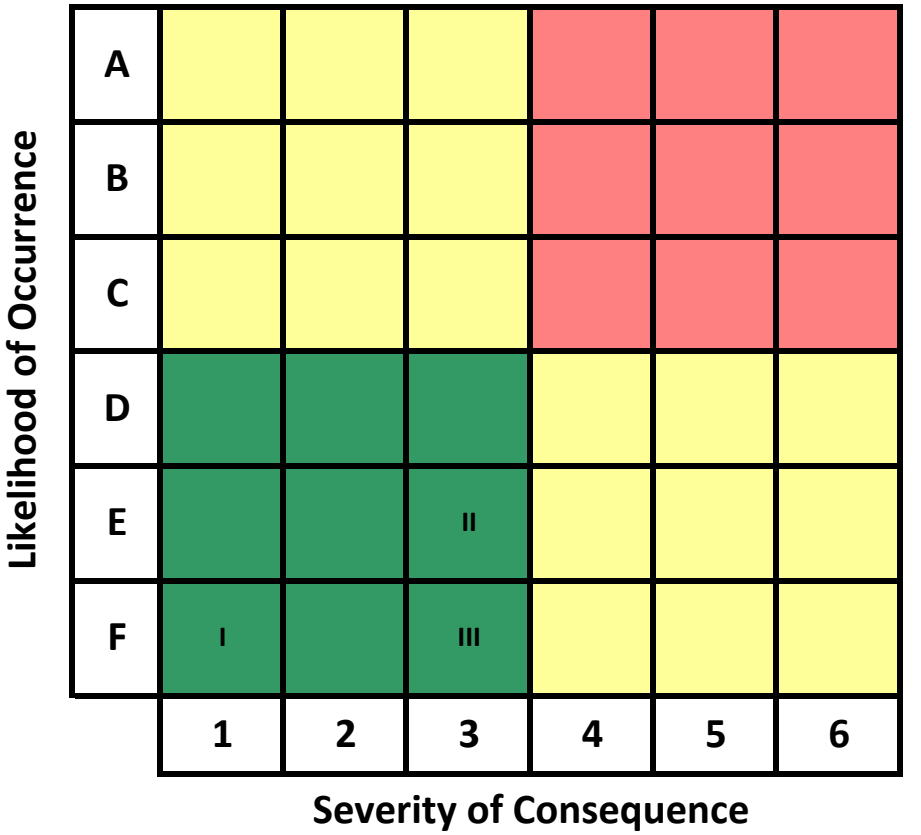
Attachment 5.7.1 Site Specific Risk Analysis for a Spill of Pregnant Lixiviant in the Field (Page 1 of 14)

Credible Scenarios for Release of Pregnant Lixiviant

Scenario Number	Location	Description
1	**Leak of Line From Production Well to Header House**	In this scenario, one of the pipe fittings or sections of high density polyethylene (hdpe) pipe would leak and pregnant lixiviant would spill onto the ground in the pattern area.
2	**Leak of Production Line in Header House**	In this scenario, one of the fittings, pieces of instrumentation or pieces of pipe would leak and pregnant lixiviant would spill onto the ground inside the header house.
3	**Leak of Production Pipeline Between Header House and Plant**	In this scenario, one of the pipe fittings or sections of high density polyethylene (hdpe) pipe would leak and pregnant lixiviant would spill onto the ground between the header houses and the plant.

Scenario 1
Leak of Line From Production Well to Header House



Legend/Key

Likelihood of Occurrence:

A: Event has more than a 90% chance of occurrence.
B: Event has between 70% and 90% chance of occurrence.
C: Event has between 50% and 70% chance of occurrence.
D: Event has between 30% and 50% chance of occurrence.
E: Event has between 10% and 30% chance of occurrence.
F: Event has less than a 10% chance of occurrence.

