NOVASEL

Findings of the Borehole Location Study at The Wolford Run Passive Treatment System

Jamison Coal Company – Jamison No. 1 Mine located in Salina, PA Bell Twp. Westmoreland County

Upper Freeport Seam – Borehole located southeast of Salina at the extreme eastern edge of the Jamison deep mine. The Jamison Mine is approximately 400 acres in size. The location of the borehole is an isolated extension of the mine downdip of the main portions of deep mine. Surface elevation at 854' and the bottom coal elevation at 751'. Coal is nearly 48" in thickness. There is 103' elevation difference between bottom of the coal and the surface elevation of the borehole. This borehole appears to be situated in the lowest surface elevation point of the mine. There are no other obvious areas that have a surface elevation that is lower and a coal elevation equal to or lower in elevation than the existing discharge point. It is most likely that this borehole was situated to help drain the mine and is the perfect location for draining the mine pool since this appears to be the lowest point in the mine with the combined lowest coal and surface elevation with all water in the mine flowing downdip towards the borehole location. However, the chemistry of the mine water suggests that there is mixing of an alkaline pool with a pool of more acidic mine water. The sources of the two waters could be mixing at or near the borehole location, or be traveling some distance before discharging at the site.

Avonmore Field R&P Mine Map

R&P exploration drilling/mine map of the Avonmore area showing the extent of the Jamison No.1 Mine. The map also shows the location of a Cochran Coal Co. Upper Freeport mine named the Truxall Mine and is approximately 2500 acres in size. This mine is located updip of the Jamison Mine and is not directly connected to the main body of the Jamison Mine, except for, an apparent drainage tunnel leading from the Truxall and connecting to the Jamison mine extension within 2000 feet of the borehole location. This drainage tunnel appears to have been placed so that water draining from the Truxall bypassed the Jamison, providing for a direct link from the Truxall to the borehole location at the extreme eastern extension of the Jamison Mine. The Truxall mine is at least six times greater in size than the Jamison and appears to not be flooded except for the area where the tunnel connects to the lower end of the Jamison Mine.

The map shows many drill holes in the area targeting the Upper Freeport coal seam but none in the treatment system area. Coal thickness all around the area ranges between 42 and 50 inches in thickness. There are no areas of the deep mines that can be located both lower in surface elevation and downdip of the treatment system location. This map shows the structural contour elevations of the Upper Freeport coal seam at 50' contour intervals. The structural contours indicate that the Port Royal (Elders Ridge) Syncline is situated ~8500 feet to the southeast of the site. The Roaring Spring (Murrysville) Syncline is situated ~ 16,000 feet to the northwest of the site. The elevation of the coal at

the synclinal trough is ~450 feet in elevation while the elevation of the coal on the anticlinal ridge is at nearly 1100 feet in elevation. The apparent dip of the Upper Freeport coal seam in this area is approximately 3% to the south and east. Coal elevation at the site is at near 751 feet in elevation.

Unnamed R&P Mine Map of Mines near Salina

Does not show the structural contours but does show in great detail the location of mined out areas of the Upper Freeport coal seam. The map does not show a drill hole in the area of the treatment system. Drill holes that are shown do not have surface elevations; few have elevations of the coal seam while some have coal seam thicknesses.

This map also shows in great detail the drainage tunnel leading from the Truxall Mine connecting to area of mine containing the borehole. The map also shows that there are no other locations within the Jamison Mine that ties directly into the Truxall Mine. A coal barrier is clearly delineated on the map separating the two coal mines.

Westmoreland County Coal Report

The passive treatment system is located on the USGS Avonmore 7.5 minute quad. The Report shows that there are other coal seams outcropping in the area of the treatment system. The Upper Freeport coal seam is shown to crop out in the area down next to the Kiskiminetas River. The Report does not show mining in the area of the passive treatment system contrary to what is shown on the mine maps from R&P Coal Company. The mapping by the Report of the mined out areas of the Upper Freeport coal seam stops just south and west of the town of Salina.

