	March 29th 2021	April 21st 2021
1.3 Supplied information		
Review based on following documents	1. Document Ref. 0: Letter from White & Case to Mr Wimbush, 18 January 2021, Fingerboards Mineral Sands Project – Public Hearing 2. Document Ref. 43: Fingerboards Mineral Sands Project Inquiry and Advisory Committee Technical note, 18 January 2021. 3. Alfa Laval Australia Pty Ltd, *Laboratory Spin Test Report – Mineral Sands Slimes Tailings* *Dewatering test for Decanter Centrifuge*, Rev A, 8 October 2018. 4. Alfa Laval Australia Pty Ltd, *Slimes sample Y1Q2 Fingerboards Laboratory Spin Test* *Report – Mineral Sands Slimes Tailings Dewatering test for Decanter Centrifuge*, Rev A, 2 February 2021	The review is based on the following documents: a) Document Ref. 0: Letter from White & Case to Mr Wimbush, 18 January 2021, Fingerboards Mineral Sands Project – Public Hearing b) Document Ref. 43: Fingerboards Mineral Sands Project Inquiry and Advisory Committee Technical note, 18 January 2021. c) Alfa Laval Australia Pty Ltd, *Laboratory Spin Test Report – Mineral Sands Slimes Tailings Dewatering test for Decanter Centrifuge*, Rev A, 8 October 2018. d) Alfa Laval Australia Pty Ltd, *Slimes sample Y1Q2 Fingerboards Laboratory Spin Test Report – Mineral Sands Slimes Tailings Dewatering test for Decanter Centrifuge*, Rev A, 2 February 2021 e) Kalbar – Technical Note 02 (TN 002) – Expert recommendation (Part 2.1, Questions 1 and 2) – RFI Response, 8 February 2021, Doc Ref 109 f) Kalbar – Updated Project Description (Chapter 3 of the EES) – Tracked Changes (Direction 59), 8 February 2021, Doc Ref 122 g) Supplementary Expert Witness Statement – Jarrah Muller – Water balance (Direction 59), 8 February 2021, Doc Ref 132 h) Kalbar – Technical Note 13 (TN 013) – Additional expert recommendations (Part 2.1, Question 2) – RFI Response, 12 March 2021, Doc Ref 192 i) Kalbar – Amended Draft Work Plan – use of centrifuges and removal of Tailing Storage Facility (Fingerboards Rev4 D) – Clean version, 12 March 2021, Doc Ref 197a. j) Kalbar – Updated Risk management plan (Rev4 – 24 02 2021) (updated Appendix B to revised Draft Work Plan), 12 March 2021, Doc Ref 198 k) Kalbar – Updated Risk treatment plan Water Quality and Hydrology (RevC) – 12 03 2021, 12 March 2021, Roc Ref 202 l) Kalbar – updated Draft mine Rehabilitation Plan – 24 March 2021 (appendix C to revised draft Work Plan), 25 March 2021, Doc Ref 215
Section 2 - Summary		

Centrifuge	There is technical risk related to the sizing and application of centrifuges in this duty including: o The application of solid bowl centrifuges into the minerals processing industry is relatively recent. Therefore, there are no directly comparable operational benchmarks that Ausenco is aware of for this duty. o The sizing of the centrifuges appears to be based on solids mass loading rate, but in this application the capacity may be constrained by volumetric loading, particularly due to the dilute feed density required for effective flocculation (23% w/w solids). Based on an upper benchmark for volumetric loading rate of 80 m3/h, approximately 15 x P3-10070 centrifuges would be required. If the feed is not diluted, less centrifuges would be acceptable but the fines capture would be at risk. o Scale-up from laboratory scale spin testing to full size throughput is indicative of potential dewatering performance but is not a demonstrated approach for robust equipment selection and performance prediction. o Increased proportion of fines due to variability within the deposit, different clay speciation, or poor classification within the circuit could lead to increased quantities of fines that may exceed the processing capacity of the centrifuges. o There may be poor recovery of ultrafines in the centrifuges, causing a recirculating load of ultrafines back to the process water ponds and further operational problems within the heavy mineral concentrator. Resolving this recirculating load may require high flocculant dosages and/or the introduction of coagulant(s) prior to centrifuging, or solids settling ponds that may still require scrolling with “Mudmasters” to dewater; both options increase operating cost and have environmental impacts. o Centrifuge operability issues may include excessive vibration, high wear, damage due to tramp material or other issues that impact the performance of the units	The technical risk related to the sizing and application of centrifuges in this duty is managed as follows: o The application of solid bowl centrifuges into the minerals processing industry is relatively recent. However, there are operations treating similar and more difficult tailings materials in other industries. o The sizing of the centrifuges is based on a solids mass loading rate of 55 t/h/unit, which is reasonable based on the tailings characterisation when compared to other benchmarked sites from Ausenco’s database. For the material considered at a solids loading rate of 55 t/h/unit, volumetric loading is not expected to be an issue. o Scale-up from laboratory scale spin testing to full size throughput is indicative of potential dewatering performance. Further work at larger scales is expected to demonstrate the equipment selection and performance. o The work to date on six variability samples indicates that centrifuges are capable of producing a damp product at the design rates that is expected to be handleable. o The planned updates to water balance modelling as well as pond design and centrifuge operating strategies are reasonable approaches to address potential issues with low recovery of ultrafines in the centrifuges if it occurs. o Centrifuge operability issues can include excessive vibration, high wear, damage due to tramp material or other issues that impact the performance of the units but can be managed by engineered feed preparation to the units.