Severity of Consequence:

1: Event will result in no release of pregnant lixiviant.
2: Event could release a small volume of pregnant lixiviant; exposures would have little or no effect.
3: Event could release a moderate volume of pregnant lixiviant; exposures would be elevated but still considerably less than the regulatory limits.
4: Event could release a large volume of pregnant lixiviant; exposures could be approaching regulatory limits.
5: Event could release a large volume of pregnant lixiviant; exposures could exceed regulatory limits.
6: Event will result in a release of pregnant lixiviant; exposure limits would be exceeded.

Event #	Description	Likelihood	Severity
I	Downhole piping failure	F	1
II	Wellhead fittings failure	E	3
III	Wellhead to header house piping failure	F	3

High Risk	Countermeasures will need to be taken.
Moderate Risk	Countermeasures will need to be considered.
Low Risk	No countermeasures will need to be taken.

Attachment 5.7.1 Site Specific Risk Analysis for a Spill of Pregnant Lixiviant in the Field (Page 3 of 14)

Analysis of Risks (Leak of Line from Production Well to Header House):

Event # I	**Downhole Piping Failure:** A downhole piping failure can occur if the surface line is sealed for any reason. The pump pressure at zero flow will typically exceed the operating pressure of the subsurface piping the pump is set on and may cause a failure. In that event the discharged pregnant lixiviant will remain in the casing and will continue to be recirculated until the upset condition is noted by instrumentation and shutdown or is manually shut down by an Operator during routine daily inspections completed once per shift.
Event # II	**Production Wellhead Fitting Failure:** A wellhead fitting failure can occur if the fittings are flawed, are improperly installed, are damaged by surface activities or are subjected to excessive pressures above their design limitations.
	i) *Flawed Fittings:* As in any manufacturing process, faulty fittings may miss factory QA/QC inspection. Prior to installation, construction personnel will inspect fittings for cracks, splits or other defects. Defective or substandard fittings will not knowingly be utilized in construction of production systems. Initial startup procedures will require a check of each wellhead for leaks and operators will be required to regularly inspect wellhead fittings for defects and leaks. In the event a defective fitting or leak is found, the pump will be shut down, the pressure bled off and the faulty component replaced. In addition, fittings will be inspected anytime a maintenance event occurs at that wellhead.
	ii) *Improper Installation:* PVC, HDPE, Steel and other fittings may be specified in the construction of production wellheads as long as they are compatible with the pressure, temperature and corrosive nature of the production lixiviant and the wellhead operating environment. Each fitting will have specific installation limitations that should be adhered to. Exceedance of these limitations (overtightenging, improper gluing or lubrication) may be cause for failure and a potential leak of pregnant lixiviant. Initial startup procedures will require a check of each wellhead for leaks and operators will be required to regularly inspect wellhead fittings for defects and leaks. In the event a defective fitting or leak is found, the pump will be shut down, the pressure bled off and the faulty component replaced. In addition, fittings will be inspected anytime a maintenance event occurs at that wellhead.
	iii) *Damage by Surface Activities:* Although all injection and production wellheads will have protective covers, damage may occur from debris during wind storms or errant operational activities (particularly during adverse weather conditions). In the event that a wellhead cover is dislodged, the Operator will inspect the well casing and all wellhead fittings for defect or leak. In the event a defective fitting or leak is found, the pump will be shut down, the pressure bled off and the faulty component replaced. Operators will be required to regularly inspect wellhead fittings for defects and leaks. In addition, fittings will be inspected anytime a maintenance event occurs at that wellhead.