Potential Borehole Locations

Borehole locations that could be checked out as locations for possible investigation are marked on R&P mine maps K-90, M-3 and J-14. J-14 has a surface elevation of 970 and bottom coal elevation of 623. M-3 surface elevation is ~809 and the K-90 surface elevation is ~881. None of these locations will yield an artesian flow condition if a borehole is located in these areas.

Discussion with R&P Coal Co. Geologist

Discussions concerning the geology of the area were held with a former geologist from R&P Coal Co. The geologist has great knowledge of the Jamison Mine in the Upper Freeport Coal seam and of the Kier Firebrick Company clay mine situated below the Upper Kittanning coal seam below. The Jamison Mine and the Kier clay mine do not overlap in the area of the passive treatment system. The mines do overlap at least 2000 feet to the southwest of the treatment site. It was thought that there could have been a chance that water in the clay mine could be producing an acidic discharge containing

aluminum that mixes with alkaline water from the Upper Freeport coal mine, to produce weakly alkaline, Fe contaminated water with low concentrations of aluminum. The Upper Freeport mine pool could be water of circumneutral pH, containing high concentrations of Fe with no aluminum, while the clay seam associated with the Upper Kittanning coal seam could be of lower pH, high acidity containing high concentrations of aluminum. Any deep mine located below the Upper Freeport coal seam would be completely flooded with mine water and would create an artesian flow condition whereby water from the lower mine would flow to the upper mine. It is possible that through exploration activities associated with the testing of coal and clay, a test hole positioned updip of passive treatment location penetrates two different mines at different elevations allowing the water to flow from a lower mine and mix with water from the upper mine before discharging from the borehole at the treatment system. Even if the borehole located at the treatment site does not penetrate more than one mine at this location, it is possible that another borehole located to the southwest penetrates multiple mines. A borehole penetrating more than one deep mine updip of the passive treatment site would allow mixed minewater to flow towards the borehole discharge point.

Other Areas of Mine

The map shows a portion of the mine off of the B-Mains that is located 4000 feet to the south of the borehole with surface elevation being roughly at near the 960' elevation, ~100' higher in surface elevation than the treatment site. The coal elevation would be at near the 620' to 640' elevation, or about 110' to 130' lower elevation difference between this location and the treatment site.

There is an area downstream from this site that appears to have room for a passive treatment system. A borehole would have to be drilled into the mine and a siphoning system implemented to drain water from the mine. The siphon pumping rate would have to be greater than the flow rate at the Wolford Run treatment site. The chemistry of the minewater may be of better quality at this site than at the current passive treatment site but could only be confirmed by pumping the mine pool for an extended period of time to evaluate the chemistry of the mine.

Recommendations as of February 2005

A test borehole into the mine south of the current passive treatment system could yield information on the chemistry of the minewater at another location. It may not be possible to find a location that accesses the mine pool with both a surface and coal elevation less than the current discharge point, but it is possible to find areas were the coal seam is at least 110 feet lower in elevation. A test hole location would yield water samples to determine water chemistry and the practicality of pumping or establishing a siphon pump to remove water from the mine.

If the new borehole location yields better water quality than the current bore hole location, then the mixing of the two different mine chemistries may provide for a longer

residence time within the mine which would allow for the precipitation of aluminum before discharging from the mine.

To pursue the idea of moving the discharge by drilling into the mine pool at another location, an area suitable for the construction of a treatment system would have to be identified in the area of new borehole location. To improve water chemistry by moving the discharge location, it must be assumed that there are more than one deep mines producing water to the discharge and that by moving the discharge some distance, the extra residence time would provide for an opportunity for the precipitation of aluminum within the mine.

A field meeting will be conducted to evaluate the idea of relocating discharge point. The field visit will also be used to try and locate additional discharges stemming from the Upper Freeport seam out of the Jamison Mine. Flow rates will also be collected at the site to try and capture a higher than normal flow rate due to the recent record precipitation events of the past several months.

