Table 1: Responses to Technical Advisory Committee (TAC) Review Comments

TAC DEPARTMENT	ISSUE / QUESTION #	ISSUE / QUESTION RAISED*	RESPONSE	PROPOSED MITIGATION SUMMARY
Drainage and Water Rights Licensing Branch, Manitoba Conservation and Climate (MBCC) - Sept. 28, 2021	1	*The Water Use Licensing Section, within the Drainage and Water Rights Licensing Branch, requires that CanWhite Sands Corp. submit an application for a Water Rights Licence for "other-mining" purposes to capture well drilling and groundwater extraction activities as described in the proposal.*	CanWhite Sands Corp. (CanWhite) acknowledges and will comply with this requirement.	N/A
Manitoba Infrastructure, Capital Regional Operations - Oct. 5, 2021	2	*Permits will be required for any new or modified access points onto PR 302.* *Permits will be required for any structures within the controlled area of PR 302.* *Permission will be required for any water discharge or drainage ditches tying into the right of way of PR 302. Agreements will be required with the Department for any slurry lines under/ above ground crossing or adjacent to PR 302. The application and information regarding these agreements can be found at: www.gov.mb.ca/mit/hpd/utilities.html*	CanWhite acknowledges and will comply with this requirement.	N/A
Manitoba Infrastructure, Roadside Development - Oct. 5, 2021	3	*Written confirmation from our department that either drainage is not an issue or that the applicant has adequately addressed any potential drainage issues. The applicant will have to provide our regional Technical Services Engineer, Rob Crang, 204-945-8955 or Robert.Crang@gov.mb.ca with the sufficient information to ensure drainage from this development would not adversely affect the provincial highway system. If necessary, the regional engineer may request the applicant to submit a detailed drainage plan prepared by qualified experts. Please note that the cost of this study and any revisions to the highway drainage system directly associated with this proposed development will be the responsibility of the developer*	CanWhite acknowledges and will comply with this requirement.	N/A
	4	*We have some concerns that traffic generated by this development may have an impact on the traffic operations of PR 302 and PTH 15. Therefore, we require the developer to provide some preliminary traffic projections. Please contact Karen Toews (204) 794-2733 or Karen.Toews@gov.mb.ca. Based on this information, our department will determine if a more detailed Traffic Impact Study is required. If required, this study is to be prepared by a qualified engineer and will determine what impact the traffic generated by this development will have on the traffic operations at this location and what, if any, on highway improvements will be required.*	Traffic related to the sand extraction activities combined with the traffic related to the Facility Project will result in only a minor increase to regional traffic volumes and does not warrant an additional traffic impact study (refer to Attachment A: Preliminary Traffic Projections Memorandum).	N/A
	5	*Permission will be required from our regional office for the PR 302 mobile slurry and water line crossing. Permits will also be required for the temporary PR 302 trail crossing. Under the Transportation Infrastructure Act, a permit is required from Manitoba Infrastructure to construct, modify, relocate, remove or intensify the use of an access. A permit is also required from Manitoba Infrastructure to construct, modify or relocate a structure or sign, or to change or intensify the use of an existing structure (including the alteration of existing buildings) within the 38.1 m (125 ft) controlled area from the edge of the highway right-of-way. In addition, a permit is required from the Manitoba Infrastructure for any planting placed within 15 m (50 ft) from the edge of the right-of-way of this highway.*	CanWhite acknowledges and will comply with this requirement.	N/A
MBCC, Environmental Compliance and Enforcement Branch - Oct. 6, 2021	6	*ECE requests more information on the proposed containment to enclose the mining 'overs' material.*	Overs are larger than 400 microns and therefore pose no risk of silica dust generation. Overs will be stored in covered containment tankage, periodically removed from site and disposed of at a licenced facility during the extraction year, or used in well sealing activities. This plan will prevent the overs from being exposed to rain or snow.	EAP, Section 2.3.2, Solid Waste and Hazardous Material
	7	*ECE recommends CanWhite investigate alternative disposal or end-use options for 'overs' material.*	CanWhite submits that the disposal / end use of the overs material is appropriate as described in response to #6.	N/A
	8	*ECE recommends CanWhite investigate alternative disposal or end-use options for woody debris from site clearing.*	Where site clearing is required, CanWhite will endeavour to find alternate markets for the woody debris as was done for the Facility Project area. For the Facility Project area, salvageable timber was taken to a mill to go to market, and all remaining wood debris was chipped and taken to a local community to use as biofuel.	N/A
	9	*ECE requests more information on the dewatering system and process.*	The dewatering process is as follows: The sand and water extracted from wells will first pass through a cyclone at the well cluster site to remove some water. Then the sand and water at 65% sand will pass over a dewatering screen. A dewatering screen is a one layer inclined screen. The screen catches the sand, and allows the water to pass through. The wet sand then travels off the inclined screen into a sump, and the water that flows out the bottom of the screen feeds into the UV light treatment system before reinjection (by gravity flow) back to the sandstone aquifer. When the wet sand enters the sump it is mixed with recycled water from the Processing Facility and is then transported (pumped) as a sand and recycled water slurry through a slurry line to the Processing Facility.	N/A

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	10	*ECE requests information on characterization of the water from the extraction and return processes and the risk of other contamination or additions to the water.*	CanWhite's operations are designed to maintain and/or, for some parameters, locally improve water quality. The water will be contained and under continuous flow during extraction and treatment, and therefore will not have been exposed to organic materials, chemicals or contaminants through the extraction and treatment process. CanWhite will develop and implement a program for regular sampling of the groundwater extracted from the wells and as it is returned to the Winnipeg Sandstone aquifer following UV treatment. The program will be supervised by a qualified professional. All laboratory testing of samples will be carried out by a certified laboratory. The water sampling program plan will be submitted to the Director before operations commence. See also the response for #42.	A Groundwater Monitoring and Impact Mitigation Plan (EAP, Section 8.4) will be submitted to the Director before operations commence.
	11	*ECE requests more information regarding the UV treatment, such as:* *o Details and technical specifications of the proposed UV treatment system* *o Details of operational fail safes, such as:* *- Does the pumping shut down if the UV treatment loses power?* *- What kind of sampling regime will be used to ensure adequate treatment of the water has occurred?* *- Proposed schedule of maintenance and upgrades.*	Regarding technical specifications of the UV treatment system, a design dose of 25-30 mJ/cm^2 is typical for waste water treatment systems designed to meet 200 MPN/100mL fecal coliform limit, but a higher dose may be required based on local water quality and UV lamp fouling estimates. At this preliminary stage, the final design criteria for the UV treatment system are being developed. The final system design may also include a system that provides a target of 3-log (99.9%) inactivation of both *Giardia* and *Cryptosporidium* in accordance with local drinking water standards, although this is a higher level of treatment than is typically used in other applications when returning treated water back to the environment. An upstream filtration system may be required. The control narrative related to pumping operation is still in the preliminary design stages, but will include industry-standard operational fail safe requirements such as: alternating Duty/Standby UV disinfection units, the inability for the UV system to be bypassed, separate alarms to indicate lamp failure, low UV intensity and other causes of UV disinfection unit failure. A dedicated programmable logic controller (PLC) may be provided given the mobile nature of the systems, and multiple PLCs may be provided as necessary to ensure continuous treatment, depending on the final controls design. Treatment will use previously validated UV disinfection equipment which will provide the required pathogen inactivation based on a set UVT (UV transmittance), UVA (UV absorbance) and turbidity. It is likely that this system will be designed based on an incoming UVT of >65%. Online metering of UVA and UVT will be included in accordance to the United States Environmental Protection Agency's UV Disinfection Guidance Manual, which is considered the industry standard for this type of treatment. Additional testing related to fecal/total coliforms would also be considered. At this design stage a detailed level of scheduled maintenance and upgrades is not practical, but would likely include regular UV lamp replacement, regular calibration of sensors, and the potential for additional UV disinfection units to be installed within the overall piping system based on projected changes in flow.	A Groundwater Monitoring and Impact Mitigation Plan (EAP, Section 8.4) will be submitted to the Director before operations commence.
	12	*ECE recommends copies of the following plans be submitted to EAB for distribution for review and comment by the appropriate branches/departments prior to licence issuance:* *o Waste Characterization and Management Plan* *o Water Management Plan* *o Groundwater Monitoring and Impact Mitigation Plan* *o Progressive Well Abandonment Plan*	As set out in Section 8 (Follow-up Plans) of the EAP, CanWhite commits to preparing and implementing all of these Plans. CanWhite will submit them to the Director prior to commencing operations.	EAP, Section 8, Follow-up Plans
	13	*ECE requests more information regarding the estimated noise level of the extraction operation 100 m from a residence and potential noise mitigation measures available.*	There are no mandated provincial or municipal sound setback distances that would apply to this Project, and there are many factors that influence the distance that noise can travel and the intensity of noise generating activities. These factors include sounds characteristics (pitch, intensity), topography, surrounding features (buildings, open water, tree cover), climate conditions (temperature, humidity), wind direction, and existing ambient noise in the area. In the absence of mandated setback distances and the various influences on noise, setbacks are determined on a case-by-case basis. Based on the findings of the Noise Impact Assessment completed by AECOM for the CanWhite Vivian Sand Facility Project, an initial setback distance of 100 m of Project activities from the nearest residences has been selected as an initial measure to mitigate nuisance noise that maybe generated by Project activities at local residences. A review of the isopleths from the Noise Impact Assessment indicates that noise levels typically do not exceed an average of 60 dBA (the Manitoba Guidelines Maximum Desirable Sound Level for year-round operations) at a distance of 100 m from the loudest noise generating activities at the Processing Facility during daytime hours. We consider the highest sound level generated at the Processing Facility to be comparable to the noise that will be generated during extraction activities.	EAP, Section 6.3.3, Noise **Additional Proposed Mitigation:** CanWhite will have a Noise Mitigation Plan in place prior to initiating Project operations.

