



GOVERNMENT OF
WESTERN AUSTRALIA

Western Australian Department of Health process for providing advice to the Environmental Protection Authority on human health risk assessments for hydraulic fracturing proposals

Position Paper

September 2020

Implementation of the Government's response to the Independent Scientific Panel Inquiry into Hydraulic Fracture Stimulation in Western Australia

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1. PURPOSE

This paper describes the process by which the Environmental Protection Authority (EPA) refers human health risk assessments (HHRAs) to the Western Australian Department of Health (DoH) for review and advice in relation to:

- chemicals proposed for use in the composition of drilling and hydraulic fracture fluids, utilised in exploration and production activities involving hydraulic fracture stimulation (hydraulic fracturing); and
- risk to public health from impact on air and water quality and contamination of land arising from such proposals.

DoH's review of HHRAs is limited to the public and communities, and it does not deal with the assessment of occupational risk to the workers.

2. BACKGROUND

The State Government announced the establishment of the Independent Scientific Panel Inquiry into Hydraulic Fracture Stimulation in Western Australia (the Inquiry) in September 2017.

In September 2018, the Inquiry handed its report to the Minister for Environment. The report, containing 91 findings and 44 recommendations, was released publicly in November 2018 via the [Inquiry's website](#).

The Government accepted in-principle the Inquiry's 44 recommendations; and on 27 November 2018 announced its Policy Decisions (Government's Decisions) relating to hydraulic fracture stimulation in Western Australia.

On 12 July 2019, the Western Australian Government released its [Implementation Plan](#), being the Government's response to the Inquiry.

This paper is in response to:

- Implementation Plan Action 7 (Inquiry Recommendation 34) regarding all applications for onshore exploration and production proposals involving hydraulic fracturing to be referred to the EPA for assessment under Part IV of the *Environmental Protection Act 1986*;
- Implementation Plan Action 8, Inquiry Recommendation 6 regarding development of a process for identification and assessment of chemicals, Recommendation 16 requiring potential impacts to air quality and human health to be assessed in a site-specific risk assessment and Recommendation 18 requiring the peer reviewed site-specific health risk assessments to be provided to the DoH for their review and provision of advice to the EPA; and
- Implementation Plan Action 9 (Inquiry Recommendations 6), regarding creation of a publicly accessible register of chemicals assessed for hydraulic fracturing in Western Australia.

3. ASSESSMENT OF CHEMICALS AND AIR QUALITY

In accordance with Recommendation 34, any proposal for the onshore exploration or production of oil and gas utilising hydraulic fracturing will be referred to the EPA for assessment.

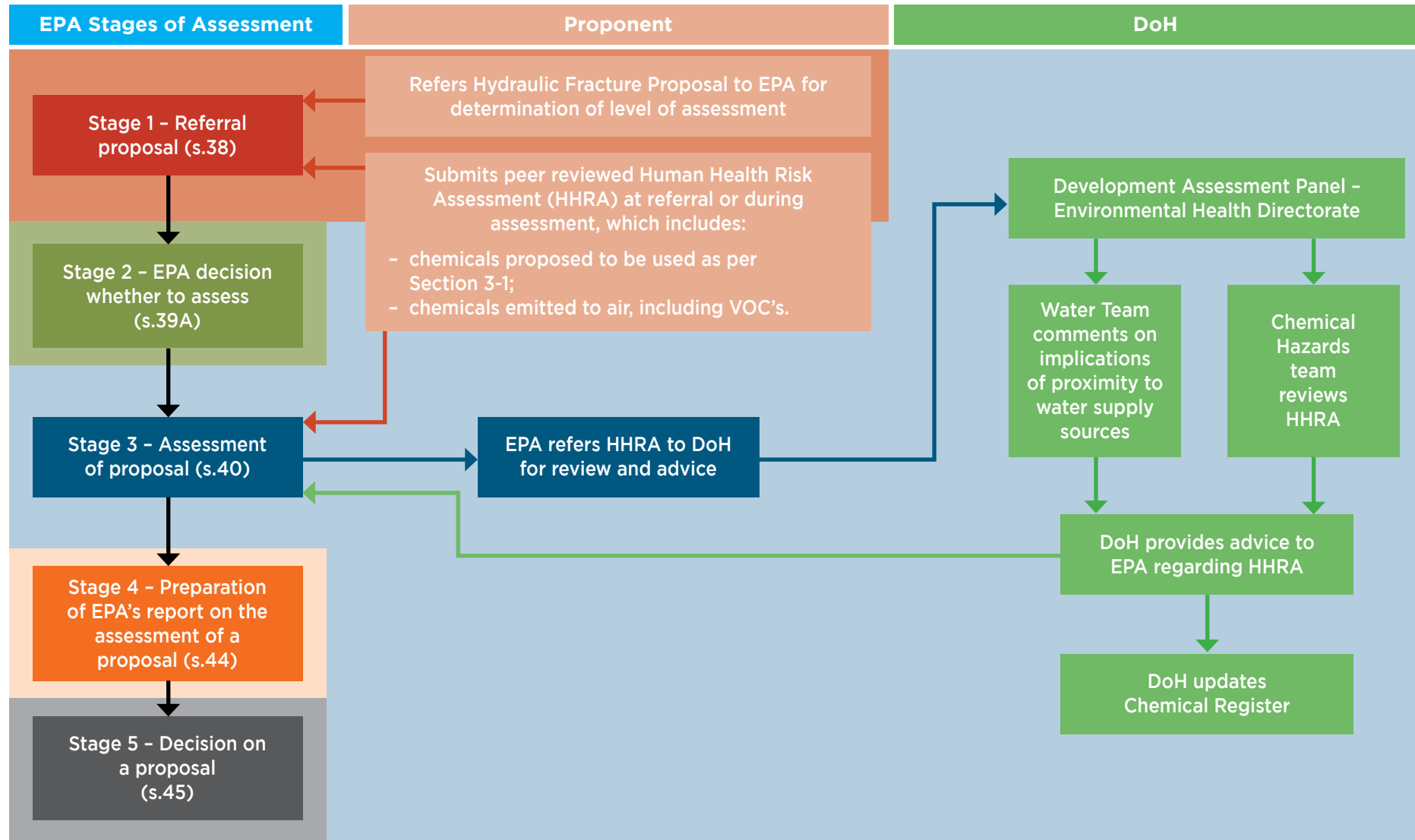
The proponent should provide a peer-reviewed, site-specific Human Health Risk Assessment (HHRA) report to the EPA, prepared in accordance with [Section 4](#) of this guidance, together with the required detailed assessment documents, addressing potential short, cumulative and long-term health risks to people arising from:

1. use of chemicals, including:
 - chemicals proposed for use in drilling and hydraulic fracturing fluids;
 - chemicals present or likely to be in produced or flow-back water;
 - chemicals proposed for use in well testing and well maintenance;
 - chemicals proposed for use in emergency scenarios;
 - chemicals proposed for use during closure and decommissioning of wells; and
 - chemicals in produced water and proposed for re-use for other purposes.
2. airborne chemicals emitted (including volatile organic compounds (VOCs)) from activities, plant and equipment associated with hydraulic fracture stimulation.

The peer-review of the HHRA report should be undertaken by an independent professional, experienced in assessing the human health risk integrating the discipline of toxicology. Their advice regarding the HHRA report should be appended to the HHRA report.

The EPA will refer the HHRA report to the Development Assessment Panel, Environmental Health Directorate of DoH who will review and provide advice to the EPA. This advice will address the completeness of the report with respect to risk to public health from chemicals proposed to be used, as well as from airborne chemicals, and the appropriateness of the measures proposed to mitigate the potential risks ([see Figure 1](#)).

Figure 1: Referral process review of HHRA's



4. HUMAN HEALTH RISK ASSESSMENT (HHRA)

The HHRA is to be undertaken by a professional experienced in assessing the human health risk integrating the discipline of toxicology, to be engaged by the proponent and peer reviewed by an independent, similarly qualified and experienced professional.

The health risk assessment format is to follow the principles identified in [enHealth - Environmental Health Risk Assessment: Guidelines for assessing human health risks from environmental hazards, 2012](#).

Exposure factors are to be sourced from [enHealth - Australian Exposure Factor Guide, 2012](#).

The HHRA should assess the exposure pathways, potentially exposed groups, and potential health outcome of the exposure, specifically:

- source of the chemicals and emissions;
- pathway/media (water, air, food and soil) to receptors;
- exposure routes (inhalation, ingestion, skin contact);
- identify the people and communities potentially affected (receptors) and their proximity to the hydraulic fracture operations;
- likely concentration of contaminants at receptors; and
- potential health endpoints from their exposure to those contaminants.

To assist with the DoH's review and EPA's assessment of the peer reviewed HHRA, proponents should:

- provide a conceptual site model clearly illustrating the source - pathway - receptor analysis undertaken;
- provide the current material safety data sheets for any proprietary chemicals, materials and substances that may be in, or added to any fluids used for the purposes of drilling or hydraulic fracturing, or otherwise introduced into a well, reservoir or subsurface formation, in the course of the activity;
- tabularise inventory of chemicals proposed for use (as listed in [section 3-1](#)), providing evidence that the proposed chemicals are registered or approved for use in Australia, in the form shown in [Appendix 1](#). The approval for use should be confirmed by the peer reviewer, verified by the DoH upon review; and
- consider the guidance and potential impacts to water and air identified in [Appendix 2](#).

