

Inuvik to Tuktoyaktuk Highway (ITH) Project

Risk Matrix

[Reviewed as of 20 May 2013]

PROJECT GOALS

- To provide a safe, secure and effective Highway from Inuvik to Tuktoyaktuk with a view to:
 - Meet all applicable codes, guidelines and regulations to include technical, environmental and legal
 - Deliver the Project on budget, using a cost effective method and with minimum impact on the Region's OandM budget
 - Deliver the high quality Project by Nov 2018
 - Develop Community Partnerships, Northern Companies by building capacity and providing meaningful and transferable skills and training
 - Deliver a well run Project that can be a model for future major projects .

RISK MATRIX EXPLANATORY NOTES-

Every major project should acknowledge the risks inherent in the project- assess the risks and clearly articulate mitigation measures. This Risk Matrix attempts to accomplish this.

- It is important to assess both the **probability** and the potential **consequences** of any event that may impact the project. A high risk of an event happening with a low consequence may be more acceptable than a low risk event with severe consequences. In some cases we have noted some impacts. This is a difficult exercise and must be carefully reviewed.
- Rating manual:
 - Level of Risk** (how likely) - the assigned a rating of 1-5 corresponding to **Low (1-2), Medium 3 or High/Unknown (4-5) risk or impact**
 - Impact** (magnitude of consequences) - assigned a rating of 1-5 corresponding to **Low (1-2), Medium 3 or High/Unknown (4-5) risk or impact.**
 - Ratings** (level of risk *impact) - The resulting overall ratings can range from a lowest risk/lowest consequence rating of 1 to the highest risk and consequence rating of 25. The Project should pay attention to the ratings of 15 or higher and is depicted in a **red highlighting.**
- To some extent, the consequences of an 'event' will impact all aspects of the project. However, the table notes who bears the greatest responsibility and liability for this event (the owner or the contractor). Our Assessment is based on risks from the Govt point of view. In some cases risks can be cumulative in nature – (if two or more occur then a third risk is likely) and risks can be compounded (if one happens then another will occur). The GNWT will bear all the owner responsibilities.
- It is important to note that "Risk Assessment" is subjective and can be seen differently by a variety of agencies and importance can be a point of discussion – cost vs environmental issues for example.
 - The level of knowledge and understanding of a given situation may increase or decrease the perception of risk.
 - Contingency plans or mitigation plans are devised to deal with the "what ifs"; and
 - Some risks have a defined cost attached and where possible an estimate is provided.
- Risks will change or mature over the life of the project. This document is an "ongoing assessment tool". A risk may increase, decrease or be eliminated. Reducing, increasing or eliminated risks are marked with a (R), (I) or (E). New risks may be identified. Some risks may not be identified, until they are actually realized.
- The following are the key risks to the project as perceived by the GNWT.

Serial	Risk Area	Risk Element	Description	Primary Resp	Level of Risk (likely to occur) 1-5	Level of Impact 1-5	Rating 1-25 15 is high	Actions - Mitigation/Risk Reduction/Contingency	Potential Impact Notes
Project Management Risks									
1	Project Management	Experienced PM team and consultants required	Project can be complex with many technical issues, legal issues, regulatory challenges and budget challenges. An experienced team with sufficient depth and knowledge is required.	DOT GNWT	2	5	10	The department to assign a team to manage the issues and have the proper checks and balances to ensure proper oversight. The DOT to ensure any proponent and consultants has the proper resources in place to take on the project. FMB, DM Infrastructure Committee and the ITH Oversight Committee can all fulfill an oversight function.	The project team needs to assess all risk and all options. Clear contingency plans to be developed, prepared and costed. Oversight must be timely and effective.
2	Contractor Competencies	Experience of Contractors and Sub Contractors	The Contractor and Sub Contractors lack experience and knowledge reference best practises regarding road and bridge construction. Inexperience leads to errors and potential violations of regulatory conditions	DOT GNWT	3	4	12	Develop an Integrated Team approach and review all aspects of the project including design, construction sequence and risks. Pre-qualification of all Contractors and sub-contractors. DOT to host a series of focused sessions to share lessons learned on past projects. Recent experiences at source 177 has given the DOT a good sense of future issues. Contractors performance was measured and found acceptable.	Studies of the Construction Industry pinpoint Contractor and Sub Contractor poor knowledge of best practises or that they may be unfamiliar with some aspects of construction. While pre-qualification is a mitigation measure in itself, often questionable competencies do not become obvious until the road construction as well as its bridging and by-passing of obstacles is well into the project. There are not many contractors or sub-contractors with experience in building roads in a permafrost environment.
3	Project Administration	Contractors and Subs are Poor Administrators	This project has a number of moving parts. Both the Contractor and the Sub Contractors must follow sound administrative practices. Work, site investigations, surveys, soil sample results and invoicing must be meticulously documented and filed. Many Contractors and Subs are proud of their construction techniques but may fall woefully short in organizing administration.	Contractor Sub-Contractors DOT GNWT	3	3	6	Integrated Team to address protocols and expectations regarding administration and document control. DOT to host sessions on lesson learned. DOT and Human Resources to assist in attracting experienced and competent administrative staff for Contractors and Sub Contractors.	Research indicates that within the construction industry there is a reported significant incidence of errors resulting in change orders with associated costs, delays and issue disputes directly attributable to poor front of office administration. Document control is vital.

