Department of Pesticide Regulation

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M E M O R A N D U M

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FROM: Work Group on Responses to National Research Council
National Academy of Sciences (NAS) Report

DATE: July 14, 2016

SUBJECT: EVALUATION AND IMPLEMENTATION OF COMMENTS/RECOMMENDATIONS FROM THE NATIONAL ACADEMY OF SCIENCES REPORT ENTITLED "REVIEW OF CALIFORNIA'S RISK ASSESSMENT PROCESS FOR PESTICIDES"

The Department of Pesticide Regulation (DPR) conducts risk assessments as part of its mission to protect human health and the environment by regulating the sales and use of pesticides in California. To ensure that DPR's risk assessments use the best scientific information and current methods, DPR contracted with the National Academy of Sciences (NAS) in 2013 to conduct an independent peer review of DPR's risk assessment practices. The National Research Council (NRC) of the NAS completed its review and issued its report (NRC 2015), including recommendations to improve DPR's risk assessment process and reports, in April 2015. DPR appreciates the NRC committee's thorough review and constructive recommendations and comments. DPR is encouraged that the NRC generally approved many aspects of our risk assessment process including:

- DPR's priority-setting process for identifying pesticides to enter risk assessment.
- DPR's risk characterization documents, which they characterized as comprehensive and following established risk assessment practices.
- DPR's use of state-specific data for exposure assessments.

The NRC made several recommendations that will enhance the clarity of DPR's risk-assessment process and improve risk-assessment documents as a decision-making tool for risk managers. Some of the key recommendations DPR will address include:

- DPR should update the documentation of its priority-setting process to provide more details so the public can better understand the process and to provide greater transparency for the process.
- DPR should ensure that risk assessors and managers have a common understanding of the definitions, principles, and steps of the risk-assessment process, including stakeholder involvement.
- DPR should leverage risk assessment work by U.S. EPA where appropriate and incorporate California-specific information to make the best use of limited resources.
- DPR should incorporate problem formulation and other relevant elements recommended in the Silver Book into its risk-assessment process so that risk assessments can be designed to address the decisions that need to be made by managers.
- DPR should update its risk-assessment guidance documents regularly to reflect the most current risk-assessment practices.
- DPR should consider expanding pesticide use reporting for nonagricultural purposes to improve information about exposure from these types of pesticide uses.
- DPR should consider improving the reporting of pesticide-related illness

This memorandum documents DPR's responses to the recommendations and comments presented in NRC's report. It includes a brief evaluation of each recommendation, DPR's ability to implement the recommendation, and where appropriate, a time schedule for implementing the recommendation. The recommendations are listed in order, by the NRC report chapter in which the recommendation appeared. The comments are listed by page number as they appear in the NRC report.

Chapter 2 – Setting Priorities among Pesticides for Risk Assessment

Recommendation:

1. *DPR should update its 2004 documentation of its priority-setting process to provide more details so that the public can understand the process better. Flow diagrams would be helpful in documenting the steps in the process, identifying the staff and peer-review groups involved in each step, and indicating the opportunities for public input.*

2. *DPR should provide more explicit documentation and support for how AIs (active ingredients) are categorized into groups of high, medium, and low priorities.*

Response: The DPR document, describing the initial screening process for the prioritization of human health assessments is revised and posted on DPR's website (DPR 2016, <http://www.cdpr.ca.gov/docs/risk/raprocess.pdf>). This document now contains a narrative describing the parameters that the Adverse Effects Advisory Panel uses to initially assign AIs to the high, moderate, and low categories. This preliminary categorization scheme is then used by the Risk Assessment Prioritization Work Group in their selection process for initiation of human health risk assessments. DPR makes the recommendations of the Work Group available to interested parties, and posts them on DPR's public website (DPR 2015).

Recommendation:

3. *DPR should develop a more objective and structured approach for ranking high-priority AIs on the basis of the criteria presented in Box 2-2 so that others could reasonably reproduce the rankings. One option to consider is the development of a scoring system to weight the different factors. Such a scheme could provide greater transparency in illustrating how the 10 high-priority candidates for risk assessment were selected. If such a scheme were developed, it would be important to have it peer-reviewed before implementation.*

Response: DPR has attempted several times to develop numerical systems to weight the diverse factors used for ranking high-priority AIs. The weighting process was discussed with members of the work group and members considered all aspects of prioritization including the toxicity, exposure, current uses, and number of illnesses and incidents, among others.