Analysis of Risks (Leak of Line from Production Well to Header House) - cont'd:

Event # II (cont'd)	**Production Wellhead Fitting Failure (cont'd):**
	iv) *Excessive Pressure:* Excessive pressure may occur at the wellhead in the event the downstream line is plugged or sealed off. As flow reduces, submersible pump pressure increases and, at zero flow, may exceed the operating pressure for the fittings. Instrumentation installed will provide the opportunity for shutdown based on pressure and flow rate as well as alarms. Exceedance of pressure set points and subsequent shut down may be cause for failure and a potential leak of pregnant lixiviant. Restart procedures will require a check of the upset condition wellhead for leaks and operators will be required to regularly inspect wellhead fittings for defects and leaks. In the event a defective fitting or leak is found, the pump will be shut down, the pressure bled off and the faulty component replaced. In addition, fittings will be inspected anytime a maintenance event occurs at that wellhead.
Event # III	**Production Wellhead to Header House Piping Failure:** Production well piping to the header house will typically be constructed from HDPE. The pipe will normally be designed for flow and pressure typical to that particular mine unit and its calculated operating parameters. The piping will typically be buried below the anticipated frost line to prevent freezing during a power outage or planned shutdown. A piping failure can occur if the line is damaged during backfilling, has a faulty fusion joint or is overpressured during operation.
	i) *Damage During Backfilling:* Each well to header house pipe will typically be buried below the frost line. After trenching is complete, the line(s) are normally laid into the trenches, the fittings fused on the ends and the trench backfilled with standard construction equipment (backhoe, motor grader, loader). Because of the sandy nature of the soil at the Lost Creek Project, it is unlikely to have sharp rocks or masses in the backfill material. Initial startup procedures will typically require a pressure check of each of the flow lines to insure no leaks are present. Operators will be required to regularly inspect the wellfield where they will look for signs of leakage such as wet, soft or abnormally green spots. Operators will also monitor flow and pressure data for anomalies as well as utilize instrumentation to alarm for upset conditions. In the event an anomalous reading or alarm is given, the Operator will normally review the well in question up to pressure testing the line for leaks. In addition, the wellfield area will be inspected anytime a maintenance event occurs.

Analysis of Risks (Leak of Line from Production Well to Header House) - cont'd:

Event #	Production Wellhead to Header House Piping Failure (cont'd):
III (cont'd)	ii) *Faulty Fusion Joint:* HDPE pipe requires melting or "fusion" to join threaded fittings to the ends and connect piping pieces together. Properly performed, fusion joints are the strongest sections of the pipe due to the increased density at the joint. Each pipe size has specific installation parameters for heat and pressure during fusion. The operator of the HDPE fusion unit will typically be required to complete task training on the device prior to operating it or be under the direct supervision of a trained operator. If a joint is improperly fused, it may leak. Initial startup procedures will typically require a pressure check of each of the flow lines to insure no leaks are present. Operators will be required to regularly inspect the wellfield where they will look for signs of leakage such as wet, soft or abnormally green spots. Operators will also monitor flow and pressure data for anomalies as well as utilize instrumentation to alarm for upset conditions. In the evant an anomolous reading or alarm is given, the Operator will normally review the well in question up to pressure testing the line for leaks. In addition, the wellfield area will be inspected anytime a maintenance event occurs.
	iii) *Excessive Pressure:* Excessive pipe pressure may occur in the event the downstream line is plugged or sealed off. As flow reduces, submersible pump pressure increases and, at zero flow, may exceed the operating pressure for the pipe. Instrumentation installed will normally provide the opportunity for shutdown based on pressure and flow rate as well as alarms. Exceedance of pressure set points and subsequent shut down may be cause for failure and a potential leak of pregnant lixiviant. Restart procedures will require a check of the upset condition flowline for leaks and operators will be required to regularly inspect wellfields for evidence of leaks, i.e.: signs of leakage such as wet, soft or abnormally green spots. In the event a leak is found, the pump will be shut down, the pressure bled off and the faulty piping replaced. In addition, the wellfield will be inspected anytime a maintenance event occurs at that wellhead.