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4	Initial Cost Estimates and Budgets are used to make early decisions	Important to ensure accurate cost estimates as under bidding is a major concern.	The project is in the early stages and it is important to evaluate the accuracy of estimates available at this time; funding is being secured at this stage and if enough contingencies are not built in or the estimates are not complete; it may be high risk in the later stages of the project. As this is a joint project with the Feds committing to \$200m and the GNWT committing \$99m- all cost estimates must be as accurate as possible.	DOT GNWT	3	5	15	The Department must evaluate current estimates and make sure that enough contingencies are built in the cost estimates. The DOT should have at least three independent costs prepared. The GWNT has notified the feds and the press the project is estimated at \$299m. Design remains at 85% and risks remain. There is current getoech works underway and work on the 100% to give the GNWT more confidence.	Under budget may jeopardize the delivery of completed project and pressure a contractor to make many claims. Extremely high estimates may affect the project approval process. Research indicates people like to use low estimates initially.
5	Procurement Process	Ensure a fair and transparent process that is auditable and makes sense	This is a mega project worth many millions and the pressures to award will be great. The GNWT/DOT need to be extremely careful in ensuring an approved process is agreed to early in the project life and there is a clear and auditable trail for decision making and awarding work. Initial steps may lead to other decisions or force decisions which must be avoided.	DOT	4	5	20	The Project team and various Departments involved needs to articulate a process and timetable as soon as possible. There will be pressure to keep the work in the region and to also spread around the NWT. Alliance model or Early Contractor Involvement models can be used. Recent negotiated contract for source 177 had significant local involvement.	The project could get mired into a difficult and protracted process that detracts from the actual work. Lessons learned from other projects must be reviewed. There are many examples from other provinces/territories that could be used as a model.
6	Legal	Claims	As a complex and multiyear project, early legal advice must be sought to ensure DOT avoids costly claims, law suits and other complex legal issues.	DOT	2	4	8	DOJ has been involved and will continue to monitor the project.	Depending on the procurement option the legal issues could be extremely complex or simple. A robust documentation control must be used.
7	Project Schedule Possible Delays	Delays and Claims	The project schedule will include a timetable for: planning, design, permitting, procurement and construction. Contractors will lease/purchase equipment and delays may cause equipment to stand still. Opening the Hwy is not tied to any specific date such as a major bridge. Delays for the GNWT are not a huge issue.	DOT	3	5	15	Have a clear project schedule and logistics supply plan with enough time to do all the key steps. Depending on the construction contract the contractor may take the risk on the construction.	Permitting, weather, geotech, design decisions, logistics and production rates will all impact the schedule.
Design and Technical									
8	Design and pre-engineering	Need to undertake all the proper	The project to be designed using current codes, standards and practices. Design build/P3 model may accelerate the project	DOT GNWT	4	4	16	Efforts must be made to ensure all the relevant information is available before key decisions are made (current geotech	Decisions made with erroneous data or poor assumptions will add unnecessary risks. Poor design or