Findings

- Borehole located three quarters of the way down synclinal limb of the Port Royal Syncline
  - Synclinal limb trends south and east at approximately 3% dip
  - Borehole located at both the combined lowest coal elevation and surface elevation within the Jamison and Truxall mines
  - All other points within the mine that has a lower coal elevation are located higher in surface elevation by at least 50 feet in elevation
    - If new borehole location is chosen away from present location, then pumping or siphoning would have to be used to remove water from the mine
    - No guarantee that the new location would yield better water quality than the present location

- Jamison Mine completely flooded
  - Water elevation at borehole at least 854'
  - Entire Jamison mine has coal elevation of less than 860'
  - Flooded environments often times produces a net alkaline mine water discharge with elevated iron concentrations and low aluminum concentrations

- Truxall Mine does not appear to be flooded a great deal
  - Portion of mine in southwest corner could be flooded
  - Estimated 90% of mine not flooded due to structure of coal
    - Humid conditions in the areas of the deep mine not flooded can produce highly acidic water with aluminum and iron

- 3% dip of coal seam could flood mine pool an additional 800 feet updip by raising mine pool 24' (elevation to Slope Entry)

- Drainage tunnel connecting to borehole location is flooded
  - Provides direct path from Truxall mine to the borehole location

- Kier Brick clay mine does not overlap the Jamison
  - Appears unlikely that an exploration drill hole would penetrate both the Jamison and an underlying clay mine within the Jamison Mine

- Kier Brick clay mine does overlap the Truxall
  - Exploration test holes could potentially penetrate both the Truxall mine and the underlying Kier Brick clay mine
    - Recent exploration drilling does not encounter clay mine
  - Kier Brick clay mine would be completely flooded and would upwell into any open voids above the clay mine
  - Water from clay mine may be low in pH, high in acidity and aluminum

- Jamison Slope Entry at near the 900' elevation
  - Surface elevation of borehole location at 854
  - Bottom coal elevation 775.4' at mine entry
  - Bottom coal elevation 751' at borehole location
  - Slope entry coal elevation is 24.4 feet higher in elevation than borehole location
  - Approximately 2000 feet distance between Slope Entry and borehole
  - Raising mine pool to this elevation would back up mine pool ~800 feet updip into the Truxall Mine

- Utilize open area upstream of treatment system for additional treatment
  - Drill new hole at the site to produce water tight seal
    - Drill right next to current location
      - Excavate and seal current borehole location
      - Install valve on new borehole

    - Drill a new hole upstream of current system
      - Take chance on missing mine
      - May change chemistry somewhat
      - If successful, water would flow downstream to the system

- Chemistry of present discharge location
  - Two different types of mine water appear to be mixing close to the borehole
  - Jamison completely flooded

- Truxall not flooded
- Jamison tied to borehole location by means of long drainage channel parallel to the mine
- Truxall tied to the borehole location by means of long drainage channel to the north of Jamison
- Mine waters from both mines do not mix and mingle until they reach within 2000' of the borehole

➢ Mining Company Exploration Hole Data 2003
- Two drill holes penetrated Truxall Mine in September 2003
  - Holes are dry in the Upper Freeport mine void
  - Static water elevations were 40 to 60 feet below UF coal seam
  - Truxall mine most likely dry
  - Perfect environment for the production of AMD
  - Holes do not penetrate the underlying clay mine

➢ Move to new location to drill new hole or drill new hole next to current hole
- Plug current borehole
  - Seal by excavating and removing 12 PVC
  - Pump mine pool to lower water level below steel casing
  - Install water tight seal inside steel casing

➢ Drill next to current borehole
- Install new PVC casing down into the mine
- Valve the new borehole
- Provide adapters at end of valve to allow for the coupling of new pipe
- Chemistry of water expected to stay the same

➢ Drill new hole updip and above the treatment system
- Raises mine pool elevation to allow for treatment upstream of system
- May change mine chemistry for the better by allowing a distilling area within the mine to settle out the aluminum
- Raising mine pool may also improve chemistry by flooding more of the Truxall mine

January/February Report Associated With
Wolford Run Site Investigation and Reconstruction Design
March 8, 2005

Work Completed During January and February 2005

A meeting was held at the Wolford Run passive treatment site between Hedin Environmental (HE) and the Kiskiminetas Watershed Association (KWA) on February 2nd 2005. The meeting was held to discuss findings of the geologic investigation that was recently conducted of the Upper Freeport Coal seam and associated Jamison Mine.