Currently, DPR considers that the report developed for each of the AIs selected for high-priority ranking contains sufficient information to clearly illustrate the reason for such ranking. This approach provides DPR with the necessary flexibility to meet the State's needs. DPR is currently aware of other ongoing efforts to establish numerical approaches to ranking chemicals that may be suitable for this prioritization process. Any new numerical approaches will be thoroughly evaluated by DPR scientists and if appropriate, will be incorporated into the prioritization process in the future.

Recommendation:

4. *DPR should continue to use California-specific data, such as information from the Pesticide Use Reporting program and the Pesticide Illness Surveillance Program and perhaps collect additional data to help in setting priorities (See Chapter 4 for recommendations on improving the collection of California-specific data).*

Response: DPR already uses California-specific data and will continue to use California-specific data in the priority-setting process. Information gathered by the Pesticide Illness Surveillance Program and Pesticide Use Reporting Program, if available, are taken into consideration in the current priority-setting process. Any new programs developed in the future that collect California-specific data will also be used for priority-setting purposes, if appropriate.

Recommendation:

5. *For each document that sets risk assessment priorities, DPR should disclose the names and affiliation of the members of the review group (the Adverse Effects Advisory Panel (AEAP), the Pesticide Registration and Evaluation Committee (PREC), the Risk Assessment Prioritization Work Group (RAPWG), and the Science Review Panel (SRP)) involved in priority setting to help increase transparency in the review process.*

Response: The final responsibility for "setting risk assessment priorities" lies with the Director of DPR. The various review panels serve in a purely advisory capacity, and do not in themselves set risk assessment priorities. However, DPR agrees that the membership of the groups and panels is information that is important for the transparency of the process.

DPR and other agencies already disclose membership of the groups listed in NRC's recommendation. The roles of the members of the AEAP and the RAPWG are described in the 2016 updated DPR memorandum, "Process for Human Health Risk Assessment Prioritization and Initiation" which is posted on DPR's website (DPR 2016). The members' position for the State of California and affiliation are listed in this memorandum <http://www.cdpr.ca.gov/docs/risk/raprocess.pdf>. DPR will also list the names of the workgroup in a website that is easily accessible to the public.

The PREC is a DPR advisory committee that holds regularly scheduled public meetings, and the members' names and affiliations are posted on DPR's website <http://www.cdpr.ca.gov/docs/dept/prec/precmenu.htm>. The role of the PREC in the risk assessment prioritization process is to review and make comments to the DPR Director on the list of candidate pesticides proposed for risk assessment initiation.

The names of SRP members and their affiliations are posted on the website of the California Air Resources Board <http://www.arb.ca.gov/srp/public.htm>. However, the SRP does not play a role in the risk assessment priority setting process. The prioritization and risk assessment process takes into account DPR's Toxic Air Contaminant (TAC) Act mandate to evaluate the ambient air risks from pesticides. The SRP is required by the TAC Act to ensure that risk assessments submitted to them are based on sound science. The SRP holds at least one public hearing on the results of each DPR risk assessment they review.

Chapter 3 – Risk-Assessment Practices for Pesticides

Recommendation:

6. *DPR should review the legislative mandates under which it works to determine whether an independent comprehensive evaluation of pesticides is required in every case in which a risk assessment is performed. If no new and compelling toxicology data have been generated since an U.S. Environmental Protection Agency (U.S. EPA) assessment was conducted and if there is no reason to believe that the U.S. EPA assessment is seriously flawed, DPR could rely on EPA's assessment to a greater extent. If the legislation allows, DPR should collaborate with EPA on its pesticide risk assessments and then rely on EPA's hazard identification, dose response assessment, and derivation of reference values as a starting point for its own evaluations and focus its efforts on collecting California-specific exposure data, which will help in tailoring the risk assessments to the state's needs. Some data might be obtained from other groups or researchers that are collecting exposure information in the state, but the agency may still be required to collect its own data.*

Response: This recommendation is being implemented as a pilot project beginning with the fipronil risk assessment initiated during the calendar year 2015. Using U.S. EPA risk assessments as a starting point for DPR's assessments may increase the efficiency and productivity of DPR's process. There is no legal mandate that prevents DPR from relying on U.S. EPA's risk assessments or any other regulatory agencies' assessment for hazard identification, dose response assessment, and derivation of reference values as a starting point for DPR's assessment. However, DPR does have an independent duty to evaluate the risks of pesticides and assure that Californians are protected. This duty may require DPR to conduct a separate risk assessment; at a minimum it requires DPR to critically reevaluate the U.S. EPA assessment. The Human Health Assessment Branch (HHAB) is developing guidance for staff to determine when it is necessary or appropriate to deviate from U.S. EPA's risk assessments as a starting point for DPR's assessments. The guidance will be completed by the end of 2017. DPR already collects California-specific exposure data and will continue those efforts. Upon review of the data for scientific validity, DPR also uses data submitted by other organizations. To the extent allowed by valid data from other sources, it is appropriate for DPR scientists to focus their efforts on California-specific data and assessment.