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	Works	design steps and site investigations	completion. Missing a key step or rushing a process may add significant risk					program) . Poor information will lead to significant errors in planning, cost estimates and budgets and increase risk.	lack of information may increase the O & M costs in the life cycle of the infrastructure.
9	Design Team experience and depth of knowledge	Team depth and capacity to respond	The GNWT must ensure the technical Design Team is capable and has the necessary depth of resources to carry this project to completion and can react to all the project requirements. Any contractor or JV must have a high capacity team.	D DOT GNWT	3	3	9	Ensure the Design Team has the necessary backup to deal with issues to include RFIs and technical questions. Track the exact timeline of all questions and responses. Contractor must also be fully capable to deal with issues in the field as well. Design team and owner must work in conjunction.	Any lack of depth and or experience may cause added costs or construction risks.
Regulatory and Process Risks									
10	Project Approval Process	Ensure project is properly approved by the various regulatory agencies	This is a complex project involving EIRB, Water Boards, Feds, local boards, all have their own process and all produce reports and recommendations. The DOT must ensure approvals are not given with a long list of restrictions which may be impossible to comply with.	DOT GNWT	2	5	10	Ensuring the proper information is provided to the various agencies. Ensuring the DOT is aware of the recommendations and any restrictions and all "knock on" effects are assessed.	Significant Oand M costs or very restrictive construction costs could be added to the project. All those involved need to be aware of the whole picture.
11	Skilled Labour	Lack of Skilled Labour	The Contractor will require skilled labour (mechanics, welders, carpenters, heavy equipment operators, surveyors, techs, engineers) for this project. Failure to secure and retain skilled labour reduces productivity. This is a 5-6 year project that will be in direct competition with our projects.	Contractor GNWT	2	3	6	The Project Manager may facilitate an attraction plan by linking the Contractor with other Ministries involved in the training (ECE). While attraction and recruitment is primarily a contractor responsibility, the Government can offer assistance in shaping a training program/plan. It should leverage GNWT Department of Education, Culture and Employment programs. This has commenced with ECE and Aurora College.	It is in GNWT best interest to see the successful attraction of both skilled and semi-skilled labour to the project. Where it is practicable, Contractors should be encouraged to hire locally and offer employment to graduates of GNWT Department of Education, Culture and Employment certified apprenticeship programs such as Aurora College – School of Trades, Apprenticeship and Industrial Training.
12	Promoting local and Aboriginal Employment	GNWT Non-Compliance with Policy	Government Projects must reflect its policies regarding the promotion of employment among aboriginal peoples. Failure to do so brings a lack of confidence and public censure with the potential for litigation.	Contractor GNWT	3	3		The Project Manager will facilitate linking the Contractor with the Ministry of Aboriginal Affairs and Inter-Government Relations to ensure understanding of and compliance with these policies.	The intent is to demonstrate the GNWT is actively encouraging Contractors to support its policy of Aboriginal Affirmative Action. See serial 11.
13	Permits	Permits must be secured and remain valid	Permit Control can be problematic. Given the expected duration of the project there is risk of either permits not being secured in time; or, equally troublesome, permits expire before work is completed.	Contractor	3	4	12	Project Manager to be responsible to maintain a Permit Register, identify permit requirements and coordinate permits. A regulatory Road Map is being developed and should be ready 1 June 2013 in	Project Manager to regularly review Permit Register and commitments.