Fines Handling	The technical application of Alfa Laval centrifuges has risks associated with dewatering performance and handling of the centrifuged product that warrant further work: o The centrifuged product is expected to seep once placed, and some liquefaction of the material during rehandling and trucking is likely. o The impact on groundwaters should be assessed.	The handling of the centrifuged product is described in the updated draft workplan: o The centrifuged product will be paddock dumped with the overburden to ensure the fines cake and overburden is evenly distributed to avoid localised areas of high fines content, which could cause perching of groundwater after closure. o Liquefaction of the material during rehandling and trucking may occur from time to time, however this can be managed by adjusting the centrifuge operating parameters. o The impact on groundwaters is managed as outlined in Section 8.5.2 of the workplan and the Water Risk Treatment Plan (Attachment C of Risk Management Plan).
Water consumption	The overall project water consumption is still dependant on the sitewide water balance, including the design and operation of all related equipment and water management structures.	The overall project water consumption is dependant on the sitewide water balance, including the design and operation of all related equipment and water management structures. This has been updated in the Addendum to Expert Witness Statement of Jarrah Muller, February 2021, EMM.
Tailings management structures	The temporary tailings storage facility may still be required to generate an initial mining void, or for settling ultrafines from the centrifuge effluent stream.	Tailings storage stockpiles are described in the workplan and their water management plans and risk assessments are described in the reviewed documents. Ultrafine management is proposed to be assessed using updated water balance modelling.
Centrifuge relocation	The cost of relocating the centrifuge facilities is expected to be high. It may be more cost effective to convey to intermediate transfer points which may also provide for reduced haul fleet emissions and dust generation.	There is an opportunity to convey tailings to intermediate transfer points which may also provide for reduced haul fleet emissions and dust generation.
Section 3. Further work Recommendations		
	Further work should consider: • Validating the centrifuge sizing with the vendor, based on the latest available test work (2 February 2021), and including potential volumetric limitations on the centrifuge sizing for diluted feeds (as required for effective flocculation). • Conducting a full-size centrifuge trial (say with one skid-mounted centrifuge) treating similar material from other operations to validate the assumptions around centrifuge performance and centrifuged material properties. In particular, the relationships between feed density, flocculant and coagulant consumption, bowl speed, throughput, fines capture and product moisture should be examined.	Further work should consider: • Validating the centrifuge sizing with the vendor, based on the latest available test work (2 February 2021). • Validating the assumptions around centrifuge performance and centrifuged material properties by conducting a sufficiently large-scale centrifuge trial treating similar and variable material. In particular, the relationships between feed density, flocculant and coagulant consumption, bowl speed, throughput, fines capture and product moisture can be examined.

	• Conducting a testing program to determine the materials handling, truckability, geotechnical and hydrogeological (permeability) characteristics of the centrifuge product. • Confirming the design for co-storage of fine and coarse tailings, including the required and expected mixing approach, required volumes and geotechnical basis. • Conducting a variability program to understand the ranges of particle size and mineralogy and the impact these have on centrifuge throughput. • Model the impact of ultrafines recirculation on the process, and the potential to retain a fines storage facility to enable settling of the ultrafines. • Validation of the water balance, based on the above work. • Assess the risk of groundwater mounding and the impact on geotechnical stability and seepage based on the above work.	• Conducting a testing program to confirm the materials handling, truckability, geotechnical and hydrogeological (permeability) characteristics of the centrifuged product. • Updating the water balance (as planned) to validate the centrifuge fines recovery and management strategies.
