Notice of Determination

Appendix D

To:
☒ Office of Planning and Research

U.S. Mail:	*Street Address:*
P.O. Box 3044	1400 Tenth St., Rm 113
Sacramento, CA 95812-3044	Sacramento, CA 95814

☐ County Clerk
County of: ______
Address: ______

From:
Public Agency: Ca. Dept. of Food & Agriculture
Address: 1220 N Street, Rm 221

Contact: Laura Petro
Phone: 916-403-6628

Lead Agency (if different from above):

Address: ______

Contact: ______
Phone: ______

SUBJECT: Filing of Notice of Determination in compliance with Section 21108 or 21152 of the Public Resources Code.

State Clearinghouse Number (if submitted to State Clearinghouse): 2011062057

Project Title: Statewide Plant Pest Prevention & Management Program EIR (PEIR) - Addendum No. 1

Project Applicant: California Department of Food & Agriculture - Plant Health & Pest Prevention Services Division

Project Location (include county): Statewide

Project Description:
Addendum No. 1 to the PEIR certified on December 24, 2014. CDFA proposes changing the PEIR to include Merit 2F urban/residential turf applications as part of the Japanese Beetle Program. These changes are minor modifications to the PEIR within CDFA's jurisdiction, will be subject to management practices and mitigation measures described in the PEIR, and will result in no additional significant environmental impacts beyond those already identified in the PEIR. (CEQA Guidelines, 15164,15162, 15163.) The Addendum includes an evaluation and explanation of the decision not to prepare a subsequent EIR supported by substantial evidence. (Guidelines 15164(b)(d)(e).)

This is to advise that the California Department of Food & Agriculture has approved the above
(☒ Lead Agency or ☐ Responsible Agency)

described project on 7/15/16 (date) and has made the following determinations regarding the above described project.

1. The project [☒ will ☐ will not] have a significant effect on the environment.
2. ☒ An Environmental Impact Report was prepared for this project pursuant to the provisions of CEQA.
   ☐ A Negative Declaration was prepared for this project pursuant to the provisions of CEQA.
3. Mitigation measures [☒ were ☐ were not] made a condition of the approval of the project.
4. A mitigation reporting or monitoring plan [☒ was ☐ was not] adopted for this project.
5. A statement of Overriding Considerations [☒ was ☐ was not] adopted for this project.
6. Findings [☒ were ☐ were not] made pursuant to the provisions of CEQA.

This is to certify that the final EIR with comments and responses and record of project approval, or the negative Declaration, is available to the General Public at:

______

Signature (Public Agency): Laura Petro   Title: Environmental Program Mgr I

Date: 7/18/16   Date Received for filing at OPR: JUL 18 2016

Governor's Office of Planning & Research
STATE CLEARINGHOUSE

Authority cited: Sections 21083, Public Resources Code.
Reference Section 21000-21174, Public Resources Code.

Statewide Plant Pest Prevention and Management Program EIR (PEIR) ADDENDUM NO. 1

1. Introduction

This document is Addendum No. 1 to the Statewide Plant Pest Prevention and Management Program Environmental Impact Report (PEIR) prepared by the California Department of Food and Agriculture (CDFA). The PEIR is intended to provide the public, responsible agencies, and trustee agencies with information about the potential environmental effects of implementation of the Statewide Plant Pest Prevention and Management Program (Statewide Program). The Final PEIR was prepared in compliance with the California Environmental Quality Act (CEQA) of 1970 (as amended) and the State CEQA Guidelines (Title 14, California Code of Regulations Section 15000 et seq.) (CEQA Guidelines). The Final PEIR was certified on December 24th, 2014 by Karen Ross, Secretary. California Department of Food and Agriculture was the Lead Agency. A Notice of Determination was filed with the Office of Planning and Research.

CDFA is proposing changes to the PEIR and Statewide Program to include Merit® 2F turf applications to the Japanese Beetle Program. Under CEQA, an addendum may be prepared when minor modifications are proposed for a project that has already been approved and when no additional significant environmental impacts would result. (CEQA Guidelines, §§ 15164, 15162, 15163.) Addendum No. 1 evaluates whether any new significant impacts or a substantial increase in the severity of previously identified significant impacts would result from implementation of the proposed modification.