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								consultation with ILA, AANDC, NWTTWB and others.	
Construction Risks									
14	Project Management	Delay, claims geotech risk and engineering risks	The Project Manager must have the necessary resources (people and processes) to be able to properly manage this \$299 m project. This is a large and complex project that requires a high skill level and expertise to successfully manage and execute. Contracts, payments, planning, detailed scheduling, accounting, quality assurance and proper on site leadership are all functions that must take place to effectively execute this project. We need to ensure that GNWT has adequate resources and the time to handle these issues.	DOT GNWT	3	5	15	Ensure a Risk Analysis is conducted for each new company/team added to the Project and review work progress and quality of existing team. Ensure the proper staff and processes are in place and the key functions have enough depth to deal with a number of issues at the same time. Constantly review the organization and conduct post activity reviews to ensure all is being done to ensure success. This includes weekly updates.	Claims, time delays, court action, legal issues and cost overruns could occur. Work to be redone. Work delayed due to capacity issues. Quality issues arise. Public confidence would be affected.
15	Project Oversight and Quality Assurance	Project Risks	Project oversight committee to oversee the project at all stages. In case of P3 project delivery, the Concession Agreement to be drafted with complete risk assessment, risk mitigation and risk sharing aspects. For a standard construction contract late completion, poor quality and not performing to the permits need to be laid out.	DOT GNWT	3	5	15	Ensure the proper staff and processes are in place and the key functions have enough depth to deal with a number of issues at the same time. Constantly review the organization and conduct post activity reviews to ensure all is being done to ensure success. Respond quickly to the issues and ensure risks are eliminated or mitigated or clear understanding of risk sharing.	Significant political and financial impact if project goes astray due to lack of oversight. Public Confidence eroded. Media interest extreme.
16	Changes during Construction	Change Orders increase Time and Costs	Changes to design creates change orders which bring either delays or added costs.	GNWT	5	4	20	Comprehensive Design Review is critical to ensuring a consistent construction plan. A defined control and approval process for change orders should be implemented.	Change Order approvals must be reviewed expeditiously so that construction work is not impeded or delayed awaiting decisions. Project Manager may require the services of a qualified consultant (with the experience on similar projects) to vet change orders.
17	Project Oversight	Project Manager's Time is spread among several competing	Lack of oversight may cause problems that come to have major consequences	DOT GNWT	1	2	2	Single project Project Manager assigned permitting him/her to dedicate their full attention. FMB/DMS and ITH Oversight committee to provide oversight.	Coordination of the oversight will need to be done to ensure effective use of the various committees.

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		projects							
Technical and Environmental Risks (Climate Change, Permafrost)									
18	Environmental Reviews and Approvals	Environmental restrictions or new conditions add to costs	An Environmental Impact Study will support the construction project but will establish conditions, cautions and restrictions regarding construction. There is risk that these conditions could be misunderstood (and therefore violated) by the contractor; or, the Minister of Environment may submit addendums with further construction restrictions. In the first case, the contractor would risk penalties that could include dismantling or redoing work and incurring delays.	DOT GNWT	2	5	10	Ministry of Environment to be engaged in Risk Management Process. Both the Project Manager and the Contractors will review all environmental studies and conditions to ensure clarity and resp. Review will include highlighting of sensitive areas such as waterways, wildlife sanctuaries and no go areas along each phase of the route.	The EIRB is complete and has 44 recommendations. These need to be reviewed along with all the commitments to ensure the GNWT has not committed to something that has cost implications. We await the federal response.
19	Work Spread Sites and Environmental Impacts	Operating Practises at Spread Sites cited for environmental infractions	Ministry of Environment has stringent rules and regulations regarding camp operations and equipment sites. Violations frequently result in fines (contractor responsibility) or shut down/close orders. In the latter this delays project and could seriously jeopardize work on road construction	Contractor DOT GNWT	2	4	8	Before any spread site, staging camp or equipment fleet site is established, the Contractor will brief the Project Manager on the site location, concentration of personnel & equipment, and review the Health, Safety and Environmental Protection measures that will be in place. The Project Manager will confirm that the Contractor will be in compliance. Project Manager is to be on distribution for all cited infractions which will serve as an indicator of compliance	Recent inspections by ILA and WSCC of the source 177 work indicated no major issues.
20	Intervention of Special Interest Groups/ Environment Lobby Groups	Agitation and confrontation impacting the Project	The Arctic is a sensitive area with local, national and global communities claiming oversight. All will have an opinion on the practises of the contractor and the GNWT regarding environmental stewardship. Infractions and either perceived or confirmed misuse or abuse will negatively impact reputations of both the government and the contractors. This will invite even greater regulatory oversight with the attendant demands for changes to construction. Equally important, should the project fall into disfavour with the public (both Territorial constituents and those	Contractor GNWT	2	4	8	The Project Team will develop a Communications Strategy that showcases the GNWT commitment to the environment and the regulatory regulations to be followed. The environment will be an identifiable and separate agenda at all Risk Management Reviews. The Communications Plan will include concrete measures to the project's management as evidence that it is a strong environmental steward. Implementation of the ITH Corridor Working Group will serve as a forum for info exchange.	The impact of a poor report card regarding environmental stewardship is multi-faceted. Some consequences will be obvious such as fines and re-construct or redo orders. Others may be indirect but no less painful for both the Government and the Contractor and could include: <ul style="list-style-type: none"> Reluctance of financial institutions to lend to the contractor Reduced public support for the Government because of an eroded confidence in its