4. Review of Letter from White & Case to Mr Wimbush, 18 Jan		
Refers to advantages of use of centrifuges stated in the TN	The use of centrifuges in minerals processing and sand applications is limited. The benefits are therefore subject to the equipment working as per design and testwork scale-up to full size. Therefore, this technology has the potential to provide for several advantages compared to conventional wet storage of fines and scrolling, but these are yet to be demonstrated in practice.	The use of centrifuges in minerals processing and sand applications is limited. However the technology is likely to provide for several advantages compared to conventional wet storage of fines and scrolling. Ausenco's database of similar applications and recent (February 2021) testwork on six samples indicates that the material is amenable to dewatering by centrifuges.
1. Water recovery	Even with centrifuges included in the project there will continue to be uncertainty of the amount of water recovered, dependant on the climate and soil conditions as follows: a) the variable size distribution of the feed material, and the attrition and breakage of particles during the beneficiation process and efficiency of separation of coarse and fines will impact the proportions of coarse and fine tailings produced, required centrifuge throughput and the total water recovery b) the centrifuge discharge moisture and water losses to fine tailings will be a function of clay size distribution and speciation of clays and other minerals, the flocculant addition and centrifuge operating conditions (i.e. throughput, bowl speed, differential scroll speed, etc.). c) management of contact and non-contact water sources, including catchment areas, diversion structures, and variable moisture contents of dewatered fines and coarse sand will impact the amount of water recovered	The water balance has been updated by Kalbar to include centrifuges, and consider seasonal impacts on water supply and storage. There will be variable water recovered subject to the following factors: a) the variable size distribution of the feed material, and the attrition and breakage of particles during the beneficiation process and efficiency of separation of coarse and fines b) the centrifuge discharge moisture and water losses to fine tailings, as a function of clay size distribution and speciation of clays and other minerals, the flocculant addition and centrifuge operating conditions (i.e. throughput, bowl speed, differential scroll speed, etc.). c) management of contact and non-contact water sources, including catchment areas, diversion structures, and variable moisture contents of dewatered fines and coarse sand.
2.	The centrifuge product will be discharged in a state that is close to fully saturated (most of the void volume between the solid	The centrifuge product will be discharged in a state that is close to fully saturated (most of the void volume between the solid particles will

Need for temporary TSF and in-pit fines	particles will be filled by water). The centrifuge product will be expected to seep water after centrifuging and after placement. The amount of water that seeps from the centrifuged tailings is related to the flocculant addition, compaction of the cake under its own weight (self-consolidation) as well as compaction equipment (which may be required to improve trafficability, increase rainfall runoff and reduce rainfall erosion).	be filled by water). The centrifuge product may seep water after centrifuging and after placement. The amount of water that seeps from the centrifuged tailings is related to the flocculant addition, compaction of the cake under its own weight (self-consolidation) as well as compaction equipment (which may be required to improve trafficability, increase rainfall runoff and reduce rainfall erosion). The centrifuge product has been described as a 'damp' cake in recent descriptions by Kalbar.
3. Allowing continuous backfilling of voids	The amount and method of centrifuged fines storage will depend on the logistics of placing centrifuged fines. There may continue to be settlement of fines after placement under self-weight and compaction.	In principle Ausenco agrees with this comment. Required interim fine tailings storage is proposed in a stockpile with managed drainage.
4. Reduces overburden haul and dust and noise	It is probable that haul distance could be reduced. However, relocation of the centrifuge facilities is likely to incur high costs as well as interruption to operations. Use of modular systems may moderate the costs, downtime and duplication implications.	It is probable that haul distance could be reduced. However, relocation of the centrifuge facilities is likely to incur high costs as well as interruption to operations. Use of modular systems may moderate the costs, downtime and duplication implications. Conveying to intermediate trucking points may present an opportunity for the project.