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			Prior to commencement of drilling activities, CanWhite will test the noise-generating equipment used during the extraction process and collect sound measurements at multiple points at 100 m distance from the extraction site (or at the nearest residence) to confirm that sound levels meet the 60 dBA limit at these monitoring points. Ambient sound levels (background noise) will also be collected at each location. Noise generated from extraction equipment shall not exceed 60 dBA at these monitoring locations, unless the ambient noise level exceeds the 60 dBA limit. Mitigation will be applied in all cases where noise exceeds the 60 dBA limit. Mitigation measures may include engineered controls such as soundproofing material or insulation around noise-generating equipment, portable noise barriers, and equipment maintenance. Operation controls can also be applied, including limited operating hours, minimizing acceleration and deceleration of motors, and limiting activities that create noise (e.g. hammering pipe; limiting the use of vehicle back-up alarms). Any noise complaints will be investigated and addressed as quickly as possible.	
	14	*ECE recommends the proponent develop and maintain a complaint management plan to track and respond to public complaints regarding the operation of the Development.*	CanWhite will develop a Noise Mitigation Plan for the Project that will include a strategy for addressing community concerns in discussion with the Environmental Compliance and Enforcement (ECE) Branch to confirm the recommended scope for the plan. The draft plan will be submitted to ECE for review and will be finalized prior to the initiation of Project operations.	**Additional Proposed Mitigation:** CanWhite will have a Noise Mitigation Plan in place prior to initiating Project operations.
	15	*Hazardous Waste Generator Registration for the Development will be required if the Development anticipates generating and storing waste as per the Hazardous Waste Regulation M.R. 195/2015.*	CanWhite acknowledges and will comply with any applicable requirements of the Regulation.	N/A
	16	*Above-ground petroleum storage facilities with a total storage capacity of 5000 L or more require a permit under the Storage and Handling of Petroleum Products and Allied Products Regulation M.R. 188/2001.* *o Please note that above-ground petroleum storage facilities with a total storage capacity of less than 5000 L do not require a permit under M.R. 188/2001, but are still subject to partial application of the regulation.*	CanWhite acknowledges and will comply with any applicable requirements of the Regulation.	N/A
	17	*In the event of a fire, release, spill, leak or discharge of a pollutant or contaminant to the environment, immediately report the incident to Manitoba Conservation and Climate by calling the 24-hour Emergency Response Line at (204) 944-4888 or 1-855-944-4888. Provide a report following the incident with details of the occurrence, clean-up actions and future mitigation of a similar event.*	CanWhite acknowledges and will comply with any applicable emergency management procedures.	N/A
MBCC, Wildlife, Fisheries and Resource Enforcement Branch - Oct. 6, 2021	18	*The amount of existing disturbance and fragmentation within the project area cannot be used to assess impacts to all species. Species of local importance like white-tailed deer can favor edge habitats, while golden-winged warbler may be concentrated along existing developments, since they are attracted to the vegetation structure that development can create. These species could be impacted regardless of the landscape's "disturbed" status, and need to be considered moving forward.*	Although AECOM agrees that the evaluation of existing disturbance and fragmentation alone would not be suitable in assessing impacts to all species, other environmental factors have also been considered in our assessment that are useful in assessing potential impacts on a broad range of wildlife in the Project Area and Project Region. These factors included expected presence of specific wildlife in the region, existing local and regional landcover, natural annual variation of wildlife populations, influences on wildlife from local and regional factors (such as predator-prey cycles; human activities such as hunting), and available mitigation measures that will be applied to minimize effects on naturally vegetated areas. The assessment also takes into account the temporary nature of the Project. Occupation of any site for extraction activities will last no longer than a year, and there will be no permanent infrastructure or occupation of any one site. As described in the EAP, particularly in Section 6.5.1 (Vegetation) and 6.5.2 (Wildlife), CanWhite's plan for the development includes provisions for the protection of potential habitat of species of local importance (e.g. white-tailed deer) and conservation concern (e.g. golden-winged warbler). These provisions include: - Vegetation clearing will be conducted outside of the bird breeding season; - Clearing will be minimized to the extent feasible; - A revegetation program including monitoring will be implemented. Project components will be located on previously disturbed land to the extent feasible within a Project Site that consists of approximately 56% natural vegetation cover. Therefore, the amount of naturally vegetated area requiring clearing each year is expected to be minor, and is not expected to result in a measurable impact on wildlife populations in the Regional Project Area. Once the extraction activities has been completed, wildlife habitat at each site will be restored within a reasonably predictable period of time. Revegetation of each annual extraction site will begin immediately upon completion of extraction activities and it is expected that most natural vegetation will be very well established after approximately 4 years, with re-establishment of trees and shrubs expecting to be evident within 5 to 10 years following closure.	EAP, Section 6.5.2, Wildlife; EAP Section 6.5.1 Vegetation

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	19	*All vegetation clearing and rehabilitation plans must consider protected golden-winged warbler and red-headed woodpecker habitat moving forward. Table 4-5 declares that there is a low-moderate probability of occurrence within the project area for golden-winged warbler and red-headed woodpecker, while the project site is situated within federal Critical Habitat squares for each of these species, and the Manitoba Conservation Data Centre contains documented occurrences for each of these species. There is no mention of Critical Habitat for these species included in the document. The proponent is responsible for maintaining habitat for these federally and provincially Threatened species, regardless of the assessment on Regional-level impacts.*	CanWhite's vegetation clearing and rehabilitation plans will respect all federal and provincial statutes and regulations with respect to wildlife species. The impact assessment described in the EAP also considers the possibility of the presence of these species (see sections 4.4 [Terrestrial Environment] and 6.5.2 [Wildlife]). Although the characteristics defining 'Critical Habitat' for the golden-winged warbler are complex and only partly understood, this species generally prefers to nest in early successional habitats (or habitats exhibiting early successional characteristics), usually with dense herbaceous growth mixed with extensive patches of dense shrubby growth along with scattered taller trees adjacent to a forested edge (Environment and Climate Change Canada, 2016). This type of landcover occurs within the Regional Project Area and is not limited to the Project Site. Therefore, the limited vegetation clearing proposed for Project activities is not expected to impact the regional population of golden-winged warblers, noting that clearing will occur outside of the migratory bird breeding season and alternative nesting habitat for this species is available within the Regional Project Area. Regarding the red-headed woodpecker, Critical Habitat has not been fully defined and is reliant on observations of this species during the breeding season (Environment and Climate Change Canada, 2019). However, as shown in Table 4-2 of the EAP, the forested areas of the Project Site are mostly immature and young age classes which would provide very limited trees available with trunk/limb diameters suitable for breeding woodpecker nesting cavities. Project activities such as vegetation clearing are not expected to impact regional woodpecker populations primarily due to the minimal amount of suitable breeding habitat within the Project Site and clearing of vegetation outside of the breeding bird season. Probability of occurrence within the Project Site for the golden-winged warbler and red-headed woodpecker (as described in Table 4-5 of the EAP) was based on information from the Atlas of the Breeding Birds of Manitoba. Project activities and temporary components will be located on previously disturbed land to the extent feasible within a Project Site that consists of approximately 56% natural vegetation cover. The above-described preferred nesting habitats for these species is not limited only to the Project Site. Given the relatively small amount of naturally vegetated area that will be cleared annually to accommodate the Project footprint, it is expected that alternative nesting habitat for the Golden-winged Warbler and Red-headed Woodpecker is available within the Regional Project Area.	EAP, Section 6.5.2, Wildlife; EAP Section 6.5.1 Vegetation
	20	*The proposal does not address invasive species or biosecurity. Invasive species known to occur in the area, including spotted knapweed, should have been identified, the potential for spread addressed, and proper mitigation tactics outlined.*	The scope of the Environment Act Proposal for this Project was prepared in accordance with the Manitoba Sustainable Development 'Information Bulletin – Environment Act Proposal Report Guidelines' which do not include the topics of invasive species or biosecurity as reporting requirements. Developed/disturbed areas that currently occur within the Project Site and the surrounding Regional Project Area are known to contain numerous invasive plant species. Current land uses of the Project Site and adjacent areas are expected to continue to contribute to the further establishment and propagation of invasive plant species. However, the mitigation measures set out in section 6.5.1 (Vegetation) will mitigate the propagation of invasive species to the extent feasible. For example, areas to be cleared of vegetation will be clearly marked to avoid clearing more than is required. As stated in Section 2.1, Project activities will occur on previously disturbed areas to the maximum extent feasible to minimize Project effects on vegetation and associated wildlife. These mitigation measures are expected to control the spread of invasive plant species to the extent feasible.	EAP Section 6.5.1 Vegetation
	21	*When will the Revegetation Monitoring Program be developed? We appreciate that golden-winged warbler habitat is mentioned, and that revegetation may be augmented using native seed mixtures and native plants where required, but more details are required: A golden-winged warbler habitat management strategy should be developed that outlines how the specific habitat needs of this species will be maintained or provided as vegetation management and rehabilitation activities are carried out.*	A Revegetation Monitoring Program will be developed during the Project construction phase prior to clearing of naturally vegetated areas, with an emphasis on the specific requirements for maintaining habitat for the golden-winged warbler. Details that will be incorporated into the Program include: -What will be monitored (plant abundance, height, or other measures of success) and at what frequency (e.g. monthly, annually); -Monitor qualifications, roles, and responsibilities; -Revegetation schedule, including a review of potential conflicts (e.g. migratory bird nesting season conflicts); -Reseeding and replanting methods (appropriate seed mixes, plant species, plant source and quality control, seeding and planting methods, including rates and spacing); -Erosion-control methods employed; -Use of existing infrastructure such as roads, trails or natural features; -Measures for the control of weeds and invasive species; -List of corrective actions in the event of poor vegetative success; and -Recordkeeping and reporting requirements.	EAP Section 6.5.1 Vegetation; EAP Section 8.7 Revegetation Monitoring Program