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			external to the NWT) it could jaundice future projects						environmental protection practises <ul style="list-style-type: none"> • Greater intervention of Environmental Advocacy Groups • A reluctance of sub-contractors to engage in this project
21	Environment - Wildlife	Barriers to Wildlife	Wildlife migration patterns are disrupted resulting in government intervention, project delays and change orders with increased costs	Contractor GNWT	3	4	12	Review Environmental Impact Study. Ensure route design avoids sensitive areas. Build wildlife overpass/underpass facilities to ensure wildlife migration routes are respected	The global litmus test for an environmentally conscious public is the construction project's direct and indirect disruptions to wildlife habitat. The GNWT aim is to have demonstrable measures that safeguard both These measures are to be included in the Project's Communication Plan.
22	Environment - Noise	Unanticipated Noise Impacts	High decibel or extended exposure to medium decibel noise affects both the public and wildlife Blasting could be problematic, affecting both humans and wildlife. If not rigidly controlled it could result in public enmity.	Contractor	1	2	2	Noise discipline practises to be enforced. Confirm blasting plan and communicate it to both the public and the Government. DOT to facilitate this understanding with other Government Departments	Review the commitments made on this issue to ensure in compliance.
23	Environment – Water Usage	Exceeding Water Limits	Water use will be closely monitored to ensure the ecological balance and issues permits to draw water from natural sources with strict quantifiable limits. This will apply to winter works, camps and compaction. Exceeding water limits risks fines, shut down orders and public censure.	Contractor	1	4	4	Ensure permit limits are respected. Violations monitored by both legal authorities and the public. Closely monitor the water useage.	Impact could be significant due to sensitive nature.
24	Climate Change and Weather issues	Ice Road and Barge operations and capacities as well as work delays and stoppages	Risk of road and barge operations commencing later and closing earlier. Risk of lack of transport capacity to deliver materials to the job sites. Staff work in inclement weather with: <ul style="list-style-type: none"> • Reduce productivity • Spread of disease and illness 	Contractor Sub-Contractors Project Manager	4	4	16	Related to other serials concerning logistics and monitoring. DOT and Contractors will communicate on the status of the transportation links.	Climate change can sometimes be more dramatic in the arctic and will need to be assessed.
25	Difficult Permafrost	Road and Bridge	Road and bridge building in permafrost is technically challenging and must be properly	DOT GNWT	4	5	20	The Design team (using experts such as Don Haley) and to use all available tools and	Increased costs/km of road. Damage to the area. Increased maintenance,

