Mitigation measures are listed below for the respective impacts on surface water

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|  | **Vulcan South Surface Water Mitigation Measures** |  |

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| Stage (construction, operation and post closure) | Impact | Mitigation measure | Timing | Responsibility | Completion criteria | Design considerations |
| --- | --- | --- | --- | --- | --- | --- |
| Construction and Operation | Haul and access roads will potentially result in sediment laden runoff discharging to the downstream environment. | Runoff must be directed to ESC controls before discharge to the downstream environment in accordance with the site ESCP or pumped back into the mine water system. | ESC controls will be implemented prior to roads construction and maintained during operations | SSE | * ESC controls will be checked at the beginning of the wet season and following significant rainfall events to remove accumulated sediment and repair damage.
* WQO’s met following testing of downstream surface water monitoring sites after rainfall events per the EA.
 | ESC controls will be suitably selected, designed and installed in accordance with the ESCP and IECA (2008) |
| Construction and Operation | Potential increase in flood levels and erosion/scouring of drainage line channels due to proposed haul roads, access roads and railway. | Proposed culverts/floodways will convey flows through road and railway crossings. | Installation/construction of culverts/floodways will be completed in conjunction with the construction of the proposed roads and railway. | * SSE
 | Crossings and culverts will be inspected following rain events to identify and remediate any sedimentation built up within the culverts and/or erosion damage. | Culvert and floodway sizing and scour protection requirements will be confirmed during detailed design. |
| Construction and Operation | Existing natural catchments within the Project are modified. The proposed disturbance areas have different land use types (e.g. waste rock dump, pit, disturbed/industrial, etc.) which generate catchment runoff of varying water quality. | Proposed water management system (clean, surface and mine affected water systems) will separate water from different sources based on anticipated water quality. | * Mine water dams and drains will be constructed prior to mining activity or when it is anticipated high volumes of mine affected water quality will be generated.
* Surface water drains and sediment dams will be constructed once "natural" areas are disturbed. See response to clean water catchment runoff below.
 | SSE | Water management drains will be inspected following rainfall events to identify and remediate any sedimentation preventing the drains from flowing into downstream sediment dams/mine water dams and/or erosion damage. | Water management infrastructure sizing and scour protection is confirmed during detailed design. |
| Operation | Proposed mining pits subject to flood risk will alter existing catchment runoff and downstream flow regime. | Proposed clean water diversion infrastructure (i.e. clean water diversion levees, bunds, drains and dams) will mitigate flood risk into active mining areas/pits and diverts the majority of clean water catchment runoff around the Project to existing drainage lines. | Clean water infrastructure will be constructed prior to areas becoming disturbed to reduce mixing of clean water runoff with water of lower quality. This will also reduce the potential volumes to be managed through the surface/mine water management systems. | SSE | Annual inspection of levees and diversion drains will be undertaken to ensure structural integrity. | * Design and construction of levees will be in accordance with the Manual for assessing consequence categories and hydraulic performance of structures.
* Drain/bund sizing is confirmed during detailed design.
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| Operation | Mining pits will accumulate mine affected water and mining operations will be delayed if the pits are inundated. | Catchments reporting to pits have been reduced via the proposed diversion infrastructure. The proposed mine water management system is adequately sized to dewater the catchment runoff collected in active mining pits. Mine water is also used on-site to meet site demands and to reduce inventory of mine water dams.Please note that under no modelling scenarios was any of the mine water dams anticipated to overflow.  | Mine water dams will be constructed prior to when mine affected water runoff will be generated due to mining activity.The active pits will be dewatered to the mine water management system whenever there is available storage. Mine water will be used on-site wherever possible. | SSE | * Reporting of storage volumes at the beginning of the wet season as well as on a monthly basis and following significant rainfall events.
* Contingency mine water storages will be constructed prior to the wet season if there is inadequate storage volume within the existing mine water management system to dewater the active pits. Dewatering of the active pit into inactive pits should be undertaken in emergency.
 | * Design and construction of dams will be in accordance with the *Manual for* *assessing consequence categories and hydraulic performance of structures*. A consequence category assessment for each dam will be undertaken to confirm operating volumes and required storage capacity.
* An assessment of mine water inflows to the mine water system will be undertaken to determine maximum operating volumes."
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| Operation | Mine water will potentially overflow from mine water storages to the receiving environment during extreme rainfall events or due to dam failure. | * Mine water dams will be managed and operated with a maximum 'operating volume' which defines the maximum volume the dams can operate up to before pumped inflows cease. The operating volumes of each dam are below their respective full storage volumes to maintain storage capacity below the spillway level of the dams which will reduce the risk of overflows to the receiving environment. However, mine dams were not modelled to overflow under even the most extreme climate scenario.
* If mine water dams are at their operating volumes, mine water can be pumped back to the pits in emergency.
 | * Mine water dam sizing, pump sizing and operating volumes will be designed prior to the construction of the dams.
* Max operating volumes will be active throughout the operational period.
* Installation of pumps will be completed during construction of the mine water dams."
 | SSE | Reporting of storage volumes at the beginning of the wet season as well as on a monthly basis and following significant rainfall events. | * Design and construction of dams will be in accordance with the "Manual for assessing consequence categories and hydraulic performance of structures". A consequence category assessment for each dam must be undertaken to confirm operating volumes and required storage capacity.
* An assessment of mine water inflows to the mine water system will be undertaken to determine maximum operating volumes."
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| Operation | Water will be required on-site to meet site demands. | It is proposed to use available water in on-site storages prior to using external water supply to meet site demands. | Use water available on-site wherever possible. Use external water when water in storages on-site is insufficient to meet demands. | SSE | Monthly reporting of storage volumes and water usage (e.g., dust suppression, CHPP makeup) within the mine water system will be undertaken regularly to anticipate/forecast available volumes and demands. | Permits/licensing to take external water. |
| Post-closure | Sedimentation of drainage lines during flood events due to construction of the final landform within the floodplain. | Proposed drainage corridors will divert floodwaters up to the 0.1% AEP event (inclusive) to mitigate the potential erosion risk of the final landform during flooding. | Final landform drainage corridors will be constructed prior to or in conjunction with the final landform waste rock dumps. | SSE | Annual inspection of drainage corridor until vegetation is established within the drainage corridor and a "natural" flow regime is formed. | Sizing of water management infrastructure is confirmed during detailed design. |
| Post-closure | Erosion risk of the final landform prior to rehabilitation/vegetation establishment potentially leading to reduced water quality/sedimentation. | Proposed water management system (i.e. surface water drains, sediment dams, drop structures, contours banks, etc.) manage runoff from final landforms to prevent erosion risk. These will be rehabilitated once vegetation is established and the final landform has minimal erosion risk. | Final landform surface water management will be constructed as part of the final landform waste rock dumps. | SSE | Surface water management system will be inspected following rainfall events to identify any sedimentation/erosion on and around the final landform until vegetation is established. | Sizing of water management infrastructure is confirmed during detailed design. |