Recommendation:

7. *DPR should undertake a careful review of the framework presented in Chapter 8 of the Silver Book (NRC 2009) and the practical guidance in U.S. EPA (2014) and NRC (2014) for improving risk assessments. The review should include collaboration between risk assessors and managers to ensure a common understanding of the definitions, principles, and steps of the risk-assessment process, including stakeholder involvement.*

Response: Historically, DPR has separated risk assessment activities from risk management activities. Based on the U.S. EPA, NRC guidelines and the NRC's review of DPR's risk-assessment process for pesticides, DPR is revising its risk-assessment process. The revised risk-assessment process will consist of several phases that increase opportunities for stakeholders to participate in the process and improve the usefulness of the Risk Characterization Document as a decision-making tool for risk managers. The first phase is termed as an outreach phase. During this phase, DPR will reach out to all relevant stakeholders to inform them that DPR is initiating the risk-assessment process for a specific pesticide. DPR will invite stakeholders to submit data and information that may be relevant to conducting a risk assessment. DPR will invite stakeholders to engage in a dialogue with us about their concerns and issues regarding the risk assessment. The second phase is an effort to formulate the problem and determine the scope of the risk assessment. During this second phase, DPR staff and managers will consider data and information from stakeholders, the pesticide's toxicological data, available pesticide use data, available pesticide illness data, potential exposure scenarios, sources of uncertainty and variability, and relevant U.S. EPA risk assessments to establish the scope of the risk assessment. During the scoping phase, DPR will develop a conceptual model of exposure pathways and an analysis plan that outlines the technical details for conducting the assessment. This phase will result in a summary of DPR's effort to formulate the problem and determine the scope of the risk assessment. The summary documents will be presented at a public meeting of the Pesticide Registration and Evaluation Committee for comment by the Committee and the public. The risk-assessment phase follows the scoping phase. Unacceptable risk identified in the completed risk assessment will be addressed by the risk managers in the mitigation process. This recommendation is being implemented as a pilot project beginning with the fipronil risk assessment initiated during the calendar year 2015.

Recommendation:

8. *DPR should incorporate problem formulation and other relevant elements recommended in the Silver Book into its risk-assessment process. An important consideration is that risk managers should be involved in the problem-formulation stage so that risk assessments can be designed to address the decisions that need to be made by the managers and other stakeholders. Consideration should be given to whether a general set of problems and risk-management options could be formulated to use as a starting point in problem formulation.*

Response: This recommendation is being implemented as a pilot project beginning with the fipronil risk assessment initiated during the calendar year 2015. This recommendation is important in making DPR's risk assessments more useful to risk managers and relevant to the issues faced by DPR. Further evaluation will be needed to determine if a general set of problems and risk management options can be formulated to use as a starting point for problem formulation.

Recommendation:

9. *DPR should update its risk-assessment guidance documents regularly to reflect the most current risk-assessment practices. The guidance documents could draw from the work of U.S. EPA, Office of Environmental Human Health Assessment (OEHHA), and other relevant agencies; this could help to standardize and streamline reviews and evaluation approaches and promote consistency among the assessment teams and contributors. It might be useful for DPR to develop an overarching framework for considering and applying the various guidance documents on which it relies to ensure consistency between risk assessments and to aid new risk-assessment staff.*

Recommendation:

10. *DPR should update its guidance on defaults and begin developing explicit guidance on the inclusion of missing defaults, such as defaults for human variation in susceptibility to cancer and for risks to susceptible subpopulations (during early life and other stages). Guidance should also be developed on when departures from defaults may be justified.*

Response: DPR is implementing these recommendations. DPR recognizes the need for comprehensive guidance documents to ensure consistency and transparency in risk assessments, and that the guidance needs to be regularly updated to reflect the most current risk assessment

practices. The HHAB has either initiated or is about to initiate a review of the guidance documents listed below and interim approaches are indicated for each. An additional set of guidance documents will be updated starting in 2017, and DPR will also initiate creation of an overarching guidance document in 2017. During the process of updating guidance documents, DPR reviews all relevant documents from U.S. EPA, the Canadian Pest Management Regulatory Agency, Organization for Economic Co-operation and Development, and OEHHA to ensure DPR is using the most current scientific data and principles to support our guidance documents.