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	22	*How will red-headed woodpecker habitat be identified, and what actions will be taken to avoid potential impacts?*	Refer to the above response for #19.	EAP, Section 6.5.2, Wildlife; EAP Section 6.5.1 Vegetation
	23	*Federally and provincially Threatened eastern whip-poor-will are also known to occur in the project area, and potential changes to their habitat as a result of project clearing and revegetation plans should also be considered moving forward.*	Refer to the above responses for #19 and #21.	EAP, Section 6.5.2, Wildlife; EAP Section 6.5.1 Vegetation
	24	*What revegetation monitoring protocols will be followed, and what will trigger progressive actions like reseeding and replanting?*	Revegetation monitoring protocols, including progressive actions such as reseeding and replanting, will be developed prior to initiation of Project construction. Some of the details that will be incorporated into a Revegetation Monitoring Program are provided in the response for #21. The triggers for progressive actions will be specified in the Revegetation Monitoring Program (Section 8.7).	EAP, Section 8.7, Revegetation Monitoring Program
	25	*Will bulldozing or mulching equipment be used to clear drill sites, temporary drill access trails, and slurry/water lines? Woody material should not be deposited next to standing timber or shrubs, and piled in a fashion that will not impede wildlife movement.*	Most sites that have been selected for Project activities are on previously disturbed sites such as gravel quarries or open fields. Many of the selected sites up to and including year 2025 will not need to be cleared. CanWhite will reduce clearing to the greatest extent possible. Where clearing is necessary, CanWhite will use feller bunchers to remove salvageable timber. Remaining timber/brush will be chipped or mulched and as with the facility site clearing, be removed for alternate uses such as biofuel for nearby communities. CanWhite will not deposit woody material next to standing timber or shrubs, and will not pile cleared material in a manner that would potentially impede wildlife movement.	**Additional Proposed Mitigation:** Woody material will not be deposited next to standing timber or shrubs. Cleared material will not be piled in a manner that would potentially impede wildlife movement.
	26	*It is unclear how the well clusters will be connected. Vegetation should not be cleared between cluster sites, other than what is needed for drill access trails and flow lines.*	Up to seven extraction wells may be operating simultaneously, either in one well cluster or spread across two adjacent well clusters (e.g. four operating wells in one cluster and three in an adjacent well cluster) (EAP, Section 2.2.1 Extraction Method). Therefore, minor clearing between up to two adjacent active well clusters may be required to accommodate temporary drill rig access trails. However, as indicated in Section 6.5.1 (Vegetation) of the EAP, areas to be cleared of vegetation will be minimized to the extent feasible. Also, much of the Project Site has been previously disturbed, with only 56% of the Project site consisting of natural vegetation cover. As indicated in Section 8.7, a Revegetation Monitoring Program will be implemented annually after the first year of Project operations to determine the success of the revegetation program and determine if follow-up reseeding or replanting is required.	EAP Section 6.5.1 Vegetation; EAP Section 8.7 Revegetation Monitoring Program
	27	*Please provide an Invasive Species Strategy that contains an assessment of species known to occur in the area, all preventative/control measures that will be taken, and monitoring protocols that will be followed to ensure that spread does not occur.*	Refer to the above response for #20.	EAP Section 6.5.1 Vegetation
MBCC, Environmental Assessment Branch, Air Quality Section - Oct. 7, 2021	28	*It has been claimed in the proposal that the impact of the project on air quality is expected to be minor to negligible. What is the basis of this expectation? Has any air quality impact assessment/dispersion modeling study been done for this project?*	Air quality dispersion modeling was completed for the CanWhite Vivian Sand Facility Project because that project is a stationary processing facility, with stationary components and includes the enclosed/contained handling of dry silica sand product. Air dispersion modeling was completed for that project to demonstrate the effectiveness of incorporating particulate/silica dust control measures in that project design. For the Vivian Sand Extraction Project, silica sand will be extracted from wells in a water and sand slurry. After screening of the slurry for waste 'overs' (material that is too large), the slurry will be immediately contained within a slurry line that conveys the enclosed sand slurry to the facility for processing which removes the risk of silica dust dispersion. At no time will dry silica sand be left exposed at the Project Site and therefore there will be no potential for the generation of airborne respirable crystalline silica. Other sources of impacts to air quality are from a small number mobile equipment (e.g. pickup trucks; drill rigs; pump stations; see Table 2-1 in the EAP for a complete list) that will move around the Project Site as extraction wells are drilled and progressively decommissioned. Air dispersion modeling is typically not required for projects without permanent processing components and very limited sources of dust (e.g. from local gravel roads) and a small number of mobile equipment. Mitigation measures to minimize the potential for Project effects on air quality include minimizing idling of motorized equipment, applying water to gravel roads to control dust as required, and properly maintaining vehicles and equipment. With the application of these mitigation measures, effects on air quality are expected to be sufficiently mitigated and the need for air dispersion modeling to support the conclusion of minor to negligible effect on air quality is not considered necessary/warranted. For these reasons, the need for an ambient air monitoring program is also not considered necessary/warranted.	EAP Section 6.3.1 Air Quality
	29	*Have the emissions of various air pollutants from all potential sources including fugitive dust emissions been estimated or calculated for the project?*	Refer to the above response for #28.	Refer to mitigation proposed for #28.
	30	*Respirable crystalline silica content of particulate matter is a health concern for this type of operation. Was respirable crystalline silica considered a potential air pollutant in the air quality assessment study? Air Quality Section suggests that the proponent submit a detailed characterization of the particulate matter indicating silica content.*	Refer to the above response for #28.	Refer to mitigation proposed for #28.
	31	*Is there any plan to conduct an ambient air monitoring program at the facility's fence line during the sand extraction process?*	Refer to the above response for #28.	Refer to mitigation proposed for #28.

