What does this report do?

This report presents a list of chemicals emitted from California refineries, and then prioritizes the chemicals according to their emissions levels and toxicity. The report covers emissions that occur routinely in daily operations, and well as accidental and other non-routine emissions. This report does not attempt to actually measure exposure or risk in communities, but is instead a compendium of information, including health information, that may be useful for considering which chemicals to monitor near facilities, emergency response, and other efforts.

Why was this report prepared?

In public meetings following the release of the Governor’s Refinery Report¹, community members asked if there existed a complete list of chemicals that could be released from refineries, and if those chemicals had been prioritized for monitoring to ensure that any monitoring system would be tailored – insofar as feasible – to measure the most important chemicals.

As a result of these questions from the public, the Office of Environmental Health Hazard Assessment (OEHHA) used existing information to compile a list of chemicals that would be top candidates for air monitoring near refineries according to the volume of the chemicals emitted and the toxicity of the chemicals.

How does this report relate to ARB’s report?

The report is a companion document or appendix to ARB’s air monitoring report, “Refinery Emergency Air Monitoring Assessment Report”. It can be used to inform discussions on which chemicals to monitor.

What is the source of the information?

OEHHA used publicly available information to compile the list of chemicals and their emissions. The Air Resources Board’s (ARB) California Emissions Inventory Development and Reporting System (CEIDARS) Facility Search Tool was the information source for routine emissions from all refineries in California for the years 2009-2012. A second query in CEIDARS for 2014 data produced the toxicity-weighted emissions data.

We also used data reported by refineries in response to a US Environmental Protection Agency Information Collection Request related to their Petroleum Refinery Sector Risk and Technology Review and New Source Performance Standards in 2011 on routine and non-routine emissions from all California refineries.²

Additional sources included literature searches, internet databases, publicly available data, government reports, peer-reviewed journal articles, and incident databases.

¹ Governor’s Interagency Working Group on Refinery Safety February 2014 “Improving Public and Worker Safety at Oil Refineries”
What are the key findings?

- The report identifies 188 chemicals emitted from California refineries, although there are large variations in the frequency, amounts and toxicity of the emitted chemicals.
- There is generally good information for understanding the toxicity of the identified emitted chemicals.
- All of the chemicals with routine emissions greater than 10,000 pounds per year statewide (14 chemicals) have an OEHHA Reference Exposure Level (REL), which is a level of exposure that does not cause noncancer health effects. OEHHA did not attempt to determine whether or how often these exposure levels may have been exceeded in areas near refineries.
  - 107 chemicals have at least one health guidance value from OEHHA or US EPA.
  - 94 chemicals have at least one emergency exposure value to evaluate the harm of large unanticipated releases.
  - 33 chemicals do not have any health guidance value. These chemicals are generally released in much lower quantities than those with guidance values.
- The top candidates for air monitoring based on amounts of emission and toxicity considerations include acetaldehyde, ammonia, benzene, 1,3-butadiene, cadmium, diethanolamine, formaldehyde, hydrogen sulfide, manganese, naphthalene, nickel, PAHs, PM, sulfur dioxide, sulfuric acid, and toluene.
  - In terms of amounts released, the top ten Toxic Air Contaminants routinely emitted from California refineries were: ammonia, formaldehyde, methanol, sulfuric acid, hydrogen sulfide, toluene, xylenes, benzene, hexane, and hydrogen chloride.
- California criteria air pollutants with high routine and non-routine emissions are: sulfur dioxide, nitrogen oxides, and particulate matter (PM).
- Hydrogen fluoride is a highly toxic chemical of serious concern; it is used at two refineries in California.
- Applying toxicity weights to the total pounds released in 2014, the top toxicity-weighted releases, starting with the highest are: formaldehyde, nickel, arsenic, cadmium, and benzene, followed by total polycyclic aromatic hydrocarbons (PAHs), hexavalent chromium, the PAHs benzo(a)pyrene and phenanthrene, beryllium, ammonia, 1,3-butadiene, the PAH naphthalene, hydrogen sulfide, acetaldehyde, manganese, and diethanolamine.
  - However, the total amount released of hexavalent chromium, arsenic, and beryllium from all California refineries are all less than 100 pounds annually, making it likely very difficult to detect these in air.
- The release of these chemicals from refineries does not necessarily mean that local communities face a significant health risk or substantial exposures, but it does increase the likelihood of exposure for nearby communities. Air monitoring of these chemicals may inform decisions that could reduce exposure.

Where can one access the full report after the release?
- https://oehha.ca.gov/air