an operational system that removes as much water as possible while controlling impacts to the environment
- Keep Ion loss under control
    - Evaporation plume must take into consideration the plume drift of the dry aerosol compound that can be lofted during operations.

Site Visit Trip Report

Homestake Grants, NM site visit was successful as we toured the entire site and were able to view and question key personnel from Homestake about the past and present operations. We have identified several items that will need to be addressed in advance of the April evaporation reconfiguration start up.

EP1:

While evaluating EP3 there is a large amount of abandon unused piping (HDPE and other plastics) that are resting on the and submerged in the impoundment. We are commending that as much of that piping that is no longer being utilized for active operations be removed from the impoundment as part of the preparation for the April 2018 evaporation start.

The impoundment has adequate power available for operations of the units, though some conductor reconfiguration will be required to get the power to the recommended unit placement.

The present pumping system was not operational at the time of the site visit but can be utilized for evaporation operations.

Since EP1 is the final locations for the site remediation concentrates we looked into the possibility of switching the location of high TDS waters found presently in EP3 into EP1. The pipeline for pumping to EP3 from EP1 was evaluated. We recommend that a pump be located on EP3 with a switching valve that can be used to move water from EP3 to EP1 and further the same configuration be made at EP1 so that it be set to pump or receive water from or to EP3.

Since EP1 is the terminal location for the remediation concentrate it makes since to modify operations now so that final concentration is taking place in the final location, verses concentrating in EP3 and having to move its concentrates to EP1 for final disposition.

EP2:

During the site visit we observed a large part of EP2 has the remnants of a sprinkler system on its surface. The system consists of a plastic piping system with sprayer heads on uprights. This entire system will need to be removed from the EP2 and disposed of properly.

The impoundment can be pumped into EP1, we would recommend that EP1 be modified to pump into the pipeline that moves liquid to EP3. Since EP1 is the final repository for concentrated brine from remediation it would be more long term operational sense to begin to set up EP2 to deliver to EP3 for concentration and the pumped to EP1 for hyper concentration.

EP3

Evaluation of the impoundment found a piping system on its northwest area. We recommend that this be removed and disposed of properly.

The impoundment is presently being used as a concentrated brine impoundment. We are recommending that a pump and valving system be added to the present receiving pipeline so that concentrated brine can be pumped to EP1 for final hyper concentration. This is being recommended since EP1 is the final resting location for all remediated concentrates.

After pumping capability is added to EP3 we recommend that EP3 become the primary high-volume evaporation location for all liquid pre-concentration. The space and location of EP3 make it ideal for eventual automated evaporative concentration operation. Upon completion of preconcentrating the liquid it can then be pumped to EP1 for the longer controlled process of hyper concentration.

Power was evaluated at the EP3 location. Adequate power exists for operational changes, but subpanels would be required to feed the power to the evaporators.

WCP and ECP have potential for additional evaporation, but not with the present equipment in inventory. They would require a surface disturbance methodology for evaporation while maintaining dry aerosol drift control. That technology is effective but beyond the scope of this evaluation.

Environmental Concerns:

Ion content drift

The plume drift of dry aerosol is the primary concern with the environment. EP1 gives the best protection against plume drift for hyper concentration of the remediated brines. Since it is designated to receive all the final remediation fluid concentrates, it can be used to perform the hyper concentration allowing EP3 to become the primary high-volume evaporation area for the site. Changing the present process to handle all high TDS concentrates in EP1 will allow a new method of evaporation to be retrofitted onto EP1 operations in the future.

Noise pollution concerns

Operations times are limited on EP1 and EP2 due to neighbor noise concerns. The operational times are presently accepted by the neighbors. If operational changes are made to have EP3 become the main pre-concentrating area and EP1 is converted to hyper concentrate handling, several new technologies for evaporation with 30 db less noise can be considered for inclusion to get longer run times and deliver much lower noise levels for the neighbors. Further evaluation of this process change is beyond the scope of this investigation but should be looked at in a follow-on evaluation.