Scenario 2
Leak of Production Line in Header House

Likelihood of Occurrence	1	2	3	4	5	6
A						
B						
C						
D		II, III				
E			I			
F						

Severity of Consequence

Legend/Key

Likelihood of Occurrence:

A: Event has more than a 90% chance of occurrence.
B: Event has between 70% and 90% chance of occurrence.
C: Event has between 50% and 70% chance of occurrence.
D: Event has between 30% and 50% chance of occurrence.
E: Event has between 10% and 30% chance of occurrence.
F: Event has less than a 10% chance of occurrence.

Severity of Consequence:

1: Event will result in no release of pregnant lixiviant.
2: Event could release a small volume of pregnant lixiviant; exposures would have little or no effect.
3: Event could release a moderate volume of pregnant lixiviant; exposures would be elevated but still considerably less than the regulatory limits.
4: Event could release a large volume of pregnant lixiviant; exposures could be approaching regulatory limits.
5: Event could release a large volume of pregnant lixiviant; exposures could exceed regulatory limits.
6: Event will result in a release of pregnant lixiviant; exposure limits would be exceeded.

Event #	Description	Likelihood	Severity
I	Piping/Fitting Failure in Header House	E	3
II	Instrument Failure in Header House	D	2
III	Control Failure in Header House	D	2

High Risk	Countermeasures will need to be taken.
Moderate Risk	Countermeasures will need to be considered.
Low Risk	No countermeasures will need to be taken.

Attachment 5.7.1 Site Specific Risk Analysis for a Spill of Pregnant Lixiviant in the Field (Page 7 of 14)

Analysis of Risks (Leak of Production Line in Header House):

Event # I	**Piping/Fitting Failure in Header House:** A piping/fitting failure in the header house can occur if the design criteria are exceeded for any reason. Plausible causes for failure are flawed components, improper installation, abnormal stress or excessive pressure.
	i) *Flawed Fittings:* As in any manufacturing process, faulty fittings may miss factory QA/QC inspection. Prior to installation, construction personnel will typically inspect fittings for cracks, splits or other defects. Defective or substandard fittings will not knowingly be utilized in construction of production systems. Initial startup procedures will normally require a check of header house piping for leaks and operators should be required to regularly inspect the same for defects and leaks. In the event a defective fitting or leak is found, the piping will be typically be shut down, the pressure bled off and the faulty component replaced. In addition, fittings will normally be inspected anytime a maintenance event occurs at that point. In addition, leak detection equipment and a liner are planned for installation in all header houses. In the event of a major discharge of production lixiviant, the sump instrumentation will normally alarm and shut down flow to and from the house.
	ii) *Improper Installation:* PVC, HDPE, Steel, Stainless Steel, Brass and other fittings may be specified in the construction of header house production piping systems as long as they are compatible with the pressure, temperature and corrosive nature of the production lixiviant. Each fitting will have specific installation limitations that should be adhered to. Exceedance of these limitations (overtightening, improper gluing or lubrication) may be cause for failure and a potential leak of pregnant lixiviant. Initial startup procedures will normally require a check of header house piping for leaks and operators should be required to regularly inspect the same for defects and leaks. In the event a defective fitting or leak is found, the piping will be typically be shut down, the pressure bled off and the faulty component replaced. In addition, fittings will normally be inspected anytime a maintenance event occurs at that point. In addition, leak detection equipment and a liner are planned for installation in all header houses. In the event of a major discharge of production lixiviant, the sump instrumentation will normally alarm and shut down flow to and from the house.
	iii) *Abnormal Stress:* Although all initial construction typically insures components and piping are plumb and true with respect to supports and the header house, settling may occur over time which could apply abnormal stress to piping components in particular. The Operator will normally inspect the header house and its components for defect or leak at least once per shift. In the event abnormal stress is noted, the Operator would typically generate a work order for modification of the piping, supports or both. In circumstances where the Operator may feel that the stress could create a leak in the near term, he would typically shut the header house down for immediate repairs. In addition, leak detection equipment and a liner are planned for installation in all header houses. In the event of a major discharge of production lixiviant, the sump instrumentation will normally alarm and shut down flow to and from the house.