- Handler exposure assessment. U.S. EPA released its most recent guidance in September 2015. HHAB has initiated review of new exposure studies and is also determining the most appropriate statistic to use when upper-bound estimates are needed. Completion of this update is anticipated in late 2016. In the interim, exposure assessments will continue to rely on the approach and defaults outlined in Beauvais et al. (2007), and exposure appraisal will include estimates from U.S. EPA's new guidance.

- Post-application exposure assessment. U.S. EPA released its most recent guidance in March 2013. HHAB has initiated review of new exposure studies, and concurs with most of the 2013 U.S. EPA policy. Completion of this update is anticipated in late 2016. In the interim, exposure assessments will rely on the approach and defaults from U.S. EPA's 2013 guidance.

- Dermal absorption. U.S. EPA, the Canadian Pest Management Regulatory Agency, and DPR agreed on a draft policy in 2008. HHAB is in the process of updating this guidance to provide greater specificity and confidence in the resulting estimates. The updated approach currently being used by HHAB is documented in Ngo (2015). HHAB is reviewing newly submitted studies using this approach and expects to finalize an updated policy in late 2016 after reviewing OEHHA's 2012 document "Technical Support Document for Exposure Assessment and Stochastic Analysis" <http://www.oehha.ca.gov/air/hot_spots/tsd082712.html>.

- Inhalation absorption and breathing rate. U.S. EPA released its most recent guidance in 2012 as part of its Residential Exposures Standard Operating Procedures. OEHHA released its most recent guidance in 2015. HHAB has initiated review of these policies and anticipates completion of this update in early 2017. In the interim, exposure assessments rely on DPR guidance documents that were finalized in 2000 and 2008.

- Dietary exposure assessment. HHAB expects to initiate an update to its 2009 dietary exposure guidance starting in 2016 and to complete the update in 2017. HHAB currently uses the U.S. EPA Dietary Exposure Evaluation Model-Food Commodity Intake Database (DEEM-FCID)/Calendex, Version 9.14) that is based on the 2003-2008 National Health and Nutrition Examination Survey/"What We Eat in America" (NHANES/WWEIA) dietary survey. HHAB has begun testing the beta version of DEEM-FCID (Version 10 with 2005-2010 NHANES/WWEIA). In the interim, new dietary exposure assessments rely on DPR's 2009 guidance document, but utilize the most recent DEEM-FCID (Version 10). HHAB is currently updating its guidance for evaluating illegal residues on fresh produce for the DPR's Enforcement Branch Pesticide Residue Monitoring Program.

- Default "Uncertainty Factors" (UF) for non-cancer endpoints and inhalation dosimetry. HHAB expects to initiate an update to its guidance on UFs for non-cancer endpoints and inhalation reference concentrations (RfC) starting in 2016 and to complete the update in 2017. The update will include new science for interspecies inhalation gas dosimetry related to extra-thoracic, tracheobronchial, pulmonary, and systemic effects. In the interim, new risk assessments will rely on DPR's 2011 guidance document (provided to NAS in 2011) but utilize the concepts delineated in the 2012 U.S. EPA document "Advances in Inhalation Gas Dosimetry for Derivation of a Reference Concentration (RfC) and Use in Risk Assessment," http://cfpub.epa.gov/ncea/risk/recordisplay.cfm?deid=244650&CFID=50656799&CFTOKEN=16532718 and the 2013 OEHHA "Air Toxics Hot Spots Program Technical Support Document for the Derivation of Noncancer Reference Exposure Levels," http://www.oehha.ca.gov/air/hot_spots/rels_dec2008.html.

- Benchmark Dose (BMD) modeling. HHAB expects to initiate an update to its 2004 guidance documents for continuous and quantal data in 2016 and to complete the update in 2017. In 2015, HHAB had numerous discussions with the U.S.EPA BMD modeling team and attended the U.S.EPA training courses on categorical regression analysis and model averaging workshops. Updates will focus on (1) data selection for modeling, (2) derivation of a benchmark response, and (3) criteria for model selection. In the interim, new risk assessments rely on DPR's 2004 guidance document, but utilize the most recent Benchmark Dose Software (BMDS), including analysis of multisite tumor data.