5. Risk of seepage from fine tailings removed as material is dewatered	There will be ongoing risk of seepage. The centrifuged tailings will not be fully dewatered, and will contain up to ~35% w/w solids (35 percent of the total mass of water and solids will be water). This water is expected to seep from the centrifuged product with vibration (i.e. material handling and placement) and under compaction (under self-weight, or via compaction equipment).	The centrifuged tailings will not be fully dewatered, and will contain up to ~35% w/w solids (35 percent of the total mass of water and solids will be water). This water may seep from the centrifuged product with vibration (i.e. material handling and placement) and under compaction (under self-weight, or via compaction equipment). Seepage from the fine tailings, if it occurs, will be into the coarse sand layer and management strategies have bene presented by Kalbar.
REVIEW OF TN 18 JAN 21		
Section 1. Introduction Fine tailings 21% of ore and coarse 74%. Remainder is HMC (5%???)	The relative proportions of coarse, fines and HMC product will vary during the life of the mine, as the mine treats material with different size distributions and mineralogical proportions.	The relative proportions of coarse, fines and HMC product will vary during the life of the mine, as the mine treats material with different size distributions and mineralogical proportions. The production samples provide an indication of the changes in size distribution that are expected over the life of the project.
Fine tailings still in slurry	The basis for the solids content is not clear. Typically, this number would be reported as % w/w solids (weight of solids divided by total weight of solids + water). However, geotechnical engineers use a convention where moisture content is the mass of water divided by the mass of solids. The difference can be significant when managing water requirements across a project and aligning with geotechnical	The basis for the solids content is most likely reported on a % w/w solids basis (weight of solids divided by total weight of solids + water), but should be clarified and aligned in subsequent project documentation, as geotechnical engineers typically report using a different convention (mass of water divided by the mass of solids).

	requirements. Alternatively, moisture can be reported on a volume (rather than weight) basis. The moisture basis should be clarified in all project documents. Presuming 30 – 35% w/w solids (weight of solids divided by total weight of solids + water), and based on the photo, the material likely has a high proportion of colloidal (electrostatically charged) clay particles.	
Section 2 Water recovery from tailings	The comments in this section represent a reasonable summary of the likely water recovery from tailings.	The comments in this section represent a reasonable summary of the likely water recovery from tailings.
Footprint	The comments in this section represent a reasonable summary of footprint considerations.	The comments in this section represent a reasonable summary of the footprint considerations.
Fine tailings disposal dams	The comments in this section represent a reasonable summary of the likely process.	The comments in this section represent a reasonable summary of the likely process.
Section 5 Alternative Options – Centrifuge tailings		
GTSM requires consideration of options to minimise volumes of tailings and water in external TSFs	In principle, including centrifuges in the project has the potential to minimise the volume of tailings and water placed in external tailings facilities. However, more work is required to validate the extent of the volume and water savings.	In principle, including centrifuges in the project has the potential to minimise the volume of tailings and water placed in external tailings facilities. An updated water balance has been provided by Kalbar reflecting the impact of centrifuges on the project.
Need for TSFs can be avoided altogether	Even with the inclusion of centrifuges in the project, it is possible that a fines storage facility will still be required to: • Allow ultrafines to settle from the centrate water stream, to avoid an increasing recirculating load of ultrafine slimes that are not easily captured in the centrifuge, and/or • Generate void space in the mine to enable in-pit TSFs If ultrafines was managed through a settling pond, water clarification (i.e. in pinned bed or dynamic bed clarifiers) could be used to reduce the volumetric flow sent to the pond. Alternatively, the decant system could be designed to enable fines to settle, with periodic dredging.	With the inclusion of centrifuges in the project, it is possible that ultrafines may need to be managed. Kalbar have outlined water balance modelling to understand and address suspended solids in the process water. Mining voids are proposed to be generated through the use of managed stockpiles.