Odor Pollution

During the site visit Odor complaints were discussed as part of the impacts to the environment. Wind direction and higher temperatures are the biggest factor in these complaints. Odor mitigation is possible with the adaptation of mitigation casting to evaporators. However, odor control will have to be evaluated in a follow-on study as it is beyond the scope of this evaluation.

Recommendations for logistic changes and improvements for Homestake Grants, NM

- Have excess and abandon piping on EP1 removed and disposed of properly
- Have pumping piping system on EP1 modified to not only send water to EP3 but be able to receive water from EP3 (common pipeline wye valved)
- Have the sprinkler piping and tubing removed from EP2 and disposed of properly
- Have EP2 piping and pumping modified to deliver water to EP3 for concentration
- Have EP3 piping and sprinkler system removed and disposed of properly
- Change EP3 present receiving pipeline to a receiving and sending system with the addition of necessary pumps and valves
- Add 480 power sub-panels to the EP3 location for operation of 350 KW of equipment.

Automation Optimization of Ion Drift

Evaluation of the present electric supply sheds are adequate for the addition of automated systems for drift control. Evaluation completed looked at process changes to also reduce the costing of automatic drift controls. The single largest process change recommendation from the evaluation is the change to where hyper concentrate is stored. At the present time it is stored in EP3 while EP1 is the ultimate resting place for the remediated concentrates. By changing the process on the site to have EP1 hold hyper concentrate and EP3 become the high-volume pre-concentrator automation efforts could be focused on EP3 only.

Wind is the primary concern with plume drift on the location. Early automation to control drift can be as simple as a wind direction and wind velocity logic system that takes evaporators offline at specific speeds and directions.

Later automation efforts should look into more sophisticated methods including wet bulb depression, water temperature as well as wind and speed. Full automation of this preliminary stage of evaporation would not be recommended until evaporation process can be fully understood after the water balance work is completed.

We recommend that only a wind speed and wind direction shutdown be considered at this time for the April 2018 start. It offers the best environmental protections for the least investment.

Consideration by Homestake should be given to the electrical changes required to have water pumps and fan controls changed to automated on/off cycles.

Evaporation Enhancement analysis

The present inventory of units and the average per day performance expected is summarized in the table below.

Unit	Count	Average Rate GPD	
Apex	5	33000	
Turbomist	8	86400	
Surface Mist	2	9600	
Total Average Day		**129000**	
chart assumes new APEX running 100000 TDS water			

Presently the inventory consists of five APEX units, eight Turbomist units and two Surface Mist units. For purposes of the report I have utilized the APEX units in the high TDS waters presently impounded in EP3. These TDS level reduce the evaporation efficiency of the unit. With the present inventory Homestake will evaporate 129,000 gallons per day on average assuming a 10 hour run day based on the noise abatement operating schedule.

The chart below shows the replacement of the angled exit Turbomist units with Landshark Units. It also replaces the Surface Mist unit (smaller APEX looking evaporator) with two APEX units running in the lower TDS water.

Unit	Count	Average Rate GPD	
Apex	5	33000	
Landshark	8	124800	
Apex	2	16800	
Total Average Day		**174600**	
chart assumes 5 new APEX running 100000 TDS water			

If the Landshark units were purchased an approximately 40,000 GPD could be achieved.

