Summary of public comments received on Natural Gas Condensates Screening Assessment Report

Comments on the draft screening assessment of Petroleum Sector Stream Approach (PSSA) Natural Gas Condensates (NGCs) and the proposed risk management scope document to be addressed as part of the Chemical Management Plan were provided by Canadian Fuels Association, Canadian Association of Petroleum Producers, Shell Canada Limited and Dow Chemical Canada.

A summary of comments and responses is included below, organized by topic:

Topic	Comment	Response
Risk Assessment		
Methodology	Going forward, assessment approaches should be developed based on collaboration between Health Canada and interested member company representatives, as well as dispersion modelling experts.	Additional information submitted was considered and the final screening assessment report was updated.
	The screening assessment should avoid using the definition functionally describing the usage and basic chemistry, but without chemical constituency of the substances. Chemical Abstracts Service Registry Numbers	The nature of Unknown or Variable composition, Complex reaction products or Biological materials (UVCBs) poses challenges to assigning CAS RNs to complex petroleum substances. There is often no consistent way to assign CAS RNs to petroleum substances, and multiple CAS RNs may describe similar substances.

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	(CAS RN) should be used instead.	This assessment addresses Natural Gas Condensates (NGCs) as a group, and includes all NGCs that meet the definition and use criteria outlined in the screening assessment. Data on three specific CAS RNs were used to assist in the assessment. The analysis done and definition provided within the screening assessment report (SAR) are considered sufficient to clearly capture all NGC substances in the context of this assessment.
	It is positive that a substance such as hydrogen sulfide (H_2S) within the NGCs is being assessed separately on its own merits and not as a component or constituent of the NGC substance in question.	Recognizing that a separate assessment of H2S is underway, and taking emissions from petroleum industry sources into consideration, it was suitable in this case to exclude consideration of H2S in the NGCs assessment.
	The ecological assessment should not rely solely on benzene to assess the toxicity of NGCs.	The evaluation of ecological risk of NGCs was not based on a high-hazard component (e.g., benzene). It considered data on the whole substance or similar substances (e.g., low boiling point naphthas).
	Using the obsolete SCREEN3 modelling for storage and transportation scenarios may lead to inaccurate assumptions and policy-making decisions. The assessment should use a refined/tiered assessment (e.g., a detailed review of emissions) when a potential concern is identified to reduce uncertainty and improve confidence in the conclusion. AERSCREEN should be used instead of SCREEN3, and AERMOD or CALPUFF should be used if further exposure refinement is needed (due to proposed toxic conclusion). Thus, a tiered approach is recommended, using AERSCREEN, or AERMOD or CALPUFF to	The assessment is based on best available data and focuses on identifying exposure scenarios of potential concern to the general population, rather than on site-specific or processing unit-specific exposure and risk. The final human health assessment was updated to reflect additional work conducted on sensitivity analysis regarding handling volume, vapour recovery efficiency, and alternative air dispersion screening level model (AERSCREEN). AERSCREEN provides results consistent with the SCREEN3 modelling. AERMOD is a more refined model, requiring site-specific meteorological and GIS terrain data.

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	refine the proposed conclusion.	
	Chambers (2004) reported a 1-hr benzene level in ambient air of 12.85µg/m^3 at 50 m downwind from a sweet gas plant, which is below the SCREEN3 estimate of 55.24 µg/m^3.	These comments were considered and are reflected in the assessment report (section 9.1.1).
	Zielinska et al. (2014) reported that the benzene concentrations downwind of two condensate tanks approached background within approximately 70 m.	
	The default conversion factor of 0.2 from the U.S. EPA (United States Environmental Protection Agency) for long-term exposure is very conservative. Using a refined modelling based on hour-by-hour meteorological data; the annual predictions can be an order of magnitude lower.	Exposures were modelled under typical conditions. The annual adjustment factor of 0.2 was selected based on recommendations from SCREEN3 dispersion model for estimating concentrations from area release sources, along with considering uncertainty in the data for the NGCs. This adjustment factor was consistently used in eight screening assessment reports published under the Chemicals Management Plan (CMP). The assessment is based on best available data and focuses on identifying exposure scenarios of potential concern to the general population, rather than on site-specific or processing unit-specific exposure and risk. However, concerns noted in the comment were considered and are reflected in section 9.1.2 of the final screening assessment.
	An area of 20 m x 20 m for truck loading/unloading does not represent actual truck size.	An area of 20 m x 20 m represents an area where releases might occur during truck loading/unloading rather than truck size. It is standard across Petroleum Sector Stream Approach (PSSA) assessments and represents a conservative truck loading/unloading area for source of emissions in order to estimate potential exposure for the general population.