As reported earlier, there does not appear to be any other location in the mine that will allow for the relocation of the discharge point by drilling. According to the geologic structure and available mine maps, there are no other points within the Jamison Mine with a combined lower surface elevation and coal elevation, than the current discharge point. Therefore, there appears to be no way of relocating the discharge short of drilling a borehole in an area with lower coal elevation and pumping water to create a new discharge point. This option would be costly to operate on a continual basis and there would be no guarantee that the water quality from this new location would be of better quality than the existing discharge point.

During the site visit, a discussion about the possibility of raising the mine pool was developed. It was theorized that the discharge point could be raised by several feet in elevation. Raising the mine pool in elevation by several feet would create more area upstream of the current treatment system thereby allowing additional treatment components to be installed on the site. One of these components would most likely be the addition of a Vertical Flow Pond (VFP) to raise pH, remove acidity and have the ability to flush aluminum solids that would collect within the system. If the mine pool could be raised successfully, then water would be piped directly from the borehole location to a point upstream in buried PVC pipe to provide sufficient elevation to construct a VFP. The current flow path of water flowing from the mine would then be reversed, with water discharging from the new VFP flowing downstream towards the existing treatment system. Small modifications to the existing treatment system will allow for the reverse flow of water through the system.

It was decided that Hedin Environmental would secure the required couplers and pipe extensions to raise the mine pool 4 to 6 feet in elevation. John Linkes, a member of KWA, volunteered to assist in monitoring of the mine pool to see how quickly the mine discharge responded to an extension soon after being added to the borehole pipe. It was found that the borehole pipe was a section of 12" Schedule 40 PVC. The pipe could then be added onto by extension using rubber Fernco couplers to fasten an extension onto the borehole pipe.

On February 7th, 2 feet of SDR-35 pipe was added onto the borehole discharge pipe. Water from the mine rose 14 inches up in the 24 inch extension soon after the addition of

the pipe. Flow rate prior to adding the pipe was 250 to 275 gpm. A trickle of water was found to be flowing after one-half hour of observation.

After 24 hours had passed since the addition of the extension, John Linkes observed that the mine pool had reestablished its previous days flow rate of 250 – 275 gpm. John then installed an additional 12 inch extension and found that 24 hours later the flow rate once again reestablished itself to previous days flow rate. It was noted that soon after the 12 inch extension was added while the flow of water was stopped from flowing from the borehole pipe, that there was leakage of about 20 gpm from around the 12 inch PVC pipe within the limestone bed.