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	Region including ice polygons	building in difficult terrain /permafrost to be considered during design and planning	designed and controlled. This is a design challenge to build a road that is sustainable in the permafrost region without jeopardizing permafrost conditions or incurring major OandM costs.					information to make sure road design will be effective in the environmental conditions. A short test section has been constructed to confirm design issues and test proposed insulated areas. The QC and QA teams to ensure on site practices are being strictly adhered too.	operation and lifecycle costs
Quality Control and Quality Assurance Risks									
26	QA/QC All Special Advisors	Not completing the required due diligence	QC/QA team ensure all design and construction meet exacting standards. The Project places significant trust in and relies upon the work and recommendations of various experts and consultants involved.	DOT GNWT	3	4	12	Qualified companies and personnel who have the knowledge and experience to add value to the project are doing this work. Proper processes are in place to ensure the work is complete and proper checklists or procedures are in place and nothing is overlooked or missed.	Redoing major components of the project. Court action. Loss of public confidence. Safety issue
General Risks									
27	Public Confidence Media	The public see this project in many different ways. Public confidence is important for the project.	Lack of good and timely communications and spreading of rumours may lead to the public lacking confidence in the Project. The Procurement process must be transparent and accountable to the public.	DOT GNWT	3	5	15	Concentrate on good communications and excellent coordination. Clear communications plan in place prior to any work commencing. Establishment of Project Offices in Tuk and Inuvik through the GSO will assist in passing key messages.	Poor press and a lack of communication will impact the project with added distractions. Develop a web site and Communications plan that: <ul style="list-style-type: none"> • Notifies the Public • Health & Safety tips • Progress and Milestone Achievements
28	Political Risks	Political Influence	There may be opportunities for decisions to be influenced through the political process	DOT GNWT	3	5	15	A clear and concise process for decisions and procurement are developed using the best practises for PM	PM team to be fully aware of all the issues and the impact of decisions.
Supply Chain Risks									
29	QA/QC against Inferior Materials	Inferior Materials are not to of sufficient quality	Use of Inferior materials (geotextile, bridge materials) risks the integrity of the construction and places public at risk. Delays and increased costs (both time and money) to reorder/reship materials and redo construction.	Contractor DOT GNWT	2	4	8	Establish product specifications and procure from reputable suppliers with experience in providing to the North Establish stringent quality assurance/ quality Control measures that include inspections and testing before products leave manufacturer and on receipt and installation.	Gravel for base is quarried in region, surface gravel is not. Almost all other materials and products must be imported from the South (rail/road to Hay River then ice road/river barge to Inuvik.
30	Scarce	Resources and	Pre-fabricated steel products, attachments,	Contractor	2	3	6	Project Manager to determine materials	

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	Resources	products not available	culverts and other materials required for road and bridge construction may be in short supply – creating delays in construction	DOT GNWT				specification early and share supplier information Integrated Team to conduct a staff check of availability and lead times. Integrated Team to host a transportation working group with ground and barge service providers to confirm capacity Finalize schedule and order materials well in advance of requirement	
31	Material Price Escalation	Increased Costs	Prices may escalate over time or due to scarcity.	Contractor	5	4	20	Negotiate Fixed Price Contracts early. To do so the Project Manager will provide a comprehensive schedule.	
32	Projects in Competition	Equipment and Material Scarcity	There are numerous projects (Oil and Gas drilling, communications cable and tower construction, urban development, infrastructure improvements and DND runway extension) all competing for materials, leased equipment and cargo capacity to bring it forward on rail (to Hay River) barge or ground transport. Risk this Project may suffer lack of availability of material and equipment resulting in delays	Contractor GNWT	3	5	15	Finalize Work Schedule and build in flexibility with road construction such that if materials or equipment is not available at one job site, switch priority to other sites. Consider pre-positioning quantities of material in advance of need. Impact of DND runway ext project in Inuvik unknown at this time- but assessed as likely to be outside current ITH construction window.	DOT needs to assess the impact of all other works in the region.
Financial Risks									
33	Project Funding	Project is fully funded jointly by Federal Gov and GNWT	Project funding based on early estimates. To date Feds commit to \$200m and the GNWT to \$99m. Cost overruns are the GNWT responsibility.	Contractor DOT, GNWT	3	4	12	Obtain as much info as possible to assist in the design and cost estimates. Current estimates based on 85% design and preliminary geotech results. By fall 2013 the DOT will have more info to refine cost estimates and contingencies.	Dot will need to closely monitor the budget and contract prices. Good experience gained through the source 177 project. Bonding and securities to be in place to protect the project.
34	Compatibility of Payment Schedule linked	Contractor has Cash Flow Problems and	The Contractor must pay out large sums to secure labour, materials and transport for delivery to spread sites.	Contractor DOT GNWT	3	5	15	DOT to develop a complete understanding of the Contractor's Concept of Construction and the Project Manager's work and	While there is always some conflict between the Contractor who wants payment early and often as opposed