2. Purpose of Addendum

The purpose of this addendum is to include the turf application scenario in the Japanese Beetle Program in the PEIR. Under CEQA, the lead agency or a responsible agency shall prepare an addendum to a previously-certified EIR if some changes or additions are necessary to the prior EIR, but none of the conditions calling for preparation of a subsequent or supplemental EIR have occurred. (CEQA Guidelines, § 15164.) Once an EIR has been certified, several approaches can be used to achieve CEQA compliance for specific activities. A subsequent EIR is only required when the lead agency or responsible agency determines that one of the following conditions has been met:

(1) Substantial changes are proposed in the project, or substantial changes occur with respect to the circumstances under which the project is undertaken, which require major revisions of the previous EIR due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects (CEQA Guidelines, § 15162 (a)(1),(2));

(2) New Information of substantial importance, which was not known and could not have been known with the exercise of reasonable diligence at the time the previous EIR was certified as complete, shows any of the following:

a. The Project will have one or more significant effects not discussed in the previous EIR;

b. Significant effects previously examined will be substantially more severe than shown in the previous EIR;

c. Mitigation measures or alternatives previously found not to be feasible would in fact be feasible and would substantially reduce one or more significant effects of the project, but the project proponents decline to adopt the mitigation measure or alternative; or

d. Mitigation measures or alternatives which are considerably different from those analyzed in the previous EIR would substantially reduce one or more significant effects on the environment, but the project proponents decline to adopt the mitigation measures or alternatives (CEQA Guidelines, §15162(a)(3)).

If one or more the conditions described above for a subsequent EIR exist, but only minor additions or changes would be necessary to make the previous EIR adequately apply to the project in the changed situation, then the lead agency may prepare a supplement to a EIR rather than a subsequent EIR. (CEQA Guidelines, §15163(a).)

A CEQA Addendum is the appropriate CEQA compliance document when changes or additions are necessary to an EIR, but none of the conditions described in Section 15162 calling for preparation of a subsequent EIR have occurred. (CEQA Guidelines, § 15164(a).) The CEQA Guidelines recommend that a brief explanation of the decision to prepare an addendum rather than a subsequent or supplemental EIR be included in the record. (CEQA Guidelines, §15164(e).)

This Addendum has been prepared because the proposed modifications to the PEIR do not meet the conditions for a subsequent or supplemental EIR. This Addendum explains why the proposed modifications would not result in new significant environmental effects or result in a substantial increase in the severity of previously-identified significant effects. There is no new information demonstrating that the proposed modifications would have new effects or more severe effects on the environment or would not change the conclusions of the previously-certified Final PEIR.

An addendum does not need to be circulated for public review, but rather can be attached to the final EIR. (CEQA Guidelines, §15164(c).) Prior to initiating the modified Project, the CDFA will consider this Addendum together with the Final PEIR and make a decision regarding the modified Project. (CEQA Guidelines, §15164(d).)

3. Statewide Program Environmental Impact Report Overview

CDFA is mandated to prevent the introduction and spread of injurious insect or animal pests, plant diseases and noxious weeds in California. (Cal. Food & Ag. Code § 403.) To accomplish this, CDFA implements the Statewide Program, an ongoing effort to protect California's agriculture and the environment from the damage caused by invasive plant pests.

The Statewide Program encompasses a range of phytosanitary measures for the purpose of preventing the introduction and/or spread of quarantine pests or limiting the economic impact of regulated non-quarantine pests. The activities include prevention, exclusion, management, and control carried out or overseen by CDFA against specific injurious pests and their vectors, throughout California.

Program activities may occur anywhere that a pest is (or may be) found in agricultural or nursery settings (in cooperation with commercial growers), in residential communities, at California Border Protection Stations and sometimes outside California (for activities conducted by others besides CDFA, in response to restrictions on importation of potentially infested commodities and equipment from outside the state). The location, area and extent of specific activities under the Statewide Program ultimately would be evaluated based on the site-specific situation and dictated by the target pest, the regulatory requirements and management approaches available for response.

Activities that would be conducted under the Statewide Program include pest risk analysis (evaluation of the pest's environmental, agricultural, and biological significance), identification, detection and delimitation of new pest populations, and pest management required responses that may include rapid eradication, suppression or containment including prevention of the movement of plant pests into and within California.

The Statewide Program falls under the CDFA Plant Health and Pest Prevention Division. The Division is divided into four branches. All phytosanitary measures related to pest management activities are carried out or overseen by one of the branches under the oversight of the Division Director. The four branches are:

- **Plant Pest Diagnostics Branch**, a scientific resource for providing information on pests and making all official identifications and diagnoses for suspect pests and diseases;
- **Pest Detection/Emergency Projects Branch**, initiates and operates programs which carry out phytosanitary procedures of control including suppression, containment or eradication and treatments of priority pests to prevent establishment;
- **Pest Exclusion**, initiates prevention and exclusion to keep priority pests out of the state of California and to prevent or limit the spread of newly discovered pests in the role of quarantine regulatory compliance and service to the agricultural industry and the public; and
- **Integrated Pest Control Branch,** conducts a wide range of pest management and eradication programs in cooperation with growers, county agricultural commissioners and federal and state agencies and non-governmental organizations.