- Cancer risk assessment and genotoxicity considerations. HHAB has been following the 2005 USEPA "Guidelines for Carcinogen Risk Assessment" and the 2011 OEHHA "Air

Toxics Program Technical Support Document for Cancer Potencies," http://www.oehha.ca.gov/air/hot_spots/tsd052909.html. Beginning in 2016 HHAB will prepare guidance/methodology for cancer risk assessment to address nonlinear (threshold) mode of action (MOA) of carcinogens and linear (non-threshold) genotoxic MOA as weight of evidence factors in cancer assessments. The potential for increased cancer susceptibility due to early childhood exposure to carcinogens, the use of mechanistic studies, and in vitro high-throughput/high-content data will also be considered.

- U.S. EPA Toxicity Forecaster (ToxCast) profiles. HHAB collaborates with OEHHA and U.S. EPA to examine the data from ToxCast high-throughput screening assays (HTS, including zebrafish; http://actor.epa.gov/dashboard2) and to investigate their potential use in risk assessment. In 2015, HHAB used ToxCast data for indications of pathway disruptions that could lead to toxic outcomes. The results were reported in two risk assessments completed in 2015. HHAB is currently preparing a training course for staff on the use of ToxCast assays and HTS profiles to support potential modes of action and adverse outcome pathways for individual pesticides. Notes from the course and from ongoing discussions with U.S. EPA and OEHHA will be incorporated into a new guidance document that will be initiated in 2016.

Systematic review. HHAB has been including literature reviews in its risk assessments for many years now. In 2013-2015, HHAB attended several U.S.EPA workshops that focused on systematic review methods for the identification and evaluation of different types of evidence streams (epidemiology, animal toxicology, and mechanistic) for use in risk assessments. HHAB will begin to evaluate how to systematize these methods for prioritizing chemicals for future risk assessments.

Recommendation:

11. *DPR should ensure that risk-management documents arising from its risk appraisals discuss explicitly how an appraisal informed a decision and describe the uncertainties associated with the assessment. A useful resource is draft guidance from EPA (2014), which discusses four principles (transparency, clarity, consistency, and reasonableness) to ensure the usefulness of information in the risk-characterization step to risk managers.*

Response: This recommendation is important for improving DPR's risk-assessment and risk management documents. DPR reviewed the U.S. EPA document entitled "Framework for Human Health Risk Assessment to Inform Decision Making" (EPA 2014) and plans to explain in each risk management directive how the risk appraisal informs the risk-management decisions

and describe the uncertainties associated with the assessment. Comparing the risk reductions (health benefits) of different management options in the risk assessments will improve their value to risk managers. This recommendation is being implemented in the fipronil risk assessment as a pilot project initiated during the calendar year 2015.

Recommendation:

12. *In the long-term, DPR should monitor (and perhaps participate in) the activities of U.S. EPA and OEHHA in developing guidance on unified approaches to performing quantitative risk assessments for cancer and non-cancer end points and in performing cumulative risk assessments. DPR scientists should stay abreast of current trends in exposure assessment, perhaps by having opportunities for specialized training, participation in scientific conferences, and engagement with workgroups and task forces that advance the science of exposure assessment.*

Response: Currently DPR uses U.S.EPA's Pesticide Handlers Exposure Database (PHED) to estimate worker exposures. DPR is evaluating the Agricultural Handler Exposure Task Force database (AHETF) for worker exposure, and plans to transition to the newer database as resources allow. Meanwhile, exposure assessors have begun providing calculations using the newest data to risk managers, to help them understand the impact of newer data on risk estimates.

DPR scientists involved with risk assessment are participating in numerous in-person trainings and online meetings and seminars. DPR has participated in several projects of the North American Free Trade Agreement (NAFTA) Technical Working Group on Pesticides, as well as in joint regulatory-industry exposure task forces formed in response to data call-ins. DPR communicates frequently with U.S. EPA, OEHHA, and Canada's Pest Management Regulatory Authority. The potential for application of scientific advances in risk assessment has increased these opportunities in recent years, and DPR expects that to continue. DPR is aware of several recent risk-assessment guidance documents released in recent years by U.S. EPA and OEHHA, and evaluation of these documents for usefulness to DPR's risk assessment program is being implemented in the risk assessment pilot project.