5. PUBLIC DISCLOSURE

DoH will assess the peer reviewed HHRA and provide advice to the EPA with respect to the public health risk from:

- chemicals used in oil and gas exploration or production utilising hydraulic fracturing; and
- airborne chemicals emitted from activities, plant and equipment associated with hydraulic fracture stimulation.

The EPA will consider DoH's advice in its assessment of the proposal. In addition, the following information will be made publicly available:

- the proponent's peer-reviewed HHRA report and the EPA's report, published on the EPA's [webpage](#); and
- the Chemicals Register ([Appendix 3](#)), published on the DoH's website, listing the chemicals reviewed by DoH through the HHRA process.

6. OTHER RELEVANT GUIDANCE

Relevant health guidelines to be used in preparing the HHRA report include:

- the National Health and Medical Research Council, National Resource Management Ministerial Council's (NHMRC, NRMCC) [Australian Drinking Water Guidelines](#);
- Department of Health of Western Australia's guideline: [Materials, products and substances in contact with drinking water](#);
- for air quality guideline values (AGV), the reference hierarchy of jurisdictions presented in [Table 1](#) must be followed to identify the most suitable ambient AGV (nationally or internationally) for comparison; and
- any new or industry-based guidelines with its derivation and justification fully explained.

Table 1: Reference hierarchy for ambient AGVs

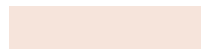
Hierarchical Rank	Jurisdiction / organisation	Example
1	Western Australian Guidelines	Development and Application of the Threshold of Toxicological Concern to Screening Evaluation of Air Toxics (DOH)
1	National Australian Guidelines	National Environmental Protection Measure (Air Toxics, Ambient Air Quality) Australian State & Territory guidelines
2	World Health Organisation (WHO)	Air quality guidelines - Global update 2005 - particulate matter, ozone, nitrogen dioxide and sulfur dioxide.
3	United Kingdom Department of Health	Environment Agency: Guidance Air emissions risk assessment for your environmental permit
4	Netherlands National institute of Public Health and the Environment (RIVM)	Centre for Substances and Risk Assessment
5	Health Canada	Health and Air Quality
6	United States	Agency for Toxic Substances Disease Registry, Environmental Protection Authority, Health Effects Notebook for Hazardous Air Pollutants, Preliminary Remediation Goals.

APPENDIX 1: NOTIFICATION OF CHEMICALS

The table below, providing an inventory of chemicals proposed for use as per Section 3-1, should accompany the submission of a HHRA.

A	B	C				D
Chemical/compound	CAS Number	Listed in				MSDS Supplied (Y/N)
		AICS	APVMA	TGA	FSANZ	
Silicon Dioxide	7631-86-9	Y				Y
Sodium Hypochlorite	7681-52-9	Y	Y			Y
Xanthan Gum	11138-66-2	Y		Y	Y	N

EXAMPLES



Definitions

CAS - Chemical Abstracts Service number.

AICS - Australian Inventory of Chemical Substances.

APVMA - Australian Pesticides and Veterinary Medicines Authority.

TGA - Therapeutic Goods Administration.

FSANZ - Food Standards Australia and New Zealand.

Explanatory Notes

- Column A: list all chemicals proposed as per Section 3-1.
- Column B: provide the CAS number for the chemical proposed.
- Column C: identify where the chemical is approved for use in Australia.
- Column D: provided material safety data sheets (MSDS) for the chemicals listed.

APPENDIX 2: GUIDANCE FOR CHEMICALS AND AIRBORNE CONTAMINANTS

CHEMICALS IN DRILLING AND HYDRAULIC FRACTURE FLUIDS

The Government provides the following guidance as applicable to HHRAs, relating to drilling fluids and hydraulic fracture stimulation fluids proposed to be used in oil and gas exploration and production involving hydraulic fracturing:

- all chemicals proposed to be used in drilling and as ingredients in hydraulic fracture fluids are to be identified by the proponent;
- evidence must be provided to the Western Australian Government that the proposed chemicals are registered or approved for use in Australia by:
 - the Australian Inventory of Chemical Substances (AICS) scheme; or
 - the Australian Pesticides and Veterinary Medicines Authority (APVMA); or
 - the Therapeutic Goods Administration (TGA); or
 - Food Standards Australia and New Zealand (FSANZ).
- Any chemicals not registered or approved for use in Australia are not permitted.
- Drilling fluids and hydraulic fracturing fluids must not contain benzene, toluene, ethylbenzene, or xylene (BTEX) above the levels prescribed in the Western Australian Code of Practice (the 'Code') for hydraulic fracturing. In effect, this means that BTEX is not permitted to be contained nor added to drilling and hydraulic fracturing fluid for any beneficial purpose connected with hydraulic fracturing.