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Municipal Relations, Community Planning Branch - Oct. 13, 2021	32	*Land use and development on private land falls under the authority of the local municipality and zoning by-law. Approval and associated conditions/requirements for any conditional use order that may be required are pursuant to the R.M. of Springfield Zoning By-law and applications would be made directly to the municipality.*	CanWhite will comply with applicable R.M of Springfield requirements.	N/A
Agriculture and Resource Development, Groundwater Management Section, Water Branch - Oct. 21, 2021	33	*The hydrogeological and geochemical assessment evaluated the first four years of operation (p.19)* [EAP]. *The project has a proposed 24-year life span. The current application is for extraction activities to the end of 2025. It would be prudent for any subsequent Notice of Alteration to include a thorough assessment of all previous monitoring and impacts, and include projections using observed data developed during operation.*	Each future Notice of Alteration for proposed extraction activities beyond 2025 will include a thorough impact assessment using monitoring data collected during extraction operations and the follow-up activities proposed in the EAP (Section 8). The assessments will include projections for subsequent blocks of proposed extraction areas.	N/A
	34	*Section 6.2.3* [EAP] *states that "Water level in the observation well network declined by up to 8.5 m (Winnipeg Sandstone) and 1.5 m (Red River Carbonate) at a distance of 89.3 m from the pumping well. Setbacks (Sctn. 1.4.1) include 100m from a dwelling and the dwelling's drinking water well. Extraction wells will be operating simultaneously (Sctn. 1.1). What will be the effect on a domestic well water level at this separation distance with multiple extraction wells operating and what plans will be in place to mitigate negative effects for the water user? Will the 100 m separation distance be adequate.*	The November 2020 pumping test utilized a pumping rate of approximately 26.6 L/s (372 US GPM) for a period of 72 hours. However, the proposed pumping rate during operations was evaluated at 2,998 m^3/day (550 US GPM) and 1,526 m^3/day (280 US GPM) within the numerical groundwater model to evaluate various operational pumping scenarios and better align with CanWhite's proposed operations. The results of the pumping test and numerical modelling are relatively consistent. Based on numerical modelling, the anticipated drawdown in the carbonate and sandstone aquifers is shown on Figures 6-9 to 6-13 of AECOM's Hydrogeology and Geochemistry Assessment Report. At a distance of 100 m, the drawdown in the sandstone aquifer is estimated to be between 5 m and 10 m, and drawdown in the carbonate aquifer is estimated to be 1 to 2 m. Groundwater elevations in both aquifers will remain fully saturated and far above the top of the carbonate aquifer and sandstone aquifer as shown on Figures 6-7 and 6-8 of the Hydrogeology and Geochemistry Assessment Report (EAP, Appendix A).	Early operations will be intentionally located in an area with very few wells, allowing for sufficient time to update the operational plan based on monitoring data from a purpose-built groundwater monitoring network associated with each year of operations. The Groundwater Monitoring and Impact Mitigation Plan (EAP, Section 8.4) prepared in advance of commencing operations will include the following: - A pre-condition well survey will be conducted to physically inspect the well, determine the elevation of the pump and evaluate the potential for any impacts in advance of operations. - If landowners' existing well pumps are located below but near the static water level, CanWhite will assume the cost of lowering the pumps, or will modify its operational plan (e.g. pumping rate, setback distances) to avoid or mitigate any impacts. - Groundwater elevations will be monitored in real time so that operations can be stopped if water levels approach intolerable ranges.
	35	*Section 8.2 & 8.4* [EAP] *It is recommended that the groundwater monitoring network include monitoring wells in both the carbonate and the sandstone aquifers capable of determining water levels on a continuous basis, be used to determine flow direction, and capable of sampling groundwater quality. The network should contain a sufficient number of wells situated between the project and groundwater users to monitor and measure potential alteration to the groundwater.*	Agreed. The purpose of the monitoring network is to establish conditions of groundwater levels and groundwater quality in advance of operations, and then allow for real-time monitoring of water levels between extraction activities and existing water supply wells during and following extraction activities. Water levels in monitoring wells will be monitored continuously using pressure transducers, while water quality will be monitored quarterly before, during and after extraction activities in each operational area. Monitoring will continue for at least five years after operations end in each area, or until groundwater levels and groundwater quality have stabilized at pre-mining levels/concentrations. CanWhite is exploring wireless telemetry systems that are capable of transmitting water levels to extraction well operators so that impacts can be detected and rapidly mitigated by reducing pumping rates, lowering pump elevations, increasing setback distances or stopping operations in extreme situations.	A robust monitoring network will be designed, constructed and monitored under the supervision of a hydrogeologist licensed to practice in Manitoba. The results will be reviewed during operations, and impacts will be avoided or mitigated in accordance with the Groundwater Monitoring and Impact Mitigation Plan (EAP, Section 8.4) that will be developed following licensing. The Plan will define triggers that initiate mitigation measures that will be rapidly implemented.
	36	[Appendix A - Hydrogeological Assessment Report] *Executive Summary & Section 1.4 indicate that the drawdown impacts will likely not require mitigation because "most pumps are installed at depths of 30 m or more". Recent well driller reports include a field for suggested pump intake depth settings. This information is provided by the well drilling company after a rudimentary pump test is completed and is used by pump installers. Within Canwhite's Local Project area wells completed in the sandstone in which well drillers have provided a pump intake depth the values range from 18' to 60' and driller recommended pump depth for the carbonate aquifer is between 20' and 80'. No recorded intake depths are 30 m or greater. The Consultant should reassess this statement.*	Standard well design for water wells calls for installation of the pump just above the elevation of the screen to maximize the Total Available Drawdown and Safe Available Drawdown for the well. Installation of pumps at a shallower depth will limit the well yield and tolerance for drawdown impacts by neighbouring groundwater users. It is AECOM's experience that well driller reports span several tens of decades, and the quality and completeness of the information in the well database is variable. Firstly, the well locations are plotted at the centre of each section or quarter section, rather than at the exact location of the well. This will have a very important influence on the magnitude and duration of drawdown impacts. Secondly, homeowners and pump installers may have departed from the recommendations of drillers by installing pumps themselves or installing wells at shallower depths to minimize costs and effort associated with pump installation and servicing, or to increase the Total Available Drawdown and overall well yield. Given the unknown status of the majority of pumps, it is prudent to conduct a physical survey of water supply wells in advance of operations in each area to document the well location, well condition, water level, pump installation depth, water use and water quality, followed by monitoring during and following operations.	CanWhite will conduct a detailed pre-development well survey to obtain accurate well coordinates and document well construction and operational use to establish appropriate mitigation measures which may include setbacks, modified operations or adjustments to pump installation depth at CanWhite's cost. The details of this survey will be provided for in the Groundwater Monitoring and Impact Mitigation Plan (EAP, Section 8.4).

TAC DEPARTMENT	ISSUE / QUESTION #	ISSUE / QUESTION RAISED*	RESPONSE	PROPOSED MITIGATION SUMMARY
	37	[Appendix A - Hydrogeological Assessment Report] *Groundwater Information Network (GIN) was used as a primary data source for the water well inventory, which was further interpreted into hydrostratigraphic surfaces, groundwater elevations and gradients, boundary condition assignment, and employed for steady state calibration. Manitoba groundwater data on GIN is outdated for more than ten (10) years, is no longer considered as a qualified resource for groundwater level evaluation and well info dependent studies. Due to the GIN data stagnation, activities such as, new well constructions, well decommissioning, and other groundwater usage developments over the past decade, may differ the understanding of the hydrogeological conditions, model settings and the reference for calibration than what has been interpreted in this report. GWDrill should be considered instead.*	Understood. The GWDrill database can be utilized to inform updates to the geological model and numerical groundwater model in the future. However, the geological contacts are relatively consistent across the study area and the majority of the wells were installed more than 10 years ago. As such, the GIN database is sufficiently accurate for this assessment. CanWhite understands that the locations of the existing wells and newly constructed/decommissioned wells are not present in the GIN database, but the physical well survey described above will remedy that information gap in advance of CanWhite's operations.	Refer to mitigation proposed for #36.
	38	[Appendix A - Hydrogeological Assessment Report] *Labelling on the graphs to aid understanding could benefit with the following:* *Figure 3-1 PR HWY numbers are missing* *Figure 6-1 Railway alignment to be removed, it is misread as "watercourse" Figure 6-4 Pumping Rate/Barometric Pressure legend is missing* *Figure 5-9, 10, 11 Equipotential lines are suggested to be added and labeled.*	Noted. Much of this information is included on figures contained in AECOM's Hydrogeology and Geochemistry Assessment report (Appendix A of EAP). The requested information will be added or removed from future figures. It is not clear if the reviewer is referencing the aqueduct that conveys water from Shoal Lake to Winnipeg, which is defined as a watercourse in available geodatabases. CanWhite notes there is a railway owned by Greater Winnipeg Water District that is coincident with the aqueduct for servicing of that infrastructure.	N/A
	39	[Appendix A - Hydrogeological Assessment Report] *References – there are several instances that the reference provided in the text does not align with the reference in Section 9 including the incorrect year; for example references in 4.2.2.2. A reference should be provided for the discussion of fluoride in 4.2.3.5.*	There are no references included in Section 4.2.2.2 of the Hydrogeology and Geochemistry Assessment Report. The reference for the fluoride discussion is: Manitoba Sustainable Development and Manitoba Health, Seniors and Active Living. 2019. Fluoride in Manitoba Well Water. Trace Elements in Well Water Factsheet #4. October 2019. (https://www.gov.mb.ca/sd/pubs/water/drinking_water/factsheet_fluoride.pdf)	N/A
	40	[Appendix A - Hydrogeological Assessment Report] *Section 1.2: Betcher and Ferguson 2003 should be referenced as Betcher and Ferguson, 2007, which estimated that there are 1,500 water wells in all of southeastern Manitoba that interconnect the Winnipeg Sandstone and overlying carbonate aquifer and not the 10,000 stated by the Consultant.*	Noted. The year of the publication was an error and will be corrected. It is also agreed that 1,500 wells were noted to interconnect the Winnipeg Sandstone and overlying carbonate aquifer, although it is likely that quite a few more have been installed in the Winnipeg Formation since 2007.	N/A
	41	[Appendix A - Hydrogeological Assessment Report] *Section 4.2.3.6 provided information from three private water wells that were sampled for groundwater characterization. Two of the three analysis were most likely sampled after running through a water softener and are of little value in characterizing the carbonate water quality. It should be ensured that future water quality sampling is from a 'raw', untreated source.*	The author agrees with the reviewer that water softeners impact the chemistry of the water in the sample. However, the purpose was not solely to characterize the quality of the water. Rather, it was to document any changes in water quality before and after the pumping test as a matter of due diligence. Further, it would be inappropriate for CanWhite and their consultants to modify the plumbing and well construction to provide access to the wellhead for sampling purposes at this stage. The approach to monitoring groundwater quality before, during and after operations will be fully described in the Groundwater Monitoring and Impact Mitigation Plan following licensing.	EAP, Section 8.4, Groundwater Monitoring and Impact Mitigation Plan
	42	[Appendix A - Hydrogeological Assessment Report] *Table 4.8 includes dissolved oxygen and ORP pre and post testing from select wells. However, it is not apparent whether there was water quality testing completed on the return water after sand separation during initial production testing (Sctn. 7.2.2). Knowing the DO concentration of the injection water may be beneficial in equilibrium modeling of the groundwater quality. It is also not apparent how bacteria could be introduced during separation and if it would present in the return water and whether UV disinfection would provide adequate treatment with the turbidity of the injection water has not been provided.*	CanWhite agrees with the reviewer that introduction of bacteria or other microbial contaminants into the water is unlikely during separation of the water and sand. However, in an abundance of caution, CanWhite intends to treat reinjected water to prevent the risk of inadvertent microbial contamination. CanWhite is working with industry leading UV treatment specialists and a certified lab to determine the required level of UV treatment and filtration (refer to response for #11). UV systems are widely used to disinfect industrial and municipal water for potable and non-potable uses. To support the design of the UV treatment system, CanWhite will be undertaking additional water quality testing to support the design of the UV treatment system. Several parameters will be monitored in the field and verified by the analytical laboratory to guide system design. ORP and DO were not measured on filtrate following sand extraction activities. However, reasonable assumptions were made for the purposes of geochemical modelling and the results suggest negligible to slightly positive impacts on water quality. Measured data collected during operations can be used to inform future assessments.	EAP, Section 8.4, Groundwater Monitoring and Impact Mitigation Plan