Chapter 4 – California Data to Inform Priority-Setting and Risk Assessment of Pesticides

Recommendation:

13. *Consideration should be given to expanding PUR reporting requirements to include licensed pesticide appliers, who would include those who perform applications for nonagricultural purposes in homes, institutions, and industries if not already required to do so. The resulting data would help to fill gaps in information about exposure from those types of pesticides uses.*

Response: California's pesticide use reporting program is recognized as the most comprehensive in the world. California has had pesticide use reporting in some form since at least 1950. The Food Safety Act of 1989 (Chapter 12001, AB 2161) gave the Department of Pesticide Regulation (DPR) clear statutory authority to require full reporting of pesticide use. That year, the department adopted regulations and full use reporting began in 1990. This system provided more realistic and comprehensive pesticide data to better inform DPR's pesticide regulatory programs. Over the years, these data have been used by many individuals and groups including government officials, scientists, growers, legislators, and public interest groups.

The PUR contains two kinds of records: production agricultural records and all others. For the PUR, production agricultural records represent applications made while producing agricultural commodities. Production agricultural applications include records for each application and the location to a square mile area (section, township, and range); all other applications are reported as a monthly summary by county. All pesticide use data required to be reported must be sent to county agricultural commissioners (CACs) who in turn, report the data to DPR.

California has a broad legal definition of "agricultural use," so the reporting requirements include pesticide applications in production agriculture, parks, golf courses, cemeteries, rangeland, pastures, and along roadside and railroad rights-of-way. In addition, all postharvest pesticide treatments of agricultural commodities must be reported along with all pesticide treatments in poultry and fish production and some livestock applications. All applications made by licensed applicators and outdoor applications of pesticides with the potential to pollute ground water must be reported. The primary exceptions to the reporting requirements are home-and-garden use and most industrial and institutional uses.

In the late 2000s, the counties worked together to develop a new standardized system, called CalAgPermits, which was in full use by 2011. It helps CACs in issuing restricted materials permits and provides an automated platform for validating and relaying pesticide use reports electronically to DPR. It accepts pesticide use reports electronically from subscriber-based firms and pesticide use reporting directly via the Web.

Over the last 5 years, an average of 3.3 million PUR records was submitted to DPR each year. Of these, 2.6 million records were production agricultural reports and 602,000 were monthly summary reports. Each production agricultural record represents one application. The monthly summary reports include the number of individual applications made; the average number of monthly summary applications per year over the last 5 years was 21 million. As resources become available, DPR will evaluate expanding pesticide use reporting for non-agricultural uses.

Recommendation:

14. *If resources allow, PUR data should be reviewed in relation to air-monitoring data and surveillance data on pesticide-related illness to determine whether any patterns are evident and to judge the accuracy of exposure assumptions or models.*

Response: DPR already reviews and evaluates PUR data in conjunction with air monitoring data and illness surveillance data to identify patterns and evaluate accuracy of exposure assumptions or models when appropriate. For example, DPR used this type of analysis to determine a regional use limit (township cap) for methyl bromide.
DPR plans to continue this work with the data from its air monitoring network <http://www.cdpr.ca.gov/docs/emon/airinit/air_network.htm>. See next response.

Recommendation:

15. *The integration of a component based on a geospatial-information system component into the PUR program should continue to be encouraged.*

Response: DPR is already implementing this recommendation as it always seeks ways to improve the geospatial-information component of the PUR program. The previous work to estimate air concentrations of methyl bromide and 1,3-dichloropropene using pesticide use data relied on total use within 1x1 mile sections. In the last few years, many county agricultural commissioners have started to record field locations using geographic information systems. DPR has obtained this data for the areas surrounding the sites included in its air monitoring network, and plans to attempt to correlate air concentrations with use at specific field locations.

Recommendation:

16. *Because surveillance programs like PISP (Pesticide Illness Surveillance Program) rarely capture more than a moderate percentage of cases, consideration should be given to improving the reporting of pesticide-related illness, for example, by improving training of*

clinicians, expanding the means by which cases can be reported, searching electronic health records, and possibly expanding the use of biomarkers. More accurate data on pesticide-related illness will support better priority-setting and aid in the development of problem formulation for conducting risk assessments of specific pesticides.