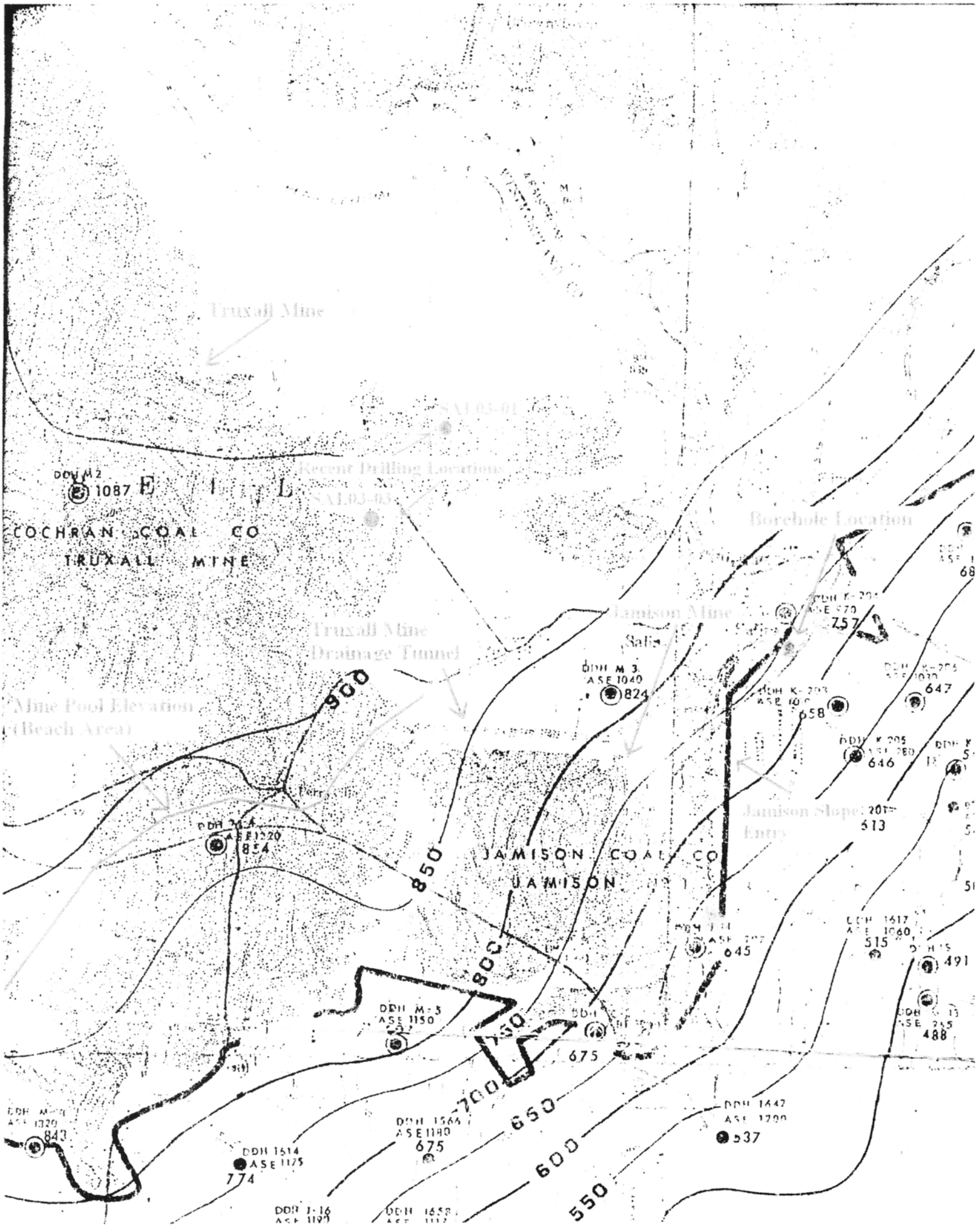
A phone call to Wes Gordon was made to find out how the PVC pipe was installed into the borehole. According to Wes, a pit was excavated down several feet and steel casing was cut off at the bottom of the pit, and a larger diameter extension of PVC pipe was added on the outside of the steel casing and extended to its current elevation point. As we backed up the elevation of the mine pool, water apparently started to seep between the steel casing and the bottom of the PVC flowing upwards through the limestone bed to the surface.

The mine pool continued to flow at the new elevation for a couple of weeks until March 3rd when HE added an additional 24 inch extension for a total of 5 feet of extension in elevation to the mine pool. Once again, within 24 hours of adding the extension, the mine pool responded by discharging at its full rate of flow of 250 – 275 gpm. During the time period in which the extension was at 3 feet, to the time that the 24 inch extension was added, the flow rate continued to flow 250 – 275 gpm and no observable points of leakage were observed within the study area.

Soon after the 24 inch extension was added, it was found that there was now 35 gpm of leakage flowing from around the borehole pipe within the limestone bed. It appears that raising the mine pool creates more pressure around the PVC pipe within the limestone bed, producing more leakage.

The mine pool stayed at this elevation until March 7th, when an attempt to straighten the 5 feet extension resulted in the extension coming off at the base of the borehole pipe creating an uncontrollable flow of water from the mine. It was noted that the flow of water started to recede within 30 minutes of the extension coming off of the borehole pipe. Most if not all of the water flowing from the mine passed through the treatment system, with little water flowing out over the embankment at the limestone pit to the stream.