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	To designate toxicity of NGCs based on benzene alone is inappropriate. Derive an alternative methodology for assessing the specified NGC.	No data on the representative composition of NGCs were submitted. NGCs can also have variable compositions because they are UVCBs. Where toxicological data on critical effects (both long-and short-term) of NGC as a whole mixture were not available, the high-hazard individual component (benzene) was used to represent the highest concern regarding long-term exposure to NGCs in this assessment. Benzene was identified as a carcinogen (Group 1 by IRAC). The presence of benzene was also used as a criterion by the European Commission to classify these NGCs. The toxicological information for other potential components in NGCs was also examined. The uncertainty associated with using a single high-hazard component for all potential hazards of the whole mixture is also discussed in the assessment report.
	There should be some recognition (in the modelling, etc.) that control measures are in place for loading / unloading operations that typically exceed 75% reduction in emissions.	Information regarding vapour control units in place for loading/unloading operations was solicited from the petroleum industry. There were no data on vapour control for loading / unloading submitted. The assumption of no vapour control units in place is reasonable in the context of a screening assessment to give a conservative estimate of exposure, to be protective of the general population. Additional sensitivity analysis was conducted to examine benzene contribution to ambient air associated with the implementation of a vapour control unit at different percentages of recovery efficiency (0%, 75% and 95%). The assessment report was updated to reflect this analysis.
	Group 2B or 3 carcinogens classification should be removed from the assessment.	The statement was updated by adding the International Agency for Research on Cancer (IARC) descriptor for Group 2B carcinogen (e.g., ethylbenzene) and Group 3 carcinogen (e.g., xylene), because these hydrocarbons are potentially present in the NGCs.
	The assessment should delineate and explain why the margins of exposure (MOEs) of 8600 or 6700 are inadequate. A MOE of 770 can be	Many factors are considered when determining the adequacy of an MOE – some include: the severity of health effects endpoints; the exposure regimen used in the critical animal study; the potential

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	readily acceptable as inadequate, however a MOE of 8600 would normally be thought of as acceptable.	duration of human exposure and the inherent hazard of the substance. Benzene was chosen to represent the highest health concern for long-term exposure to NGCs due to its potential carcinogenicity. The MOE estimate was based on the carcinogenic potency of benzene, and potential benzene levels in ambient air in the vicinity of a petroleum facility associated with fugitive release of NGCs. This is explained in the Risk Characterization Section in the assessment report.
Data and information gaps	The final assessment should include a review and incorporation of the most recent publications and findings.	The most recent publications and findings have been incorporated into the final assessment as deemed appropriate.
	Data on the physical and chemical properties of a greater diversity of Canadian natural gas condensates should be added to the report.	The report was updated to include additional data on the physical and chemical properties of Canadian NGC samples.
	In section 5 (Uses), the draft assessment indicates NGCs are not present in consumer products as only industrial uses were identified. To the best of our knowledge, NGCs are not present in consumer products. The lack of exposure from consumer products for health considerations is also presented and confirmed in section 1 0.1.4 Consumer Products on pages 58 and 59.	Noted.
	An explanation or definition of “high volume” (for a loading/unloading area for rail or truck transportation) should be provided.	Highest volume of transport by rail is presented in the assessment report (Sections 6 and 9). The report was also updated with additional sensitivity analysis on the benzene contribution with loading/unloading volumes by truck or rail.
	Considering the National Pollutant Release Inventory (NPRI) releases information of NGC components and integrating them can be an alternative component analysis approach to improve the modelling results.	No data on the representative composition of NGCs were submitted. NGCs can also have variable compositions because they are UVCBs. Uncertainty in source contribution exists regarding the apportioning of the VOC components from NGCs compared to those found in other petroleum substances, based on the total release from a whole facility.