TSFs produce dry cake from fine tailings	The term "dry stack" has become a commonly used industry descriptor for projects that are moving away from conventional "wet" tailings deposition to dryer forms of storage. However, the term incorrectly implies that the material is "dry". The centrifuged material will actually have a moisture up to and potentially exceeding ~35% w/w which means there will be a large amount of water in the centrifuged material. In practical terms a	The term "dry stack" has become a commonly used industry descriptor for projects that are moving away from conventional "wet" tailings deposition to dryer forms of storage. However, the term incorrectly implies that the material is "dry". The centrifuged material will have a moisture up to ~35% w/w which means there will be a large amount of water in the centrifuged material. In practical terms a large proportion of this water will be chemically bound to the clays, as

	large proportion of this water will be chemically bound to the clays, as well as being retained within fine capillaries so the material may appear dry once discharged from the centrifuge. Nevertheless, some water may be released through vibration (shearing) and compression during rehandling, trucking, placing and compaction of the tailings. At an Argentinian operation, the centrifuged tailings produced at a similar moisture content of ~35% w/w (albeit with a different mineralogical composition) tends to flow downhill by gravity, behaving like a very viscous fluid, akin to a lava flow. It should be noted this is a deliberate operating strategy used to help deposit the tailings across variable topography at this site and dryer moistures could be achieved if required.	well as being retained within fine capillaries so the material may appear dry once discharged from the centrifuge. Nevertheless, some water may be released through vibration (shearing) and compression during rehandling, trucking, placing and compaction of the tailings. This has been considered in the deposition plan and drainage designs. At an Argentinian operation, the centrifuged tailings produced at a similar moisture content of ~35% w/w (albeit with a different mineralogical composition) tends to flow downhill by gravity, behaving like a very viscous fluid, akin to a lava flow. It should be noted this is a deliberate operating strategy used to help deposit the tailings across variable topography at this site and dryer moistures could be achieved if required. In recent communication Kalbar have described the material as a 'damp' cake which is appropriate.
Centrifuge dewaters cake to absolute point of practical dewatering	Filters typically remove a larger amount of interstitial water than centrifuges and achieve lower moistures than centrifuges, particularly if operated at high pressures and/or with membrane squeezing and/or air blow steps. Additionally, dewatering technologies (centrifuges included) can be configured to operate at higher throughputs and wetter product moistures (within limits). Therefore, centrifuges do not (and may not always) dewater the cake to the absolute point of practical dewatering.	Filters typically remove a larger amount of interstitial water than centrifuges and achieve lower moistures than centrifuges, particularly if operated at high pressures and/or with membrane squeezing and/or air blow steps. Additionally, dewatering technologies (centrifuges included) can be configured to operate at higher throughputs and wetter product moistures (within limits). Therefore, centrifuges do not (and may not always) dewater the cake to the absolute point of practical dewatering. However, this is not a problem.
Remnant water entrained and will not drain freely when deposited in voids with overburden	Centrifuge products approach saturation (all void spaces filled by water) and are generally thixotropic and compressible. Therefore, in the same way that a sponge can entrain water due to capillary action, once vibrated (by material handling or trucking) or once compressed/squeezed (by placing and covering with material, or consolidating under self-weight) the centrifuged material can become fully saturated and seep water back into surrounding soils. The "floccs" that form through the addition of flocculant prior to the centrifuging process can also degrade with shearing, placement and compaction, and time, increasing the amount of released water. It is important to note that saturated materials typically exhibit poor geotechnical strength and trafficability.	Centrifuge products approach saturation (all void spaces filled by water) and are generally thixotropic and compressible. Therefore, in the same way that a sponge can entrain water due to capillary action, once vibrated (by material handling or trucking) or once compressed/squeezed (by placing and covering with material, or consolidating under self-weight) the centrifuged material can become fully saturated and seep water back into surrounding soils. The "floccs" that form through the addition of flocculant prior to the centrifuging process can also degrade with shearing, placement and compaction, and time, increasing the amount of released water. It is important to note that saturated materials typically exhibit poor geotechnical strength and trafficability.
Risk of groundwater mounding is removed as water	The risk of groundwater mounding may be reduced but is not removed and should be assessed considering the: • compressibility of the material • self-consolidation properties and compression from overburden	The risk of groundwater mounding may be reduced but is not removed and therefore is proposed to be actively managed through dewatering bores.