Response: DPR recognizes that a passive surveillance system, such as PISP, is not designed to provide perfect coverage of all possible pesticide-related illness cases. DPR's legal mandate identifies only one mechanism by which DPR receives reports of human pesticide-related illnesses. This mechanism is through the local county health officer, who files an illness report after a physician has reported any suspected pesticide-related illness within 24 hours of examination of a patient. To improve reporting, DPR has already undertaken a number of initiatives to identify additional potential illness reports:

- DPR contracts with the California Poison Control Centers to report pesticide-related cases directly to PISP,
- PISP receives some pesticide-related illness cases through the California Department of Public Health's (CDPH) California Reportable Disease Information Exchange system (CalREDIE),
- PISP scientists review "Doctor's First Reports of Occupational Illness and Injury," which is a Worker's Compensation document maintained by the CDPH to extract reports that may be related to pesticides,
- DPR staff screen online hazardous material spill reports,
- DPR staff review reports in the media,
- DPR staff review complaints from the general public that are made directly to a County Agricultural Commissioner's Office for possible pesticide illnesses that do not reach us through other reporting methods, and
- DPR staff review complaints made through CalEPA's Environmental Complaint Tracking System.
- In addition, DPR staff attends more than 50 events each year sponsored by organizations throughout the State where farm workers and their families are part of the intended audiences. Staff attends these events to communicate to farm workers and their families about pesticide risks and safety precautions. DPR also frequently interacts with worker advocate groups who inform DPR of farm worker concerns. These interactions inform DPR about pesticide-related health concerns of workers and their families. In addition, staff regularly attends the California Conference of Local Health Officers (CCLHO), Environmental Health Committee meeting. All California Local Health Officers (one for

each county, plus a few cities) belong to the CCLHO. Staff routinely report on PISP activities and discuss environmental health issues with scientific and medical experts.

The Office of Environmental Health Hazard Assessment (OEHHA) has the legal responsibility, in cooperation with local health officers, to develop and implement a medical education program to alert physicians and other health care professionals about the symptoms, diagnosis, treatment, and reporting of pesticide-related illnesses. For more details refer to the following link: <http://www.oehha.ca.gov/pesticides/programs/Helpdocs1.html>. OEHHA is also responsible for producing the document entitled "Medical Supervision of Pesticide Workers-Guidelines for Physicians," and physicians performing the duties of medical supervision must possess this document or be aware of the contents. OEHHA offers an online (and in-person) presentation for physicians, nurses, and pharmacists on the "Recognition, Management, and Reporting of Pesticide Illness," and another presentation geared specifically for physicians who are contracted as medical supervisors of agricultural workers who regularly handle cholinesterase-inhibiting pesticides. CDPH's CalREDIE program offers web-based training to local public health, environmental health, and agricultural staff who are responsible for pesticide illness reporting and investigation and who are new to CalREDIE. The training is an overview of pesticide illness reporting in California and the CalREDIE system.

RESPONSES TO COMMENTS IN THE REPORT

1. *Page 25 – Comment: DPR makes a number of conservative assumptions and decisions in the performance of its risk assessments. The conflation of a series of conservative assumptions and estimates regarding health effects thresholds and exposures and the application of uncertainty factors can result in scenarios that are well in excess of worst-case exposure even if each individual estimate in itself is scientifically defensible. Clarification of the outcomes of these worst-case scenarios can be achieved through comparison to a base case.*

Response: The risk assessments reviewed by the NRC Committee to prepare their report are screening-level assessments. In a screening-level assessment, DPR uses conservative assumptions. However, as DPR refines a risk assessment, more realistic assumptions are incorporated to provide a realistic estimate of risks. Beginning with risk assessments completed in 2015, DPR discusses impacts of assumptions and provides estimates where appropriate of risks using different assumptions. For example, in the final risk assessment for 1,3-dichloropropene dated December 31, 2015, cancer risk estimates for people residing in areas with high use are presented using different exposure assumptions including residence times of 30, 50, and 70 years and varying intervals within that time spent outside the high-use area.

2. *Page 26 – Comment: There are reasons for the differences in selection of models and thresholds, but the Silver Book points to the difficulty of using results of such analyses given the use of different models and model assumptions to characterize the model uncertainty associated with the BMD approach. DPR's rationale for selecting models is sometimes stated as seeking a more health-protective outcome, which is a judgement with an obscure scientific basis. In fact, there is a tendency in DPR's risk-characterization documents to intermix application of uncertainty factors (a quantifiable assumption based on accepted practice) and health-protective assumptions. Clear guidance and documents as to the approaches to and assumptions regarding such determinations would improve consistency and increase the integrity of the assessment outcome.*

Response: DPR selection of health-protective assumptions and models is implied to be somehow unscientific based on this comment. Scientific information on hazard, dose-response, and exposure is limited by numerous uncertainties that require use of model assumptions. These assumptions sometimes must rely on scientific judgment, and in such circumstances, the appropriate scientific approach is to err on the side of health protection. DPR's mission is to protect public health and the environment. In accordance with our mission, we select models that incorporate health-protective assumptions. To do otherwise would violate our core responsibility to the people of California.