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		In the current health assessment, measured emission data from NGC tankage or estimated emissions from transportation based on NGC handling volume were used. They were considered to be realistic and appropriate. The ecological assessment considers the impact of the substance as a whole and not any individual components.
	Emissions source characteristics should be refined using real vent configurations as well as available building and tank information.	The assessment is based on best available data and focuses on identifying exposure scenarios of potential concern to the general population, rather than on site-specific or processing unit-specific exposure and risk. In the current assessment, emissions were based on measurement data from a Canadian facility, or on empirical emission factors developed specifically for transportation of petroleum liquids by the U.S. EPA.
	Factors or information for deriving the emission rate of NGCs (kg/year/site) should be presented for review.	Estimated evaporative emissions (kg/year/site) presented in Table F-1 are derived from transportation quantity reported under Section 71 of CEPA 1999, and the emission factors reported by U.S. EPA (2008). This is specified in Section 9.1.2. The transportation quantity is not presented due to a concern regarding confidential business information.
	Event hours should be presented to allow validation of the model inputs.	Event hours were estimated based on the handling volume and loading rate for each mode of transport. Due to a concern for confidentiality regarding transportation/handling quantity, event hours are presented in the assessment as a range of values.
Uses and releases	The assessment analysis should recognize that not all volumes released will impact the environment or human health, owing to existing requirements to remediate releases. The volume of spills reported to be recovered from the environment should be considered in the risk assessment.	The human health portion of the assessment considers potential risk due to exposure to fugitive emissions associated with normal operations, and therefore such fugitive emissions are not part of remediation measures. The possibility of recovery of NGCs following spills is recognized in the ecological assessment. Acute impacts, which are a concern for ecological risk, are expected to occur immediately upon release of

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		NGCs. Thus, the initial spill volume is used in the assessment.
	The emission rate from NGCs tankage by Hendler et al. (2009) is very high and the emission volume should not be as great as this under Canadian conditions. The applicability of these emission estimates should be re-evaluated.	The benzene emission rate from NGC storage in the assessment was considered robust because it was derived from emission measurement of petroleum storage tanks in Canadian facilities. Also, the emission measurements from the Canadian facilities are comparable to those from the U.S. facilities.
	Caution should be taken in using DIAL studies and applying the DIAL results without further verification.	DIAL technology was referenced as one of the best available methodologies for quantitative on-site monitoring of benzene in both refineries and storage facilities by the European Commission (EIPPCB 2003, 2006). The Conservation of Clean Air and Water in Europe (CONCAWE) cites use of DIAL technology in at least 11 countries. For over 20 years, DIAL measurements were considered reliable for estimation of fugitive emissions in European refineries, and are accepted by the U.S. EPA (CONCAWE 2008; US EPA 2006, 2010) and used by NASA (Young 2012). DIAL measurements from the Chambers (2004) study are cited in the NGC SAR because this was the only available study of condensate storage tanks in Canadian petroleum facilities that directly applies to this assessment.
	The intermittent nature of the emissions should be considered. It is not clear in the assessment.	Intermittent nature associated with the transportation events is considered in section 9.1.2 of the assessment.
	The validity of extrapolating a short-term concentration to long-term exposures is questionable. Use of longer averaging times is recommended.	Where long-term monitoring data was not available, short-term measurements of benzene emissions from storage areas in a Canadian gas facility were used to estimate potential exposure in the vicinity of NGC storage tanks. The measurement data was comparable to emission measurements reported for NGC tank batteries in the U.S.. The short-term concentration Is used for deriving potential exposure over the long term. Estimates were derived using reasonable