won't seep to underling soils	• practical ability to mix coarse and fine material, given the methods of dewatering and placement, and • extent and rate of saturation	
Centrifuges produce centrates and transportable solid cake	The full-size operating centrifuges may produce a centrate that is "dirty" containing substantial suspended solids, and the solid cake may not be readily transportable due to high moistures approaching saturation and associated geotechnical characteristics. It is important to note that there are scale-up and operational factors that may prevent the full-size centrifuges from operating at the same conditions as the spin test. These include: • Machine design and hydrodynamics • Flocculant addition, mixing and residence time • Operating g-force, and machine limitations due to scrolling speeds, material clumping, vibration, or other factors	The spin tests conducted to date do provide an indication of the material that can be produced by centrifuging and the six production samples indicate that the material is amenable to centrifuging, and the centrates contain a low amount of suspended solids. Scale-up and operational factors include: • Machine design and hydrodynamics • Flocculant addition, mixing and residence time • Operating g-force, and machine limitations due to scrolling speeds, material clumping, vibration, or other factors
Proven technology	Solid bowl centrifuges are not a new technology. Technology developments in recent years have improved the viability of these units due to lower flocculant consumption, reduced power, higher g-forces, improved hydrodynamics and reduced moistures. The advent of the technology into tailings dewatering duties is relatively recent and the market share of centrifuges in tailings dewatering projects is relatively small. Therefore these centrifuges are not proven in this duty. A recent coal project has had commissioning and ramp-up challenges due to a combination of factors related to the project, duty and material characteristics. Ausenco expects that these technical challenges could be resolved for this project through appropriate project development, scale-up/demonstration and engineering processes.	Solid bowl centrifuges are not a new technology. Technology developments in recent years have improved the viability of these units due to lower flocculant consumption, reduced power, higher g-forces, improved hydrodynamics and reduced moistures. The advent of the technology into tailings dewatering duties is relatively recent and the market share of centrifuges in tailings dewatering projects is relatively small. Although these centrifuges are not proven in this duty, a review of six other similar centrifuges in other applications supports their suitability for this duty. A recent coal project has had commissioning and ramp-up challenges due to a combination of factors related to the project, duty and material characteristics. Ausenco expects that these technical challenges would be easily resolved for this project through appropriate project development, scale-up/demonstration and engineering processes.
They have been trialled but not used in mineral sands mines	Ausenco is not aware of the specific trials of centrifuges in mineral sands duties, nor the specific reasons for not implementing them on the project where the trial occurred.	Ausenco is not aware of the specific trials of centrifuges in mineral sands duties, nor the specific reasons for not implementing them on the project where the trial occurred.
Centrifuges provide certain and maximum water recovery	There remain uncertainties around the moistures achieved from centrifuges at full scale, at a range of machine configurations, material types and throughputs. Water recovery is a function of the sitewide water balance which includes climatic factors and would typically be validated through appropriate water balance modelling.	The spin testing provides an indication of the moistures that can be achieved from centrifuges at full scale. The performance will be subject to the machine configuration, material types and throughputs. Water recovery is a function of the sitewide water balance which includes climatic factors and has been evaluated as part of updated water balance modelling.
Solid cake is truckable and won't need to be	The truckability of the material will need to be confirmed. It is possible that the centrifuge product will be sloppy from time to	The material appears to be truckable based on the spin testing. It is possible that the centrifuge product may be sloppy from time to time in which case some dessication (drying) prior to rehandling, trucking and

storied in TSFs as can be used for immediate backfilling	time and will require some dessication (drying) prior to rehandling, trucking and placement. Trucking of centrifuged material will result in vibration and potentially release water from the coarse capillaries. An initial temporary storage facility for fines may still be required until the in-pit TSFs are established. A long-term storage facility for settling of “dirty” decant water and removal of ultrafine particles from recirculating loads may be required.	placement on the stockpiles can be employed. Potential seepage from the stockpile is captured. Some minor seepage from the fines into the sand may occur and is managed. Trucking of centrifuged material will result in vibration and potentially release water from the coarse capillaries, however, can be managed based on reviewing the centrifuge operating parameters. A long-term strategy for managing “dirty” decant water and removal of ultrafine particles from recirculating loads is planned to be developed based on updated water balance modelling.
Transported in day shifts and placed directly in the backfill area	Deposition of fines and coarse through the backfill profile will need to be managed to achieve an even dispersal without compromising backfill stability. For example, coarse and fines are unlikely to mix unless actively blended, leading to pockets of fines and coarse. This means that local concentrations of fines may be much higher than the 7 – 8% average with resultant geotechnical implications. Other implications could include: • reduced water recovery from the coarse sands due to re-wetting of the centrifuged material and reduced permeability of the sand water through the backfill mix, and • increased total volumes, depending on the assumed mixed bulk density.	The updated project documentation including draft work plan outlines an approach to blend and deposit coarse, fine and overburden material within specified zones of the pit. There is another operation that Ausenco is aware of that deposits centrifuge product with overburden in a similar ratio (1:10).
TSFs reduce dust and noise and rehabilitation rates	In principle these comments are correct.	In principle these comments are correct.