TAC DEPARTMENT	ISSUE / QUESTION #	ISSUE / QUESTION RAISED*	RESPONSE	PROPOSED MITIGATION SUMMARY
	43	*[Appendix A - Hydrogeological Assessment Report] Section 6.4/ Figure 6-1 Model domain are along rivers/creeks is not an adequate practise for confined aquifer modeling. These rivers/creeks have a negligible effect on the groundwater flow in the Red River Carbonate and Winnipeg Sandstone aquifers. Confined aquifer model domain has to be based on the analysis of piezometric maps (Figure 9, 10, 11), equipotential lines are not shown or labeled.*	The model simulates a multiaquifer system of unconsolidated sediments, a carbonate aquifer, a shale aquitard and a sandstone aquifer. The carbonate and sandstone subcrop below glacial materials receive recharge from precipitation and interact with streams. The model domain and size of elements was established to capture the regional extent of the project and allow for establishment of physically based boundary conditions, while keeping the number of elements to approximately 1 million, which is a reasonable number in the context of required computing power and practical simulation times. The spatial extents of the model domain are at least 6 km from the Project Site. The simulated effects of operations did not extend to the model domain boundary, indicating that spatial extents of the model are acceptably far from the Project Site. Rivers and creeks are routinely used to establish model boundaries for unconfined and semi-confined systems. It is acknowledged that deep confined systems may be better represented by assigning specified head boundary conditions along interpreted groundwater equipotential lines. This is the approach that was taken for the Winnipeg Sandstone by assigning the heads along the sandstone subcrop from Figure 5-9 as specified heads as described in Section 6.6.2 and shown on Figure 6-1. It may also have been appropriate to use this approach for the carbonate aquifer, but there are very few wells completed in the carbonate aquifer in that area upon which to base assignment of a boundary condition in the carbonate. Figures 6-9, 6-10, 6-11, 6-12 and 6-13 illustrate drawdown equipotentials (subtraction of simulated heads from calibrated heads), which is a direct calculation of changes to groundwater equipotentials in both aquifers. Measured groundwater elevations (model calibration targets) are plotted on Figures 5-9, 5-10 and 5-11 and colour shaded in accordance with defined elevation bands. It is acknowledged that equipotentials could also be drawn and labelled to illustrate the same information in a different manner but it may be difficult to delineate drawdown impacts given the spatial extent of the model domain.	N/A
	44	[Appendix A - Hydrogeological Assessment Report] *Section 6.5 Free surface setting needs to be addressed.*	To clarify, layer 1 was assigned as a 'Free Surface', layers 2, 4 and 5 were assigned as 'Dependent', layers 3, 6 and 7 were assigned as 'Confined', and layer 8 was assigned as 'Fixed'.	N/A
	45	*[Appendix A - Hydrogeological Assessment Report] Section 6.6.1 Recharge was assigned to Sandilands area uniformly; according to the surficial geology of Manitoba, organic deposit has the largest coverage over this area, however, its hydraulic property or category is not discussed in neither Section 5 nor 6. This is required to be addressed before assuming the uniform recharge.*	Recharge in this area of the model domain was derived from two separate studies as noted in the report. Given the higher degree of confidence in these data, it was treated as an input parameter rather than a fitting parameter. Organic deposits are variable in their thickness and their hydraulic properties (K ranges from ~10-3 m/s to 10-6 m/s) owing to their compressibility and the influence of their decay on porosity and permeability, but shallow surficial deposits are often sufficiently permeable to allow for infiltration of large quantities of water providing the water table is sufficiently deep. Many organic soil deposits are relatively thin and underlain by deposits of similar origin in the Sandilands area. It was assumed that the organic deposits were relatively thin based on review of available literature and geological mapping, and would therefore not further limit recharge beyond the values measured and reported in the literature. It is also noteworthy that organic soil filled depressions may act to focus recharge to the underlying aquifer system. Any changes in the conceptualization of recharge in the Sandilands area would primarily influence groundwater within the glacial materials overlying bedrock, with less influence on the deep bedrock aquifers that are the subject of this study.	N/A
	46	[Appendix A - Hydrogeological Assessment Report] *Section 6.6.2 Source of DEM information should be provided. The assignment of specified head value in floodways and creeks was not discussed.*	To clarify, the DEM is based on CanVec data. Specified head values were assigned to the floodway and creeks based at the elevation of the topographic surface at that location. The methods are described in detail in Section 6.6.2 of AECOM's Hydrogeology and Geochemistry Assessment Report (EAP, Appendix A).	N/A
	47	*[Appendix A - Hydrogeological Assessment Report] Section 6.6.4 Insufficient well boundary conditions: other wells below the requirement of water use license having dominant quantity within the model domain are also a vital component that determines the model mass balance. An estimate of average pumping rate based on the function of the well (domestic/irrigation/agriculture), and well distribution density assigning to the center of the section as a compound well to account the mass loss. Steady state calibration revisit is suggested.*	The British Columbia groundwater modelling guidelines indicate that a model is considered calibrated when the correlation coefficient is at least 0.95 and the normalized root mean squared error is less than 10% (good) or 5% (very good). For this model, the correlation coefficient was calculated to be 0.99 for the steady-state calibrated model and the NRMSE was 1.7% when reasonable assumptions and input parameters were utilized. The calibration results and statistics are discussed in Sections 6.9.1 and 6.9.2, with statistics also presented in the legend of Figure 6-2. Industry-standard references for numerical groundwater modelling include several textbooks (e.g. Anderson and Woessner 1992; Anderson, Woessner and Hunt 2015) and provincial and federal guidelines produced for British Columbia, United States (USGS), Australia and other jurisdictions. A guidance document specific to Manitoba is not available to the author's knowledge. Most references are relatively consistent, and many caution against the use of prescriptive calibration targets as it may lead to model forcing. Rather, it is more important to replicate the overall behaviour of the groundwater flow system and responses to stressors. The calibration results are considered reasonable because the results are within industry-standard guidelines with respect to calibration statistics and replication of aquifer responses to stressors. Incorporation of all domestic pumping wells into the model is not required for the purposes of impact assessment because they would not appreciably affect the ability of the model to simulate hydraulic heads that are similar to those observed as indicated in Figure 6-2. Domestic use in rural areas is not typically a consumptive use because much of the water is returned to the ground via septic field recharge.	N/A