The Code will implement the BTEX ban through restrictions on the concentration of BTEX, in accordance with the Australian drinking water guidelines and environmental protection guidelines.

The Code will stipulate that the presence of BTEX, at or below the levels prescribed, can only be:

- a) naturally occurring in water used to make up the drilling or fracturing fluid;
 - b) present as a contaminant in chemicals or other substances used in drilling or stimulation fluids and has no beneficial use;
 - c) present in produced water or flow back fluids from naturally occurring hydrocarbon contamination.
- The use of other known or suspected carcinogens, mutagens, developmental toxicants and endocrine disruptors should be minimised or avoided. Justification should be provided that a substitute is not available for these substances.

The following impacts from chemicals used should be considered in the HHRA report:

- any impacts to water resources:
 - through below-ground pathways to aquifers for contaminants;
 - from surface spills of chemicals;

- from poor management and disposal of produced flowback and wastewater i.e. overflows of storage ponds;
 - through loss of well integrity;
 - through well closure and decommissioning;
 - from production and maintenance; and
 - from emergency scenarios.
- the exposure of people through re-use of produced water for other purposes.

AIRBORNE EMISSIONS AND CONTAMINANTS

The Government provides the following guidance, as applicable to HHRAs, relating to airborne emissions and contaminants for oil and gas exploration and production involving hydraulic fracturing.

Airborne concentrations of contaminants may exceed health-based criteria in proximity to activities related to hydraulic fracturing. Limitations with the available data on emissions to air are to be addressed on a site-specific basis, with impacts assessed in the HHRA.

Baseline air quality monitoring for volatile organic compounds (VOCs) and methane, and ongoing monitoring of air quality against which to evaluate the impact emissions from the proposal should be undertaken in accordance with the Western Australian Code of Practice for hydraulic fracturing.

Air contaminants

Some air contaminants associated with hydraulic fracturing that require consideration in the HHRA are, but are not limited to:

- petroleum hydrocarbons, that include methane and other VOCs such as BTEX;
- polycyclic aromatic hydrocarbons (PAH's);
- hydrogen sulphide;
- ozone and its precursors, including nitrogen oxides (NOx);
- diesel emissions; and
- particulate matter (PM), including silica dust.

Potential impacts from air contaminants

The HHRA should consider, on a site specific, case-by-case basis, the assessment of:

- the short, cumulative and long-term health risks to the public and communities from exposure to airborne contaminants;
- the ground level concentrations of contaminants at the receptor, compared to health based guideline values;
- impact of air quality on public amenity and aesthetic enjoyment; and
- adverse impacts on people and communities.

APPENDIX 3: CHEMICALS REGISTER

This register lists the chemicals reviewed and assessed by DoH in the HHRAs, and the evaluation of the health risk they present when used as proposed. The chemicals listed have been reviewed by DoH on a site-specific basis. Inclusion on this register is not a general DoH approval or endorsement for the use of these chemicals.

A	B	C	D	E	F
Chemical / compound	CAS Number	AICIS evaluation	HHRA (public health)	Evaluation	Notes

Definitions

CAS - Chemical Abstracts Service number

AICIS - Australian Industrial Chemicals Introduction Scheme (previously NICNAS - National Industrial Chemicals and Assessment Scheme)

HHRA - Human Health Risk Assessment

Receptors - People, communities and ecosystems potentially exposed to the chemical hazards, identified on a case-by-case basis during assessment of the HHRA

Explanatory Notes

- Column A - Chemicals or compounds proposed to be used as per section 3-1. Any chemical that appears on this list should be registered for use in Australia.
- Column B - The CAS number is a unique number given to a chemical by the American Chemical Society which is universally used to identify a chemical when there are many possible names for the same chemical.
- Column C - AICIS assesses the risk associated with the use of a chemical. Typically this takes the form of a hazard assessment. An AICIS evaluation may be used to inform the HHRA. A tick in this column indicates an assessment of somekind has been done.
- Column D - A HHRA is a way of assessing the potential impact of a chemical hazard on people or a community. Typically it is unique to the situation and population being assessed. The framework to be used is [enHealth - Environmental Health Risk Assessment: Guidelines for assessing human health risks from environmental hazards, 2012](#). A tick in this column will indicate an assessment of the HHRA has been done.
- Column E - the evaluation will include narrative explaining the context and health risk, for example:
 - low hazard chemical with low potential for harm/exposure to receptors;
 - medium hazard chemical with low potential for exposure to receptors when applied according to an exposure mitigation plan;
 - medium hazard chemical with medium potential for exposure to receptors when applied according to an exposure mitigation plan;
 - high hazard chemical with low potential for exposure to receptors when applied according to an exposure mitigation plan; or
 - high hazard chemical and high potential for exposure to receptors - not supported.
- Column F - further explanatory information, with links to the assessment information.

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