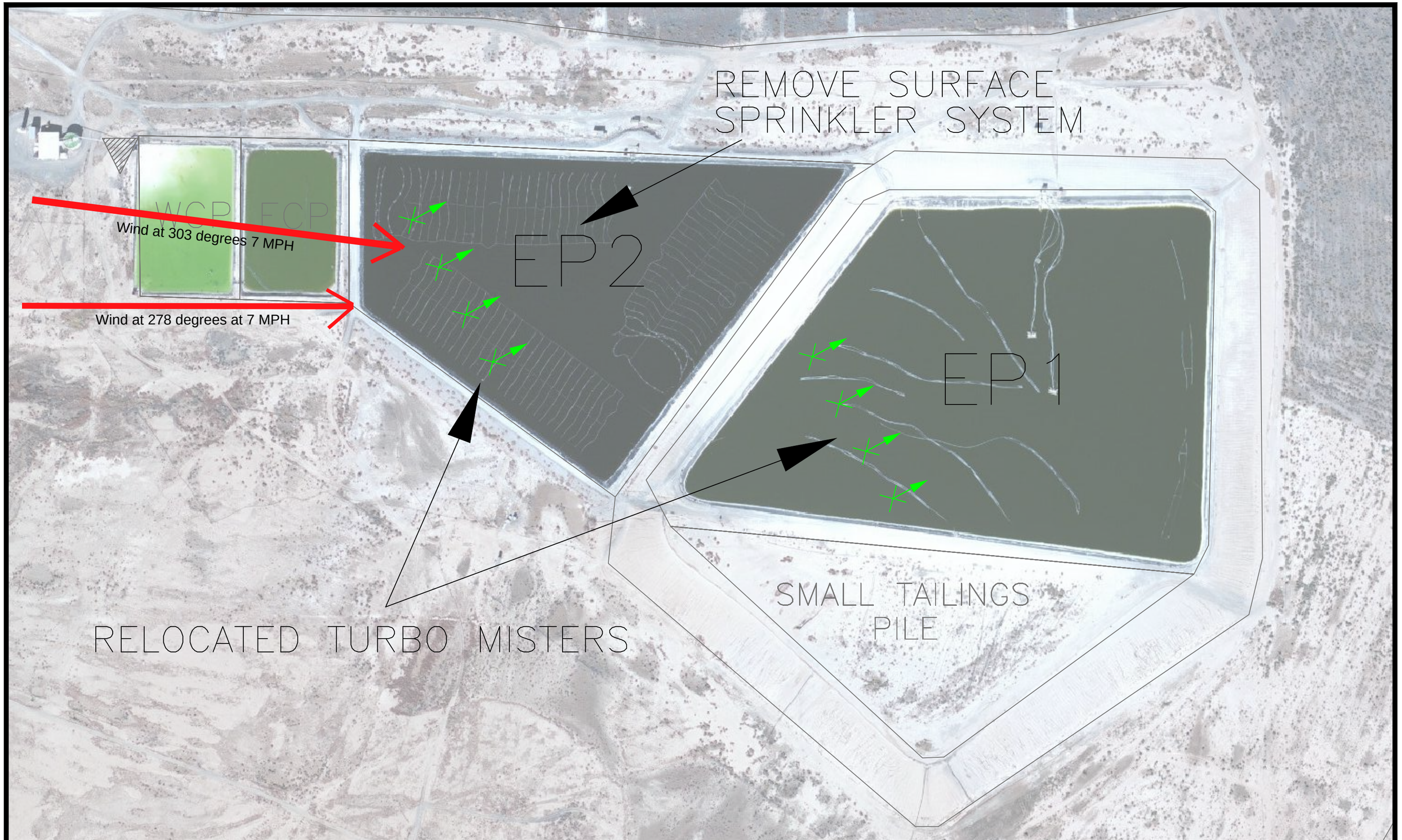
The chart below shows the addition of Landshark Units added to the present unit inventory. It also shows the addition of two APEX units while retaining the Surface Mist units.

Unit	Count	Average Rate GPD	
Apex	5	33000	
Turbomist	8	86400	
Surface Mist	2	9600	
Landshark	8	124800	
Apex	2	16800	
Total Average Day		**270600**	
chart assumes 5 new APEX running 100000 TDS water			

The addition of units effectively doubles the rate of evaporation for the site on a daily average. The addition of units would make the most sense where the inventory of Turbomist Units and Surface Mist units are already owned by Homestake. I also know that after getting the evaporation units started in the spring, we would look at changes to the Turbomist units to try and enhance their evaporative efficiency.