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	to Work Progress	fails to meet payroll and pay suppliers.	Insufficient cash flow could result in skilled labour quitting and suppliers and service providers refusing service or litigation Worse Case – Contractor becomes insolvent and project is jeopardized					payment schedules.	to the Government who must exercise probity and due diligence and therefore only wishes to pay for (verifiably) completed work – achieving a balance requires a collegial resolution.
35	Insolvency	Contractor Enters Bankruptcy Protection	Contractor becomes insolvent with risk that he ceases work and creditors cease materials, plant and equipment.	Contractor GNWT	1	5	5	Organize the construction process such that it is a series of stand-alone projects with achievable milestones. Develop a reasonable payment schedule and ensure prompt payment (See serial 34)	Bankruptcy affects reputation of Government and Contractor.
Health and Safety Risks									
36	Labour	Health and Safety Programs	The job sites incur a high incidence of accidents resulting in lost time, fines and the potential for criminal charges. Specific injuries could be attributable to: <ul style="list-style-type: none"> • Failure to wear Personal Protective Equipment • Preventable Vehicle and Earth Moving Equipment Accidents • Over exposure to the elements • Unsafe movement around water • Failure to install guards, barriers or hazard notices • Improper Storage of Hazardous Materials • Failure to protect the public from exposure to unsafe conditions 	Contractor Sub Contractors GNWT	5	3	15	Integrated Team to collegially develop a Project Health and Safety Program which will include formal training. All hired trades must have current certifications for handling of equipment and execution of duties. Recent source 177 project did note no major concerns with this area.	Studies indicate Health and Safety issues are the 4 th Greatest Risk in the Construction industry. Workmen's compensation claims are increasing while Sureties demand higher premiums and scrutinize claims.
37	Public Health and Safety	Public Exposed to Job Site Hazards	Risk of irritation/injury from roads not marked/barricaded close to public, unprepared for blasting, vehicle accidents from movement of oversized equipment.	Contractor DOT GNWT	2	2	4	Integrated Team to publish and place notifications with radio and on web site. Working with co-mgt groups and various hunters groups will assist in this. Establishment of the ITH working group will serve as a forum for info exchange.	
Culture and Heritage									

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38	Impacts on Traditional Hunting and Fishing	Violation of Public Trust/Change Order Risks	<p>Public surveys demonstrates there is support for the Road but conditional on there is to be no disruption to bear and carnivore denning, bird and fish breeding grounds or the migratory routes of bison and caribou.</p> <p>No all wildlife sanctuaries are known but as they are discovered, the conditions must be respected and change orders affected to by-pass these sensitive areas.</p>	Contractor Sub Contractors DOT, GNWT	4	4	16	<p>Crews must be educated for signs of these sensitive areas, note them and advise of the need for variations.</p> <p>Staff working on the road's construction must be trained to recognize and respect wildlife sensitive areas.</p> <p>Publicize Project efforts regarding respect for Inuit culture on web site.</p> <p>Working with co-mgt groups and various hunters groups will assist in this.</p> <p>Establishment of the ITH working group will also serve as a forum for info exchange.</p>	Could result in stop work orders or delays in the project as mitigation plans are developed.
39	Archaeological Discoveries	Change Order Risks	<p>There are known archaeological sites within the area through which the road will pass. Inevitably, other sites of archaeological significance will be discovered. These must be by-passed and the road re-routed.</p> <p>Risk of increased costs to address variations. Potential risk of Public dissent should violations occur. High risk of this occurring because staff and construction crews do not have the technical knowledge to interpret a site of archaeological significance.</p>	Contractor Sub Contractors DOT, GNWT	4	3	9	<p>Seek professional assistance in recognizing these sites such as the PWNHC.</p> <p>Establish a protocol to investigate.</p> <p>Train and educate crews.</p> <p>Experience with source 177 has shown local contractors can work successfully with PWNHC.</p>	<p>Indigenous people hold their heritage close to their hearts. There is a resurgent interest in history and these archaeological finds are a link to the past.</p> <p>Violations may be seen as a blatant disregard for heritage and can become a major issue.</p>