TAC DEPARTMENT	ISSUE / QUESTION #	ISSUE / QUESTION RAISED*	RESPONSE	PROPOSED MITIGATION SUMMARY
	48	*[Appendix A - Hydrogeological Assessment Report] Section 6.7 2534 snapshot head observations from GIN were adopted as the target for steady state calibration. In order to strategically feed for calibration, it is a necessary practise to show the statistics, such as observation intervals, formations, and ownership. Taking this as a basis, then weighing the data by quality, assigning maximum weight to data from provincial monitoring stations, etc.*	It is acknowledged that not all calibration targets should be assigned equal weight, and that weighing coefficients can be assigned to calibration targets when the dataset is well understood. The steady-state calibration data set covers a large geographical area, several aquifers and is based on groundwater elevations heads measured at the time of well installation. The dataset spans several 10's of decades and, by definition, incorporates seasonal and long-term changes in aquifer conditions. The location of each of the wells is also known to be limited in accuracy due to lack of surveyed well coordinates in the water well databases. Some categorization of wells and calibration targets was completed and is presented on Figure 6-2, whereby points are grouped according to aquifer. The transient calibration data includes wells proximal to the Project Site Area, which were given more weight because all data was collected at the same time and subject to QA/QC measures. A summary of groundwater users is provided in Appendix G of the Hydrogeology and Geochemistry Assessment Report, and lists the well ID, northing, easting, water use, well depth and the assigned lithology (aquifer). Ownership of wells has not been included to avoid sharing of personal information of domestic well owners in public documents. This information is illustrated on the map of hydraulic head residuals shown on Figure 6-3 of the Hydrogeology and Geochemistry Assessment Report.	N/A
	49	[Appendix A - Hydrogeological Assessment Report] *Calibration guideline reference is missing in the report.*	Industry-standard references for numerical groundwater modelling include several textbooks (e.g. Anderson and Woessner 1992; Anderson, Woessner and Hunt 2015, etc.) and provincial and federal guidelines produced for British Columbia, United States (USGS), Australia and other jurisdictions. A guidance document specific to Manitoba is not available to the author's knowledge. Most references are relatively consistent, and many caution against the use of prescriptive calibration targets as it may lead to forcing. See also response for #47.	N/A
	50	*[Appendix A - Hydrogeological Assessment Report] Appendix A3, Figure 6.2 shows the steady-state model generally over-predicts the observed hydraulic heads (average over-prediction: 3.27 m). The proponent defines that as "While simulated groundwater levels are generally in agreement with observed groundwater levels.." and " Results were considered reasonable as calibration statistics are within recommended guidelines." (Appendix A1, page 72). This statement is doubtable, since a numerical model should neither over-predict nor under-predict in general (the mean error should be near to 0). Additionally, the map (Appendix A3, figure 6.3) shows well that most of the observation wells in the conclusion area are also over-predicted. It is likely that the chosen recharge, hydraulic conductivities (and the mentioned uncertainties on the pump rates) and insufficient well boundary conditions are the reason for the errors. Some of the recharge rates seem to be at least at the upper limit. A detailed study on the recharge rates was not carried out.*	The British Columbia groundwater modelling guidelines indicate that a model is considered calibrated when the correlation coefficient is at least 0.95 and the normalized root mean squared error is less than 10% (good) or 5% (very good). For this model, the correlation coefficient was calculated to be 0.99 for the steady-state calibrated model and the NRMSE was 1.7% when reasonable assumptions and input parameters were utilized. The calibration results and statistics are discussed in Sections 6.9.1 and 6.9.2, with statistics also presented in the legend of Figure 6-2. It is acknowledged in Section 6.9.1 that heads are overpredicted, with the greatest differences reported in the Red River Carbonate near Winnipeg. The largest head residuals are located near the Red River Floodway and may represent artesian wells that predate floodway construction and/or aquifer depressurization over time since the wells were installed. The impacts of the Red River Floodway on groundwater elevations in the carbonate aquifer are well understood, and reflect a combination of water levels measured prior to floodway construction and after floodway construction. It is the groundwater modellers' view that there is value in the historical data in that it adds to the spatial, depth and temporal extents of the measurement dataset, but that it must be interpreted with the knowledge of the changes that have occurred over time.	N/A
	51	[Appendix A - Hydrogeological Assessment Report] *Section 6.10 The impact of injection productions to the porosity and hydraulic conductivities of Sandstone is not discussed and reflected in the aquifer property change setting. Theoretically, K and porosity increases with the injection ongoing, more rapidly at the injection location, radially slower with increasing distance.*	It is acknowledged that pressure changes alter the effective stress conditions and may bring about changes in the hydraulic conductivity and porosity. Many of these changes are simulated by adjusting the hydraulic properties of the aquifer/shale for the predictive simulations including an uncertainty analysis. However, water will not be injected under pressure (gravity flow) and the drilling methods will be essentially the same as those utilized to drill conventional water wells. Therefore, the magnitude of this effect is anticipated to be relatively minor.	N/A
	52	[Appendix A - Hydrogeological Assessment Report] *Figure 6-7 & 6-8 shows the drawdown observed in Sandstone aquifer are pulsing shaped with large spikes, which is not normal for constant rate continuous pumping.*	The sequence of extraction wells is presented in Appendix H of the Hydrogeology and Geochemistry Assessment Report. It is acknowledged that constant rate continuous pumping from the same well cluster would produce a typical drawdown curve if allowed to reach steady-state. However, the model simulates extraction well operation in accordance with CanWhite's proposed operations, which does not call for continuous pumping of a single well until it reaches steady-state. The time scale on the predicted drawdown figures (Figures 6-7 and 6-8) spans 1,890 days (~ 5 years) and the data is somewhat compressed to illustrate operations from start to finish. If the timescale were expanded, it would be apparent that the aquifer is behaving in a manner that is consistent with hydrogeological theory. The pulses and spikes noted by the reviewer are a result of superposition of multiple overlapping drawdown cones and compression of the time axis to illustrate the full temporal scale of operations.	N/A
	53	[Appendix A - Hydrogeological Assessment Report] *Section 6.11 In addition to the comment made on Section 6.10, it is worthy to conduct a sensitivity test on Sandstone porosity to understand its impact to the well-head and model robustness in the prediction scenarios.*	See response to #51. The impact of porosity was evaluated during model calibration. Any changes in bulk porosity of the aquifer in response to pumping or injection are anticipated to be reversible and short-lived.	N/A

TAC DEPARTMENT	ISSUE / QUESTION #	ISSUE / QUESTION RAISED*	RESPONSE	PROPOSED MITIGATION SUMMARY
	54	[Appendix A - Hydrogeological Assessment Report] *Part 4: Minor discrepancies in over burden material depths, drill date and well construction were noticed in some of the borehole logs (BRU 95-6, 95-7 & 95) in the EAP vs the well construction reports submitted by the driller to the Groundwater Management Section.*	These minor differences are acknowledged, and are typical in the case of multiple observers.	N/A
	55	*The claims area may include high static and flowing well conditions. The driller and operator must be prepared to handle flowing well conditions during drilling, operation and sealing. Wells that have high water levels may become flowing in the future and should be sealed as if flowing conditions are present.*	CanWhite acknowledges and will comply with this requirement.	N/A
	56	*It is recommended that the proposed Groundwater Monitoring and Impact Mitigation Plan be in place prior to operation and include monitoring to adequately assess potential impacts on groundwater users. It is recommended that an on the ground survey be conducted for all supply wells that potentially could be impacted. It would be prudent to sample well water for water quality to ensure it is not impacted.*	CanWhite's proposed Groundwater Monitoring and Impact Mitigation Plan includes these recommendations (EAP, Section 8.4); "The…Plan will address the following components:...Conducting a water well survey within the zone of influence to determine the precise location of existing water supply wells, well construction, well condition, well performance history and water quality." Water quality monitoring will include sampling the landowner well water.	EAP, Section 8.4, Groundwater Monitoring and Impact Mitigation Plan
	57	*The air used to lift the sand-water mixture must be free of lubricants, hydrocarbons or other chemicals that may impact water quality.*	CanWhite agrees, and its contractors will use oil-free compressors.	N/A
	58	*All extraction wells will re-inject water to the aquifer and so will require an Injection Well Permit from Agriculture and Resource Development Water Branch prior to construction.*	CanWhite acknowledges and will comply with this requirement.	N/A
Health and Seniors Care, Population and Public Health Branch - Oct. 22, 2021	59	*The main potential health concern identified is a potential impact on drinking water. There was very little information on ground water use in the area in the report.*	Existing groundwater use is thoroughly described in Section 1.4 of AECOM's Hydrogeology and Geochemistry Assessment (EAP, Appendix A). In the Hydrogeology and Geochemistry Assessment report, existing water quality was compared to applicable provincial and federal drinking water quality criteria for the protection of human health, aquatic ecology, agricultural use, irrigation use and livestock watering. Several parameters were identified as naturally elevated above applicable criteria (see Table 4-7 in Appendix A of the EAP). Regional studies conducted by the province of Manitoba described in several white papers document regional water quality exceedances for several parameters. CanWhite's operations are forecasted to maintain and/or, for some parameters, locally improve water quality. This conclusion is documented in Section 7.2.2 of Appendix A (Hydrogeological Assessment Report) of the EAP. A robust Groundwater Monitoring and Mitigation Plan will be developed and followed during and following operations to verify water quality in the aquifer, and guide development of any additional mitigation measures that may be indicated. Provincial and federal water quality criteria will be used as the benchmark.	EAP, Section 6.2.3, Groundwater

Notes:
* Text in italics indicate direct quotes from submitted comments; otherwise issues / questions raised have been summarized for brevity or clarification.
N/A = Not applicable.

References:
Environment and Climate Change Canada. 2016. Recovery Strategy for the Golden-winged Warbler (*Vermivora chrysoptera*) in Canada. Species at Risk Act Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. vii + 59 pp.
Environment and Climate Change Canada. 2019. Recovery Strategy for the Red-headed Woodpecker (Melanerpes erythrocephalus) in Canada [Proposed]. Species at Risk Act Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. x + 120 pp

Attachments:
Attachment A - Preliminary Traffic Projections Memorandum

AECOM

Table 1, Attachment A

Preliminary Traffic Projections Memorandum

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To:
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Cliff Samoiloff, AECOM

Project name:
Vivian Sand Facility – Sand Extraction Project
File: 6119.00

Project ref:
60640258.7

From:
S. Brad Cook, P.Eng.
AECOM

Date:
December 13, 2021

Memo

Subject: Proposed Vivian Sand Extraction Project - Preliminary Traffic Projections

Background

AECOM Canada Ltd. (AECOM), was previously retained by CanWhite Sands Corp. (CanWhite), to develop traffic data for the proposed Vivian Sand Processing Facility (Processing Facility), located south of PTH 15 and east of PR 302 southwest of Vivian, Manitoba, in the Rural Municipality of Springfield. Traffic data for the Processing Facility is detailed in a memo dated September 18, 2020 (attached in **Appendix A**) and includes trip generation estimates for the Processing Facility, anticipated traffic distribution, and estimates of traffic volume increases at the PTH 15 and PR 302 intersection during AM and PM peak periods. This information was requested by Manitoba Infrastructure (MI) as part of their review of a July 2, 2020, Vivian Sand Facility Project Environment Act Proposal (EAP) to determine if a more detailed Traffic Study was required. Based on the relatively low trip generation, MI determined that significant impacts to Highway traffic operations were unlikely and did not require a detailed Traffic Impact Study be completed for the project.