Analysis of Risks (Leak of Production Line in Header House) - cont'd:

Event # I (cont'd)	**Piping/Fitting Failure in Header House (cont'd):** iv) *Excessive Pressure:* Excessive pressure may occur in the header house production piping in the event flow in a downstream line is impeded. This can include changes in pumping systems in the plant or plugging in the ion exchange columns. Each header house instrumentation system is planned to have pressure switches on the main headers to shut down the pumps in the event an upset condition occurs. Each production well is also planned to have check valves off the main header. In the event of an individual pump or full system shutdown, flow will be stopped from re-entering the production wells. In the case of an abrupt pressure exceedance (water hammer), instrumentation systems will also typically shutdown pumps and valves, but piping allowable pressures may be exceeded and damage may occur. If pregnant lixiviant is discharged in the header house, the sump instrumentation will normally alarm and shut down flow to and from the house as well. Restart procedures will normally require a check of the upset condition for leaks and operators will be required to regularly inspect header house components for defects and leaks. In the event additional defective fittings or leaks are found, the header house will be shut down, the pressure bled off, and the faulty component replaced. In addition, fittings will typically be inspected anytime a maintenance event occurs in the header house.
Event # II	**Instrument Failure in a Header House:** Instrumentation for the pregnant lixiviant piping will be designed to monitor flow and pressure for the purpose of data acquisition and notification. Flow and pressure data will typically be used to record production volumes and determine if upset conditions exist. If flow or pressure readings are outside the set points, then alarms/shutdowns will normally be incorporated to control a problem. The Operator will typically receive an alarm that the instrumentation is not functioning and may be required to review the upset condition. A power outage will shut down pumping systems, control valves and instrumentation and will typically require a remote or local restart by the Operator.

Analysis of Risks (Leak of Production Line in Header House) - cont'd:

Event # III	**Control Failure in a Header House:** Certain systems within the header house are planned to have control instrumentation. The production pumps are planned to have remote start/stop. The main valves for both the injection and production stream are also planned to be control valves reliant on pressure readings. If the remote start/stop for the pumps fails, it will not affect the integrity of the production piping or the pressure seen within the system. It will require the Operator to complete the start or stop sequence locally. The control valves are set to fail close and therefore do not require redundant valving. Other control aspects within the header house include pressure switches on the main injection and production headers which will typically be tied to alarms and local shutdown instrumentation. The pressure switches are planned to be redundant and will have high and low settings which tie in with a shunt trip to shut down pumps within the header house. These will normally be interlocked with oxygen injection systems to insure all flow systems are closed when water is not flowing. The sump system is another area where alarms will typically be activated at the first sign of fluid and shutdown initiated at high level. The sump will normally be interlocked with the pumping system to insure no operation with fluid in the sump. A power outage will shut down pumping systems, control valves and instrumentation and will typically require a remote or local restart by the Operator.

Scenario 3
Leak of Pipeline From Header House to Plant

Likelihood of Occurrence	1	2	3	4	5	6
A						
B						
C						
D						
E	III		II			
F				I		

Severity of Consequence

Event #	Description	Likelihood	Severity
I	Pipeline failure	F	4
II	Fittings failure	E	3
III	Valve failure	E	1

Legend/Key

Likelihood of Occurrence:

A: Event has more than a 90% chance of occurrence.
B: Event has between 70% and 90% chance of occurrence.
C: Event has between 50% and 70% chance of occurrence.
D: Event has between 30% and 50% chance of occurrence.
E: Event has between 10% and 30% chance of occurrence.
F: Event has less than a 10% chance of occurrence.