Section 6 – Centrifuge Plant technical details		
2 centrifuge plans each with 4 centrifuges, building 23.5m, 13.5m and 11.5m	The proposed sizing for centrifuges is based on a solids capacity of 55 t/h/machine. However, in this application the solidbowl centrifuges are likely to be constrained by the volumetric loading (rather than solids loading). This is based on the February 2021 testwork by Alfa Laval that indicates the feed should be diluted to ~23% w/w solids to enable effective flocculation. Based on a volumetric loading rate of 80 m3/h (which is considered optimistic in Ausenco’s experience), approximately 15 x P3-10070 centrifuges would be required. This is approximately double the number of centrifuges proposed. Further work is required to clarify the limiting criteria for sizing of the centrifuges and the implications in terms of flocculant consumption, fines capture and moisture with changing volumetric throughput.	The proposed sizing for centrifuges is based on a solids capacity of 55 t/h/machine. Based on benchmarking six other similar large-scale centrifuges this solids capacity is expected to be reasonable. Further work is required to clarify the limiting criteria for sizing of the centrifuges and the implications in terms of flocculant consumption, fines capture and moisture with changing throughput.
Cake discharge conveyor, external stockpile, trucked	In addition to the scope mentioned, the centrifuge building will likely require slurry storage tanks for flocculant addition, water services (tanks and pumps), a hardstand for the radial stacker and	In addition to the scope mentioned, the centrifuge building will likely require slurry storage tanks for flocculant addition, water services (tanks and pumps), a hardstand for the radial stacker and stockpile

to pits during day shift, also has flocculant mixing tank	stockpile and drainage infrastructure and sumps/pumps to capture seepage from the stockpile. Slurry and water return pipelines and fire water services (tanks, pipes and pumps) may also be required.	and drainage infrastructure and sumps/pumps to capture seepage from the stockpile. Slurry and water return pipelines and fire water services (tanks, pipes and pumps) may also be required. These elements would typically be detailed as part of detailed design of the project.
Plants located near mining area, relocated every 4-5 years, modular, distance to void is 750m	It may be preferable to convey centrifuged material to intermediate locations rather than relocating plant and equipment. The additional conveying could lead to reduced trucking distances with a reduction in dust and haul fleet emissions.	may be preferable to convey centrifuged material to intermediate locations rather than relocating plant and equipment. The additional conveying could lead to reduced trucking distances with a reduction in dust and haul fleet emissions.
Section 7 Water Recovery		
Significant increase in dewatering as it uses centrifuges	It is important to make the distinction that the centrifuge will dewater the material rapidly to a high solids content (circa 65% w/w) and recover that water immediately to the process. The TSF may achieve higher solids contents after scrolling and desiccation. However, much of this water will be recovered slowly, lost to evaporation and not returned to the process.	It is important to make the distinction that the centrifuge will dewater the material rapidly to a high solids content (circa 65% w/w) and recover that water immediately to the process. The TSF may achieve higher solids contents after scrolling and desiccation. However, much of this water will be recovered slowly, lost to evaporation and not returned to the process.
Centrifuges make 3GL achievable – 2.9GLpa needed for process plant operating at 1,500tpa	The water balance has not been evaluated as part of this review. However, the balance needs to consider a reasonable range of centrifuge product moistures and contingencies.	The water balance has not been evaluated as part of this review. However, an updated water balance reflecting centrifuges has been provided.
8. 9. 10. Noise, Air Quality and Rehabilitation not evaluated as part of the review		
11. Centrifuge costs		
Increased upfront partially offset by removal of TSF	In principle these comments are correct. However, the additional capital costs may increase if the sizing criteria for the centrifuges (volumetric loading rather than solids loading), or full-size performance that is worser than design, increases the number of required units.	In principle these comments are correct.
Direct tailings operating cost is slightly greater, but offset by operational efficiency and accelerated rehabilitation	In principle these comments are correct. However, removal of the TSF requires sufficiently high recovery of ultrafines to mitigate a recirculating load via flocculant at a reasonable cost.	In principle these comments are correct.
12. Advantages of Centrifuge Fine Tailings		

	The advantages are repeated in the letter from White & Case to Mr Wimbush. Therefore, the comments outlined in Section 4 apply here.	The advantages are repeated in the letter from White & Case to Mr Wimbush. Therefore, the comments outlined in Section 4 apply here.