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		assumptions and the recommended adjustment factor. While considering uncertainty in the data for the NGCs, the estimates are deemed acceptable for a screening assessment.
	Key studies deriving emission estimates should be evaluated for quality.	Results of studies conducted by Chambers (2004) and Hendler et al. (2009) provide the only available monitoring data regarding measurement of emissions from NGCs storage tanks for Canadian or US petroleum facilities. The emission rates reported by these two studies are in line with each other.
	Compared to the total production of NGCs, the amount reported to be spilt (400 000 L) represents less than 0.004% of production. The commenter questions why NGC spills were examined in the risk determination.	NGC spills are considered in the assessment because they occur at a high frequency and are the largest source of NGCs released to the environment.
Persistence and bioaccumulation	Some conflicting information is presented in the Persistence and Bioaccumulation Potential section, which is confusing.	Additional information was added to the Persistence section to explain apparent inconsistencies in the empirical and modelled data. No conflicting data were identified in the Bioaccumulation section.
	It is agreed that some components may be persistent or bioaccumulative. However, there is a low potential for persistence and bioaccumulation for a typical NGC. The draft screening assessment implies that NGCs are bioaccumulative. The conclusion should state that only a small portion in the middle of the NGC range has a limited potential for bioaccumulation. A definitive statement on Persistence, Bioaccumulation, and Inherent Toxicity would be welcome in the Characterization of Ecological Risk section.	The bioaccumulation data for individual components of NGCs presented in the screening assessment are in agreement with the comment made. Persistence and bioaccumulation properties of components of the substances are used in a weight-of-evidence approach to inform risk, but no regulatory conclusion on the persistence or bioaccumulation potential of individual NGCs (as complex UVCBs) or of NGCs as a whole was made. No regulatory criteria for inherent toxicity exist, although some criteria were developed for the purpose of categorization, which allowed prioritization of substances for further consideration.

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Ecological effects and risk characterization	Update the approach / conclusion on impairment of the environment to consider the ecotoxicity studies where some of the populations/species showed some signs of recovery following exposure to petroleum or NGCs. It should also be recognized that not all material unintentionally released will be available to negatively impact the environment.	Due to variability in sensitivity to NGCs, some species or individuals are able to recover from exposure to NGCs (after a number of years, in the case of plants) while others are not. The approach and conclusion on ecological risk take this into consideration.
	The aquatic toxicity of NGCs should be described as moderate, rather than moderate to high, as many of the data presented (including the PETROTOX modelled toxicity data, and the data on heavy NGCs) indicate that most of the toxicity data are greater than 1 mg/L.	When choosing the critical toxicity value (CTV) for heavy NGCs, greater weight was given to data based on studies with NGCs, which indicate that *Daphnia* is a sensitive species with toxicity values below 1 mg/L. The data on light NGCs was updated in the final report, and the CTV for light NGCs is now 11 mg/L.
	The spills analysis should be reviewed to ensure that a large enough probability exists that a predicted environmental concentration (PEC) that could impair the environment will actually be reached.	Results presented in the screening assessment indicate that environmental concentrations resulting in ecological harm will be reached following a large fraction of spills. The magnitude and frequency of the spills were considered in the analysis.
	The assessment examines muskeg / water conditions uniquely found in Alberta. As these same conditions or natural ecosystems are not found elsewhere, the commenter questions the need to draw a conclusion and extrapolate to a national basis from a site specific or local condition.	The exposure scenario identified for muskeg / stagnant water could apply to any small water body found across Canada.
Consultation	Peer reviewers knowledgeable about industry and industrial operations should be involved in the peer review of the screening	External peer reviewers were selected based on their experience regarding exposure or hazard assessment of petroleum mixtures, and/or their technical expertise in the area of industrial operations.