The short period of time that it took for the mine pool to slow down its flow rate suggests that the area in which the mine is flooded is relatively small. The steeply dipping coal structure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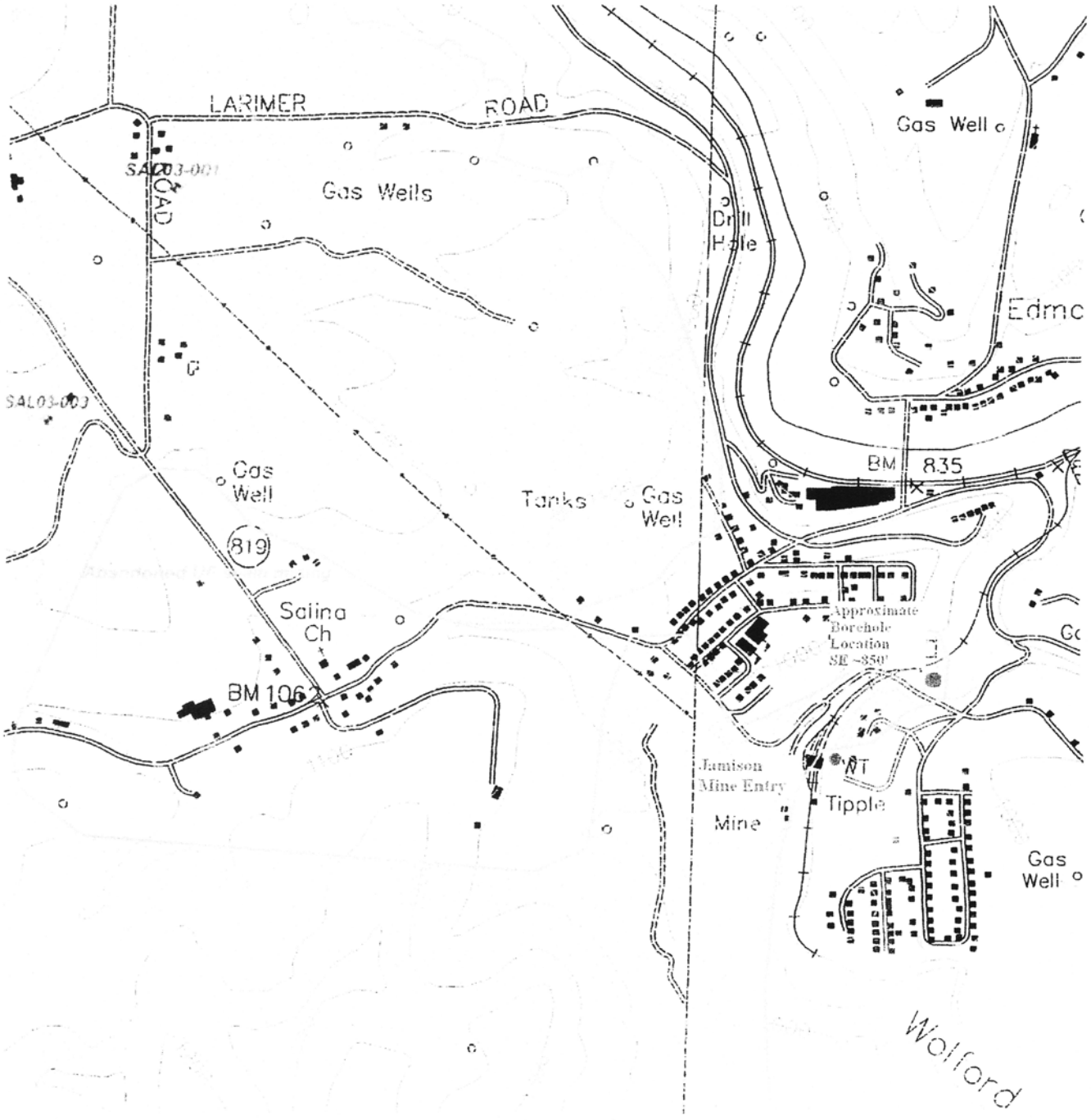
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Gas Well
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819
Salina Ch
BM 1067
Approximate Borehole Location SE ~850'
Jamison Mine Entry
Mine
Tipple
Gas Well
Wolford