Severity of Consequence:

1: Event will result in no release of pregnant lixiviant.
2: Event could release a small volume of pregnant lixiviant; exposures would have little or no effect.
3: Event could release a moderate volume of pregnant lixiviant; exposures would be elevated but still considerably less than the regulatory limits.
4: Event could release a large volume of pregnant lixiviant; exposures could be approaching regulatory limits.
5: Event could release a large volume of pregnant lixiviant; exposures could exceed regulatory limits.
6: Event will result in a release of pregnant lixiviant; exposure limits would be exceeded.

High Risk	Countermeasures will need to be taken.
Moderate Risk	Countermeasures will need to be considered.
Low Risk	No countermeasures will need to be taken.

Attachment 5.7.1 Site Specific Risk Analysis for a Spill of Pregnant Lixiviant in the Field (Page 11 of 14)

Analysis of Risks (Leak in Production Line from Header House to Plant):

Event # I	**Production Pipeline Failure:** Pregnant lixiviant is gathered at each of the header houses and pumped to the plant. Production piping from the header house to the plant will typically be constructed from high density polyethylene (HDPE) pipe. This pipe is chosen because of its durability, flexibility, ease of installation and wide range of operating characteristics. The pipe will normally be designed for a wide range of flow and pressure to allow for startup through full operation. The piping will typically be buried below the anticipated frost line to prevent freezing during a power outage or planned shutdown. A piping failure can occur if the line is damaged during backfilling, has a faulty fusion joint or is over pressured during operation. Analysis shows moderate risk, but with the mitigating factors incorporated below, it can be brought into the low risk category.
	i) *Damage During Backfilling:* Each main pipeline will typically be buried below the frost line. After trenching is complete, the line(s) are normally laid into the trenches, the fittings fused on the ends and the trench backfilled with standard construction equipment (backhoe, motor grader, loader). Because of the sandy nature of the soil at the Lost Creek Project, it is unlikely to have sharp rocks or masses in the backfill material. Construction procedures will typically require a pressure check of each of the flow lines to insure no leaks are present. Operators will be required to regularly inspect the pipeline right-of-way where they will look for signs of leakage such as wet, soft or abnormally green spots. Operators will also monitor flow and pressure data for anomalies as well as utilize alarms for upset conditions. In the event an anomalous reading or an alarm, the Operator will normally perform a visual inspection of the right-of-way as well as the valve stations. In addition, the pipelines will be inspected anytime a maintenance event occurs.
	ii) *Faulty Fusion Joint:* HDPE pipe requires melting or "fusion" to join fittings to the ends and connect piping pieces together. Properly performed, fusion joints are the strongest sections of the pipe due to the increased density at the joint. Each pipe size has specific installation parameters for heat and pressure during fusion. The operator of the HDPE fusion unit will typically be required to complete task training on the device prior to operating it or be under the direct supervision of a trained operator. If a joint is improperly fused, it may leak. Initial construction procedures will typically require a pressure check of each of the pipelines to insure no leaks are present. This is usually done prior to backfilling to allow for visual inspection. Operators will be required to regularly inspect the pipeline right-of-way where they will look for signs of leakage such as wet, soft or abnormally green spots. Operators will also monitor flow and pressure data for anomalies as well as utilize alarms for upset conditions. In the event an anomalous reading or an alarm, the Operator will normally perform a visual inspection of the right-of-way as well as the valve stations. In addition, the pipelines will be inspected anytime a maintenance event occurs.

Analysis of Risks (Leak in Production Line from Header House to Plant) - cont'd:

Event # I (cont'd)	**Production Pipeline Failure (cont'd):**
	iv) *Excessive Pressure:* Excessive pressure may occur in the production pipeline in the event flow downstream is impeded. This can include changes in pumping systems in the plant or plugging in the ion exchange columns. Instrumentation installed will provide the pressure and flow data at pipeline nodes and alarm the Operator or shut down flow systems as is appropriate. Exceedance of pressure set points and subsequent shut down may be cause for failure and a potential leak of pregnant lixiviant. In the case of an abrupt pressure exceedance (water hammer), instrumentation systems will also typically shutdown pumps and valves, but piping allowable pressures may be exceeded and damage may occur. Restart procedures will require a check of the upset condition pipeline for leaks and operators will be required to regularly inspect pipeline right-of-ways and valve stations for defects and leaks, i.e.: signs of leakage such as wet, soft or abnormally green spots. In the event a leak is found, the pipeline will be shut down, the pressure bled off and the faulty piping replaced. In addition, the wellfield will be inspected anytime a maintenance event occurs at that wellhead.
Event # II	**Production Pipeline Fitting Failure:** A pipeline fitting failure can occur if the fittings are flawed, are improperly installed, are damaged by corrosion or are subjected to excessive pressures above their design limitations.
	i) *Flawed Fittings:* As in any manufacturing process, faulty fittings may miss factory QA/QC inspection. Prior to installation, construction personnel will inspect fittings for cracks, splits or other defects. Defective or substandard fittings will not knowingly be utilized in construction of production systems. In addition, fittings will not normally be buried, thus allowing for routine inspection and leak detection. Initial startup procedures will require a check of each valve station for leaks and operators will be required to regularly inspect the same for defects and leaks. In the event a defective fitting or leak is found, the pipeline will be shut down, the pressure bled off and the faulty component replaced. In addition, fittings will be inspected anytime a maintenance event occurs.
	ii) *Improper Installation:* HDPE, steel, stainless steel, ductile iron and other fittings may be specified in the construction of production pipelines as long as they are compatible with the pressure, temperature and corrosive nature of the production lixiviant and the operating environment. Each fitting will have specific installation limitations that should be adhered to. Exceedance of these limitations (overtightening, improper welding or alignment) may be cause for failure and a potential leak of pregnant lixiviant. Prior to startup, pipelines will normally be pressure tested for leaks. Initial startup procedures will require a check of each valve station for leaks and operators will be required to regularly inspect valve stations for defects and leaks. In the event a defective fitting or leak is found, the operator will shut down the pipeline, bleed the pressure off and the faulty component replaced. In addition, fittings will be inspected anytime a maintenance event occurs.

Attachment 5.7.1 Site Specific Risk Analysis for a Spill of Pregnant Lixiviant in the Field (Page 13 of 14)

Analysis of Risks (Leak in Production Line from Header House to Plant) - cont'd:

Event # II (cont'd)	**Production Pipeline Failure (cont'd):**
	iii) *Damage from Corrosion:* Materials of construction for pipeline fittings will typically be chosen based on their pressure, flow and corrosion characteristics. Because most HDPE fittings do not mate up with larger valves, it may be necessary to utilize steel or stainless steel to crossover from the HDPE flange adapter to the valve. The mildly corrosive nature of pregnant lixiviant is typically mitigated by installing coated steel or stainless steel. Erosion of these components from production sand may be mitigated through the installation of downhole well screens and/or surface filtration. In addition, fittings will not normally be buried, thus allowing for routine inspection and leak detection. Initial startup procedures will require a check of each valve station for leaks and operators will be required to regularly inspect the same for defects and leaks. In the event a defective fitting or leak is found, the pipeline will be shut down, the pressure bled off and the faulty component replaced. In addition, fittings will be inspected anytime a maintenance event occurs.
	iv) *Excessive Pressure* : Excessive pressure may occur in production pipeline fittings in the event flow downstream is impeded. This can include changes in pumping systems in the plant or plugging in the ion exchange columns. Instrumentation installed will provide the pressure and flow data at pipeline nodes and alarm the Operator or shut down flow systems as is appropriate. Exceedance of pressure set points and subsequent shut down may be cause for failure and a potential leak of pregnant lixiviant. In the case of an abrupt pressure exceedance (water hammer), instrumentation systems will also typically shutdown pumps and valves, but fitting allowable pressures may be exceeded and damage may occur. Restart procedures will require a check of the upset condition pipeline fittings for leaks and operators will be required to regularly inspect pipeline valve stations for defects and leaks, i.e.: signs of leakage such as wet, soft or abnormally green spots. In the event a leak is found, the pipeline will be shut down, the pressure bled off and the faulty fittings replaced. In addition, the wellfield will be inspected anytime a maintenance event occurs at that wellhead.
Event # III	**Production Pipeline Valve Failure:** A pipeline valve failure can occur if the valves are flawed, are improperly installed, are damaged by corrosion or are subjected to excessive pressures above their design limitations.
	i) *Flawed Fittings:* As in any manufacturing process, faulty valves may miss factory QA/QC inspection. Prior to installation, construction personnel will inspect valves for cracks, splits, defective seats, bad operators or other defects. Defective or substandard valves will not knowingly be utilized in construction of production systems. In addition, valves will not normally be buried, thus allowing for routine operation, inspection and leak detection. Initial startup procedures will require a check of each valve station for proper operation, leaks and Operators will be required to regularly inspect the same for defects and leaks. In the event a defective valve or leak is found, the pipeline will be shut down, the pressure bled off and the faulty valve replaced. In addition, fittings will be inspected anytime a maintenance event occurs. One piece stems and discs will normally be specified to minimize failure of the operating mechanism.