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	assessment.	Credentials for each candidate (who may come from academia, industry, non-government organizations, consulting firms, or government) were carefully considered, and reviewers were selected based on their specific expertise.
General Comments	While providing numerous comments, the commenter believes the draft assessment is a well done starting point and input is offered in the spirit of continuous improvement, for both NGCs and the CMP.	Noted.
General comments (formatting)	Tables E-3 and E-4 in the Appendix have some formatting issues.	The format of Tables E-3 and E-4 was corrected in the final assessment.
Risk Management		
Emissions	For substances under the CMP that require risk management, the Government of Canada should allow facilities the option to confirm risk (e.g., via site-specific data or refined modelling) prior to implementing risk management measures.	The development of a risk management measure is carried out using a thorough and consistent approach that considers information from the final screening assessment report and other information sources including stakeholder input. It would not be feasible or desirable from a public policy perspective to develop risk management measures based on the specific operations of a single facility. This approach would also not create a level playing field.
Emissions	An effective and enforceable risk management instrument to address VOC emission reductions should be developed through a single initiative.	The risk management measure anticipated to address air emissions of NGCs is a regulation under CEPA 1999. To the extent possible, this will be integrated with the regulation that is currently being developed for the risk management of Stream 1 and Stream 2 petroleum and refinery gases.
Emissions	Consideration should be given to risk management/control instruments that	The risk management measure anticipated to address air emissions of NGCs will consider all emissions of concern, including transportation

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	impact the transportation emissions identified as an issue of concern.	emissions.
Spills	The importance of spill reduction activities should be recognized. Efficiencies via synergies with ongoing initiatives should be sought.	The proposed risk management related to the environmental risks identified will focus on practices and technologies available for reducing the occurrence and impact of spills. This will include considering ongoing initiatives, such as those underway at the federal level to strengthen pipeline and railway safety.
Spills	It is questioned whether adding NGCs to the *Environmental Emergency* (E2) regulations, which are facility based, will actually reduce or address the risk identified related to spills.	The addition of NGCs to the E2 Regulations will assist in the prevention of accidental releases from fixed facilities and will contribute to the overall objective of reducing the occurrence and impact of spills.
RM Options	Environment Canada is encouraged to consider regulatory developments already underway or alternatives to regulation in lieu of a new regulation.	The selection of the most appropriate tool for risk management of a substance is made using a thorough, consistent and efficient approach that takes into consideration information received from both the assessment and other sources (e.g. consultations). In the case of NGCs, the analysis of options indicated that a regulation was the most appropriate tool to address health concerns from fugitive and evaporative emissions. To the extent possible, this will be integrated with the regulation that is currently being developed for the risk management of Stream 1 and Stream 2 petroleum and refinery gases.
RM Options	As there are proven response systems in place for spills, the commenter questions the need to declare a substance toxic under CEPA 1999 due to spills. A substance can be included in federal emergency response regulations without a finding of toxicity or a CEPA toxic designation.	When assessing a substance or to inform the need for, and nature of, risk management actions, the full range of potential risks and actions can be considered, including consideration of existing management measures.

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	Given the controls in place by facilities in the petroleum sector, the commenter also questions the need to include NGCs in federal environmental emergency regulations.	
Consultation on RM	Environment Canada is encouraged to consult broadly (beyond the petroleum industry) on any emissions management control instrument. If industries outside the petroleum sector are not consulted, they should be explicitly excluded from the instrument. The instrument must have the support of both the federal and provincial governments and involve meaningful engagement and input from the affected industries.	Consultation with stakeholders is an essential part of the risk management process. The proposed risk management actions will involve consultation with stakeholders including implicated federal, provincial and other regulatory agencies.