Unit placement and performance enhancement

The next two pages in this report are the unit placement recommendations for operations to start as the site process is presently run. These would change if the EP3 and EP1 handling are changed as recommended above. The APEX units would follow the High TDS water to EP1 from EP3 and the Turbomist evaporators would follow the lower TDS water to the EP3 impoundment.



EVAPORATOR UNIT

REVISIONS	No.	DATE	MADE BY
	1		
	2		
	3		
	4		

DATE	DRAWN BY
10/05/2017	DDL

Homestake Mining Company
Grants, New Mexico

EVAPORATION RELOCATION
FIGURE 1

EVAPORATOR UNIT

REVISIONS	No.	DATE	MADE BY
	1		
	2		
	3		
	4		

DATE	DRAWN BY
10/05/2017	DDL

Homestake Mining Company
Grants, New Mexico

EVAPORATION RELOCATION
FIGURE 2

Water surface enhancement analysis

Water surface enhancements is still being evaluated at this time. This will come under separate report.

TDS impacts analysis and overview

TDS has a dampening effect on evaporation rates. At the present time EP3 has the highest TDS levels of water on the Homestake Mining Grants NM site.

High TDS water also has the greatest environmental risk with regard to plume contamination. As such it is recommended that Homestake use the APEX units in the high TDA waters. They have the lowest cast trajectory of all the evaporators presently inventoried at Homestake.

Unit		Highest TDS recommended
Apex		300000
Turbomist		85,000
Surface Mist		300000

Water mixing a common practice to keep evaporation rates higher, since all concentrate is going to remain on the property in EP1 at the end of the project, water mixing would be limited to storage space. If EP3 is changed to the low TDS operational impoundment it offers the chance to stage TDS levels before final concentration in EP1. This would take the process method of EP2 being the pre-concentration receiving stage. As the TDS load climbs to the 25K to 30K levels the water should be transferred up to EP3 for bulk concentration, as EP3 is separated it should have a limit of 100K TDS when the water would be transferred down to EP1 for final saturated concentration by evaporation.

Seasonal performance and schedule analysis

Recommended operational schedules are fairly simple after weather analysis. At this time I would make no machine adjustments for as the winter months are shutdown for operation of evaporative system. However, as the TDS gets higher the freeze point will lower allowing longer operation of the units into the winter months.

The limiting factor for this type of run process is pumps and pipe freezing up. The site visit revealed very little pump and pipe freeze protections. And the most common freeze protection being draining and winterizing for non-use. As the TDS levels raise near the end of the project cycle scheduling should be revisited to analyze whether operations deeper into the colder months is warranted.

Simple heat site analysis

The present collection of simple heat is through the ponding surfaces. At the present time I am still evaluating the impacts of the simple heat collection data.

Radiant cooling Analysis

The noise abatement agreement with the neighbors makes the overnight run time limited. But it should be documented that running the evaporators more then 3 hours after sunset and starting them no more than a half an hour before sunrise should be adhered to at all times.

The problem with the area weather and desert climate is the heat loss after sunset is very rapid. This causes the water in being sprayed to switch from a latent heat phase change to a sensible heat where energy is released by warming the air instead of evaporating water.

Additional Thoughts and Recommendations

We would recommend that additional investigation be commissioned into the water process handling and undertaken by Resource West, Inc. This research would study then outline a process methodology to change that water handling flow so EP1 becomes the high TDS impoundment and outline the most efficient ways of handling the water transfers and concentration levels before being moved to the next stage of concentration.

We would recommend that quotes be obtained for adding in the additional evaporation capacity of the Landsharks if the quest for this evaporation season is to bring the levels to maximum. Lead times are something that we must be cognizant of if impacts for water removal are to be maximized for the 2018 evaporation season.

We would request that as soon as the water volume is quantified we receive that information to review and start to outline how to handle the amounts required.