3. *Page 29 – Box 3-1. The committee points out the discrepancies not to suggest that DPR's conclusions fall outside the reasonable bounds of scientific analysis (in fact, DPR has carefully justified its conclusions) but to illustrate DPR's tendency toward conservatism. They also raise a question about whether any attempts at harmonization between U.S.EPA and DPR were made. Finally, despite DPR's discussion of sources of uncertainty, its summary and conclusions do not indicate the considerable level of uncertainty and the degree of confidence that DPR has in its conclusion about the existence of an unacceptable cancer risk.*

Response: DPR will seek to improve the discussion of uncertainty with clarity and transparency. In addition to reviewing U.S. EPA's and OEHHA's guidance document on uncertainties, the World Health Organization has jointly sponsored with the International Labour Organization and the United Nations Environment Programme and published two excellent documents discussing uncertainty in risk assessments entitled: Part 1: Guidance Document on Characterizing and Communicating Uncertainty in Exposure Assessment (WHO 2008) and Guidance Document on Evaluating and Expressing Uncertainty in Hazard Characterization (WHO 2014). DPR intends to

use these documents to characterize its discussion of uncertainty. All of these documents will be reviewed and considered when DPR conducts risk assessments.

4. *Page 26 – Comment: DPR has a number of internal and external sources of risk-assessment guidance, but no overarching framework that instructs the DPR assessor as to the appropriate use and application of specific methods and guidelines appears to be available.*

Response: DPR recognizes the value of such a document. DPR will need to write additional guidance documents or revise existing guidance documents before it attempts to write an overarching framework. DPR will consider the resources available to write this document.

5. *Page 29 – Comment: When harmonization is impossible because of policy issues, the reasons for the differing approaches must be clearly elaborated and defended. In several instances, risk appraisals clearly point out the differences but do not elaborate on why the differences exist and why they were intractable.*

Response: DPR appreciates the observation and beginning with risk assessments completed in 2015, DPR provides additional explanation for differences in approach between U.S.EPA and DPR. For example, in the draft chlorpyrifos risk assessment dated December 31, 2015 the risk appraisal section specifies where DPR's use of California-specific information led to differences in exposure estimates. The draft dicrotophos risk assessment dated December 30, 2015 described differences in approaches by DPR and U.S. EPA to benchmark dose modeling and review of dermal absorption studies and resulting differences in risk estimates.

6. *Page 35 – Comment: To the extent possible, DPR should partner with other agencies and organizations to obtain state-specific estimates of drinking-water consumption and concentrations of evaluated pesticides in drinking water to develop customized and site-specific exposure assessments for this pathway.*

Response: DPR evaluates California-specific drinking water data from several sources. These sources include:

- The State Water Resources Control Board database of surface and ground water samples
- DPR's database of surface water samples in California
- DPR's database of ground water samples in California
- The USDA's Pesticide Data Program (PDP) database of samples from municipal California drinking water, wells used for potable water, and bottled water.

7. *Page 36 – Comment: U.S.EPA has an initiative under way to revise its risk-assessment methods for workers. This presents an opportunity for DPR to collaborate with U.S.EPA on these important issues.*

Response: DPR has actively collaborated with U.S.EPA in assessing the risks of workers handling pesticides and harvesting and carrying out other tasks in treated crops. For many years DPR has participated with U.S. EPA and Health Canada's Pest Management Regulatory Agency (PMRA) in Joint Regulatory Committees that oversee registrant efforts in collecting new exposure monitoring data. To an extent limited by resources and other priorities, DPR has shared reviews of submitted exposure monitoring studies with U.S. EPA and PMRA. DPR will continue to collaborate in the future.

8. *Page 36 – Comment: California-specific data on environmental exposure to pesticides are also being collected (by others). It might be useful for DPR to review the scientific literature periodically for relevant information and new developments that could inform its exposure assessments.*

Response: DPR conducts a thorough review of the scientific literature prior to conducting each exposure assessment. DPR scientists are continuously reviewing the scientific literature and attending scientific symposia to identify the most appropriate and scientifically accepted methods for conducting risk assessments.

DPR is grateful to the NRC for its insightful review. We are confident that actions taken in response to the NRC's comments and recommendations will strengthen the risk-assessment process.

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