AECOM was retained by CanWhite to complete a second Environment Act Proposal (EAP) for the Vivian Sand Extraction Project (SEP) which involves extraction of sand from the Sandstone aquifer for processing at the Processing Facility. A copy of the EAP for the SEP (file no. 6119.00) dated July 23, 2021, was submitted to the Technical Advisory Committee and, as part of their review comments, MI again requested that preliminary traffic projections for the SEP be submitted to determine if a more detailed Traffic Impact Study is required.

The purpose of this Memo is to estimate site traffic volumes generated by the proposed SEP. The study was conducted according to the following methodology:

- Conduct a review of the SEP site area and determine access points to the site from the adjoining road network,
- Estimate trip generation at full build-out of the proposed SEP, and
- Project full build-out traffic generated by the SEP during AM and PM peak hours at key intersections in the study area.

The study limits for the preliminary traffic projections includes PTH 15 north of the SEP area, PR 302 for approximately 5.0 km south of PTH 15, and Road 42E (Queens Valley Road) for approximately 1.8 km south of PTH 15. Because MI is concerned about the impact of overall traffic volume increases on highways adjacent to the proposed development, traffic generated by the SEP was combined with the traffic projections for the Processing Facility which are attached in **Appendix A**.

Sand Extraction Project Location

The location of the SEP site area is illustrated in **Figure 1** and includes sand extraction well sites on the east and west sides of PR 302 south of PTH 15. As shown, sand extraction operations are located east of PR 302 during the first three years of SEP operations with access from PR 302 only. During years four and five, the extraction sites are located between PR 302 and Road 42E with access to these areas expected from both roadways.

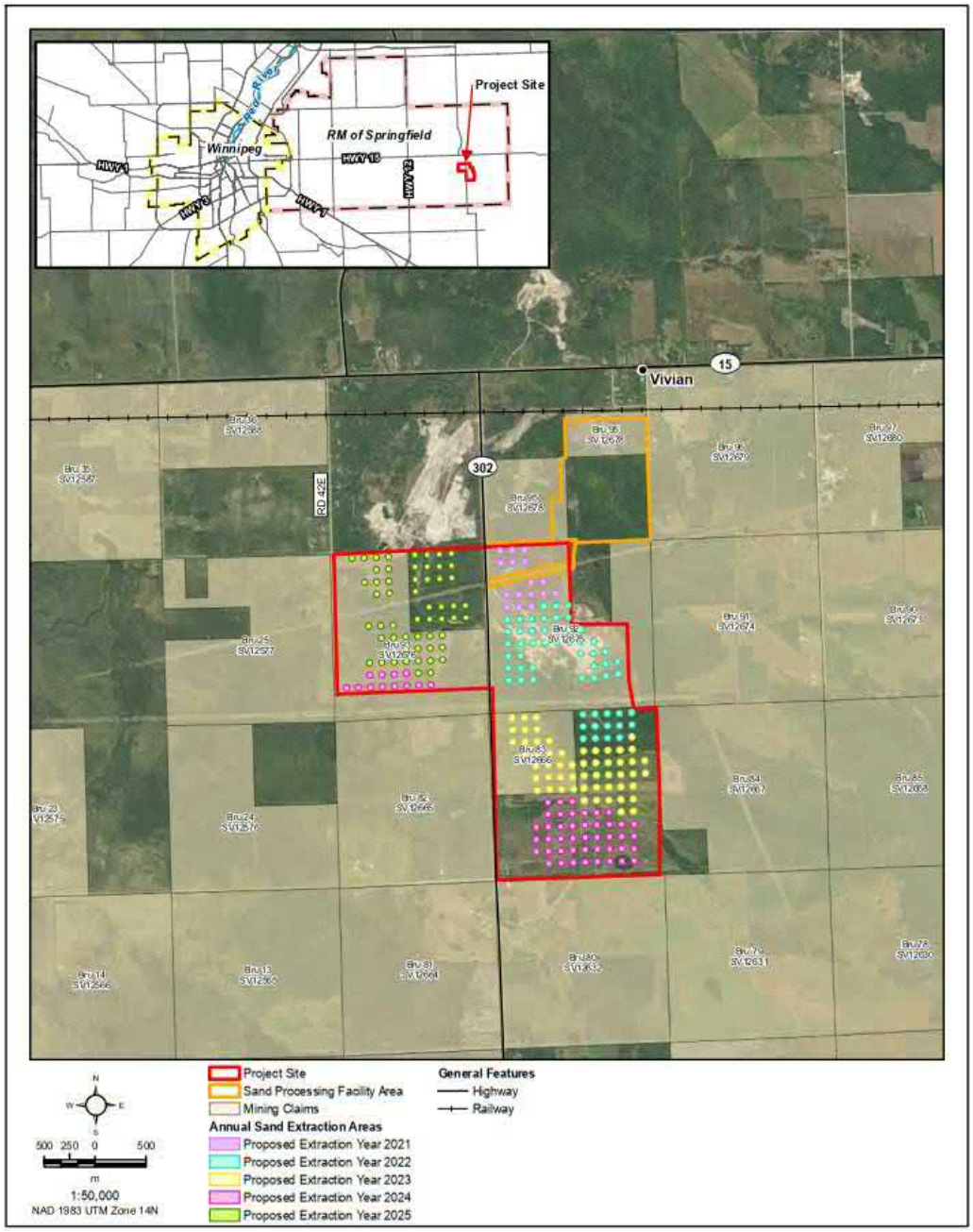

Figure 1: Sand Extraction Project Site Area

Sand Extraction Project Description

CanWhite is proposing to extract silica sand from the Winnipeg Sandstone aquifer in an area southwest of Vivian, Manitoba. Due to the depth of the sand deposits, the SEP will use well drilling rigs and water extraction rather than open pit quarry extraction method. Sand extraction will occur from April to November with an annual average of 56 well clusters with seven extraction wells per cluster. A maximum of seven extraction wells will operate 24 hours per day for 5 to 7 days each before the extraction wells are decommissioned and operations move to a different well cluster. Temporary slurry lines and associated pumping stations will be constructed to transport the sand directly to the Processing Facility instead of transporting the material by truck. The SEP includes construction of temporary access trails from PR 302 and Road 42 E (Queens Valley Road) to the sand extraction areas to accommodate well drilling rigs and installation of the slurry lines.

Trip Generation

Sand Processing Facility

As per the September 18, 2020, memo attached in **Appendix A**, the processed sand product will be transported by rail and not hauled by truck. The only truck traffic will be the occasional service vehicle (e.g. septic tank pump out, supply shipments) which would access the facility during off-peak periods. As a result, trips generated by the Processing Facility during the AM and PM peak periods will be limited to employee trips:

- AM Peak: 25 veh/hr inbound, 25 veh/hr outbound
- PM Peak: 25 veh/hr inbound, 25 veh/hr outbound

Sand Extraction Project

As discussed above, sand extraction is expected to occur from April to November with employees working two 12-hr shifts per day with shift change occurring at 7:00am and 7:00pm. Sand will be transported to the processing facility using temporary slurry lines instead of trucks. Therefore, the traffic generated by all SEP phases is associated with the drilling of wells, well operations, well decommissioning, construction of temporary access trails and installation of slurry lines.

From information supplied by CanWhite, it is expected that most of the equipment and vehicles required for the work will stay in and around the active extraction sites rather than travelling back and forth on local roads or highways. As a result, new trips generated by the SEP during the AM and PM peak periods will be limited to employee trips, with most employees travelling directly to an active extraction site or parking at the Processing Facility for their shift. CanWhite estimates that between 13 and 20 employees will be required per shift for SEP operations. For analysis purposes AECOM has assumed 20 employees with one vehicle trip per employee. The resulting SEP trip generation during the AM and PM peak periods is as follows:

- AM Peak: 20 veh/hr inbound, 20 veh/hr outbound
- PM Peak: 20 veh/hr inbound, 20 veh/hr outbound

Some additional trips will be generated by the SEP due to mechanic services or fuel delivery to the extraction sites, but these will typically occur during off-peak periods.

Trip Generation Summary

The total number of trips generated by both the Sand Processing Facility and the Sand Extraction Project are summarized as follows:

- AM Peak: 45 veh/hr inbound, 45 veh/hr outbound
- PM Peak: 45 veh/hr inbound, 45 veh/hr outbound

Trip Distribution

The trip distribution determined as part of the Processing Facility traffic projections detailed in the attached memo (**Appendix A**) was assumed to be applicable to trips generated by the SEP:

- 25% to/from Winnipeg,
- 25% to/from Steinbach,
- 10% to/from Anola,
- 10% to/from St. Anne,
- 10% to/from Vivian,
- 10% to/from Beausejour,
- 10% to/from Richer.