Analysis of Risks (Leak in Production Line from Header House to Plant) - cont'd:

Event # III	**Production Pipeline Valve Failure (cont'd):**
	ii) *Improper Installation:* Steel, stainless steel, ductile iron and other materials may be specified for installation in production pipeline valve stations as long as they are compatible with the pressure, temperature and corrosive nature of the production lixiviant and the operating environment. Each valve will have specific installation limitations that should be adhered to. Exceedance of these limitations (overtightening or misalignment) may be cause for failure and a potential leak of pregnant lixiviant. Prior to startup, pipelines will normally be pressure tested for leaks. Initial startup procedures will require a check of each valve station for leaks and operators will be required to regularly inspect valve stations for defects and leaks. In the event a defective valve or leak is found, the operator will shut down the pipeline, bleed the pressure off and the faulty component replaced. In addition, fittings will be inspected anytime a maintenance event occurs.
	iii) *Damage from Corrosion:* Materials of construction for pipeline valves will typically be chosen based on their pressure, flow and corrosion characteristics. The mildly corrosive nature of pregnant lixiviant is typically mitigated by installing stainless steel, one piece stems and discs along with corrosion resistant wetted components. Erosion of these components from production sand may be mitigated through the installation of downhole well screens and/or surface filtration. In addition, valves will not normally be buried, thus allowing for routine inspection and leak detection. Initial startup procedures will require a check of each valve station for leaks and operators will be required to regularly inspect the same for defects and leaks. In the event a defective valve or leak is found, the pipeline will be shut down, the pressure bled off and the faulty component replaced. In addition, fittings will be inspected anytime a maintenance event occurs.
	iv) *Excessive Pressure:* Excessive pressure may occur in production pipeline valves in the event flow downstream is impeded. This can include changes in pumping systems in the plant or plugging in the ion exchange columns. Instrumentation installed will provide the pressure and flow data at pipeline nodes and alarm the Operator or shut down flow systems as is appropriate. Exceedance of pressure set points and subsequent shut down may be cause for failure and a potential leak of pregnant lixiviant. In the case of an abrupt pressure exceedance (water hammer), instrumentation systems will also typically shutdown pumps and valves, but valve allowable pressures may be exceeded and damage may occur. Restart procedures will require a check of the upset condition pipeline valves for leaks/proper operation and operators will be required to regularly inspect pipeline valve stations for defects and leaks, i.e.: signs of leakage such as wet, soft or abnormally green spots. In the event a leak is found, the pipeline will be shut down, the pressure bled off and the faulty fittings replaced.