The sand extraction sites shown in **Figure 1** include areas along both PR 302 and Road 42E. However, for the first three years of SEP operation all sites are located on the east side of PR 302. To be conservative, it was assumed all generated traffic will utilize the PTH 15 at PR 302 intersection to access SEP sites except traffic travelling to/from Richer to the south. The resulting trip distribution is listed in **Table 1** and the trip assignment at the PTH 15 and PR 302 intersection during the 7:00 am and 7:00 pm shift change is shown in **Figure 2.**

Table 1: Sand Processing Facility and Sand Extraction Project Trip Distribution at PTH 15 & PR 302

Employee Vehicles per Shift	Workforce Location	Trip Distribution	PTH 15 at PR 302							
			AM Shift (7:00am - 7:00pm)				PM Shift (7:00pm - 7:00am			
			EBR	WBL	NBR	NBL	EBR	WBL	NBR	NBL
40 [1]	Winnipeg	25 %	10			10	10			10
	Steinbach	25 %	10			10	10			10
	Anola	10 %	4			4	4			4
	St. Anne	10%	4			4	4			4
	Vivian	10 %		4	4			4	4	
	Beausejour	10 %	4			4	4			4
		Total	**32**	**4**	**4**	**32**	**32**	**4**	**4**	**32**

[1] Does not include 10 % (5 trips) per shift that arrive/depart from Richer using PR 302 south of the SEP site

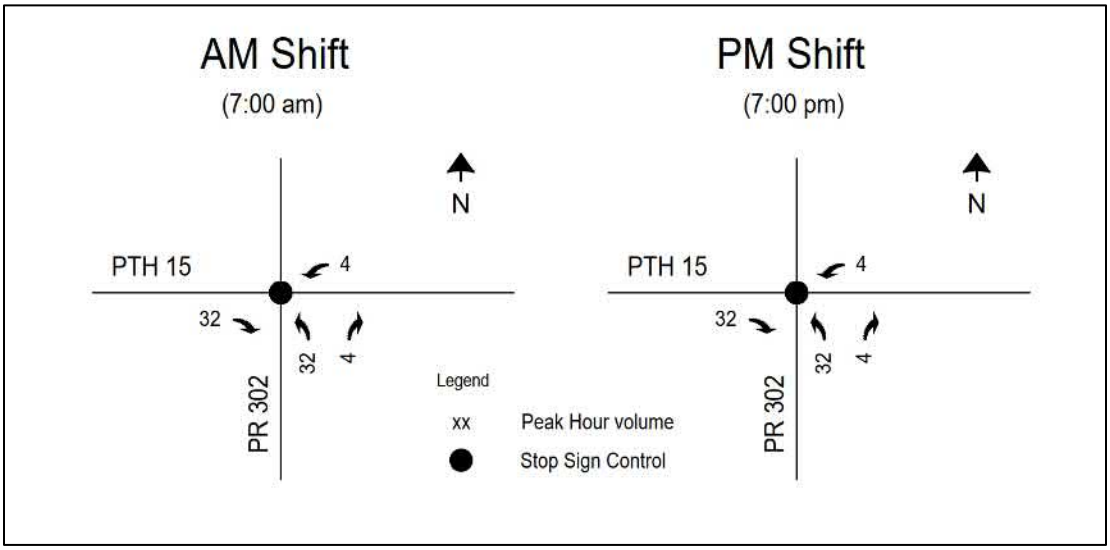

Figure 2: PTH 15 at PR 302 Trip Assignment

Summary

PTH 15 is classified by MI as a Secondary Arterial Highway which, according to MI Transportation Planning Policy 2/98, can typically accommodate annual average daily traffic (AADT) volumes of up to 6,000 veh/day. Assuming 12% of AADT occurs during peak hours, the traffic volume that can be accommodated by a Secondary Arterial during a peak hour is approximately 720 veh/hr.

From MI's 2019 Traffic Flow Map, the current AADT on PTH 15 west of PR 302 is 2,850 veh/day or approximately 342 veh/hr during peak periods. The relatively low AADT and peak hour volume indicates there is substantial capacity remaining on PTH 15 west of PR 302 to accommodate additional traffic. East of PR 302 the AADT on PTH 15 is extremely low at 910 veh/day.

During the AM and PM shift changes, traffic generated by the proposed Sand Processing Facility and Sand Extraction Project will result in 64 additional trips per hour on PTH 15 west of PR 302 and 8 additional trips east of PR 302. Even with this additional traffic, the total peak hour traffic volume on PTH 15 is well below the hourly volume that can typically be accommodated by a Secondary Arterial. For this reason, no significant impacts to traffic operations are anticipated due to traffic generated by the proposed Sand Processing Facility and Sand Extraction Project.

APPENDIX A

Preliminary Traffic Projections – Proposed Vivian Sand Facility Project

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Project name:
Vivian Sand Facility Project
File: 6057.00

Project ref:
60625356

From:
James McCutchon, P.Eng.
AECOM

Date:
September 18, 2020

Memo

Subject: Preliminary Traffic Projections – Proposed Vivian Sand Facility Project

AECOM Canada Ltd. (“AECOM”), was retained by CanWhite Sands Corp. (“CanWhite”), to develop a Traffic Projections Memo (“Memo”) for the proposed Vivian Sand Facility Project (“Facility”), just east of Highway PR 302, and south of Highway PTH15 southwest of Vivian, Manitoba in the Rural Municipality of Springfield. This Memo provides preliminary traffic projection information requested by Manitoba Infrastructure to support their review of the July 2, 2020 Vivian Sand Facility Project Environment Act Proposal, and to determine if a more detailed Traffic Study is required. The study limits include PTH 15 to the north to a point 1.7 km south along PR 302. The purpose of this Memo is to estimate site traffic volumes generated by the proposed Facility. The study was conducted according to the following methodology:

- Conduct a review of the site plan of the proposed Facility and determine the access points to the site from the adjoining road network;
- Estimate newly generated traffic projections at full build-out of the proposed Facility; and
- Project full build-out traffic generated by the Facility during AM and PM peak hours at the key intersections in the study area.

Location

The proposed access to the Processing Facility Site Area is east of and adjacent to Highway PR 302 and approximately 1.7 km south of PTH 15 in the rural municipality of Springfield, Manitoba. The proposed location coordinates for the processing facility are 49^0 52’ 18” N and 96^0 28’ 09” W.

Site Generated Traffic

Based on information provided by CanWhite, the processed sand product will be transported from the Facility by rail to markets in Canada, the United States and Internationally. Therefore, the sand product will not be transported by haul truck. Also, the extracted bulk sand product will be transported to the processing facility by slurry line, not by

sand haul truck. The only truck traffic will be the occasional service vehicle, (e.g. septic tank pump out, supply shipments), which would attend the Facility during the day.

CanWhite estimates a target site workforce of 20 to 25 persons per shift once construction is complete and the Facility is operational. For the purposes of this analysis we have used an employee single vehicle volume estimate of 25 vehicles accessing and egressing the site during the morning and evening shifts for the full build out condition. There is expected to be two 12-hour shifts per day from 7 am to 7 pm seven days per week.

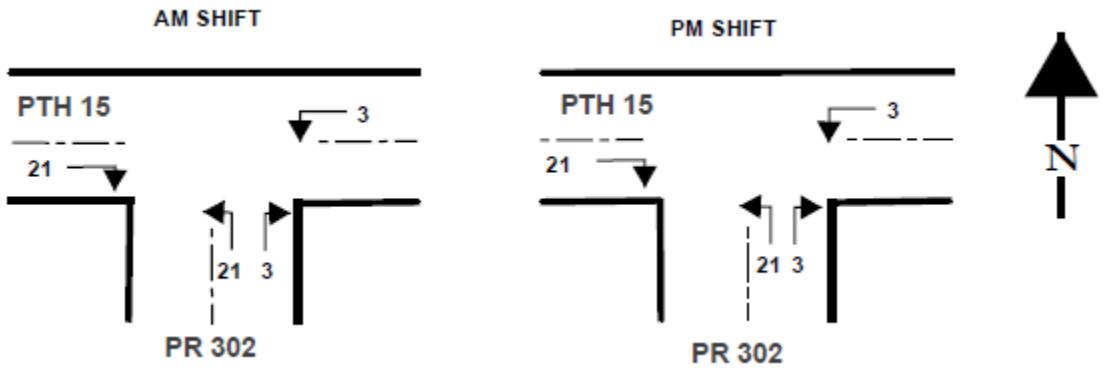
Trip Distribution

Employee workforce origins/destinations were provided by CanWhite which identified that the employee workforce is expected to include 25% from Winnipeg, 25% from the Steinbach area with the remainder from the immediate area including Anola, Vivian, Beausejour, St. Anne and Richer.

For this analysis it is assumed that 80% of the workforce will be arriving/departing at the PR 302 and PTH 15 intersection from/to the west. It is further assumed that the employees from Richer would comprise approximately 10% of the vehicle traffic and would arrive/depart to the south along PR 302. For employees from Vivian it is assumed that they will comprise approximately 10% of the vehicle traffic and arrive/depart at the PR 302 and PTH 15 intersection from the east.

The morning and evening shift trip distribution assignments are shown in Figure 1:

Figure 1 – Trip Distribution Schematic at PR 302/PTH 15 Intersection



The AM and PM Trip distribution calclations are shown in Table 1:

Table 1 – Trip Distribution Calculations at PR302/PTH 15 Intersection

			Intersection of PR 302 and PTH 15							
Employee Vehicles per Shift	Workforce Split	Workforce Location	AM Shift				PM Shift			
			EBR	WBL	NBR	NBL	EBR	WBL	NBR	NBL
25	25%	Winnipeg	6			6	6			6
	25%	Steinbach	6			6	6			6
	10%	Anola	3			3	3			3
	10%	Vivian		3	3			3	3	
	10%	Beausejour	3			3	3			3
	10%	St. Anne	3			3	3			3
	10%	Richer (Assumed that vehicles will arrive/depart from proposed access road to the south on PR 302)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a