The Statewide Program is ongoing, and future activities that may be conducted following the CEQA process are referred to as the "Proposed Program." The PEIR evaluated the potential environmental impacts that could result from implementation of the range of activities that CDFA may conduct or oversee as part of the Statewide "Proposed Program" at that time. The PEIR serves as a program-level, first-tier document, and also provided project-level detail where it was feasible to do so. The PEIR was intended to be a flexible and efficient foundation to facilitate implementation of the Statewide "Proposed Program" activities and, if needed, preparation of a tiered, project-level CEQA analysis. Such future activities include both the Statewide "Proposed Program" activities that are specifically identified in the PEIR, as well as other pest prevention and management activities not specifically identified in the PEIR.

As part of the Statewide PEIR, seven application scenarios were analyzed in the PD/EP Activities. These application use scenarios include type of chemical, concentration of chemical, application method, rate of application, area of application settings, and duration/frequency of application. The chemical use scenarios were uniquely identified by program name, chemical and identifying number. An example would be PD/EP-E-01. For further information please refer to the Statewide PEIR (Volume 1, Main Body & Volume 3, Appendix B). The chemical Merit® 2F, the treatment equipment (mechanically pressurized sprayer), and the setting (urban/residential) were previously analyzed in the Statewide PEIR.

4. Proposed Modification to Statewide Program Scenario

As identified in the PEIR, to prevent the entrance of Japanese Beetle (JB) in California, CDFA currently enforces the Japanese Beetle Exterior Quarantine, Title 3 of the California Code of Regulations, Section 3280, restricting movement of host commodities and possible carriers. CDFA also enforces the Japanese Beetle Federal Domestic Quarantine, Title 7 of the Code of Federal Regulations, Section 301.48. CDFA has an active eradication program in place for any incipient populations of JB per the requirements of the U.S. Domestic Japanese Beetle Harmonization Plan.

CDFA conducts statewide detection trapping to intercept JB, and a single beetle find in a trap may trigger a delimitation survey to further identify the significance of the find. If further detection and trapping indicates that JB may be present in numbers or life stages above a specific threshold, and eradication is determined to be feasible, an eradication project may be initiated. The PEIR's JB Program description and analysis included foliar and soil applications with respect to JB residential treatments. Currently, the PEIR describes the PDEP-E-04 scenario using Merit® 2F Insecticide that can be applied as a soil drench using a backpack sprayer or mechanically pressurized system.

The CDFA is proposing to include the turf application scenario because the JB are destructive plant pests, both as grubs (larvae) and adults. Adults feed on the foliage and fruits of several hundred species of fruit trees, ornamental trees, shrubs, vines and field and vegetable crops. Adults leave behind skeletonized leaves and large irregular holes in leaves. The grubs develop in the soil, feeding on the roots of various plants and grasses and often destroying turf in lawns, parks, golf courses, and pastures. Today, the Japanese Beetle is the most widespread turf-grass pest in the United States. Efforts to control the larval and adult stages are estimated to cost more than $460 million a year. Losses attributable to the larval stage alone have been estimated at $234 million per year - $78 million for control costs and additional $156 million for replacement of damaged turf.

The $78 million for control costs represents increased pesticide use in areas east of the Rocky Mountains where JB is established and there is no attempt to eradicate it as it is not feasible. These are the pest control management costs that come with having to "live with" the JB. JB has severe impacts on our urban/residential environment affecting homeowners and it is critical to be able to address all life stages of the JB.

Based on input from sister agencies and the CDFA's JB Science Advisory Panel (JBSAP) recommendations for JB control in December 2015, CDFA is proposing to include turf applications to the JB Program description. Turf applications are similar to the foliar and soil applications already analyzed in the PEIR because they use the same backpack sprayer or mechanically pressurized system. The application of Merit® 2F could occur in residential setting with drench applications made to turf (lawns/golf courses) and ornamental ground cover (including flowers and containerized plants), recreational areas, and commercial settings using a mechanically pressurized sprayer. Additionally, larger areas such as school athletic fields or cemeteries could receive applications made with a small low pressure boom sprayer.

CDFA will follow existing management practices (MPs) and mitigation measures for activities conducted under the Statewide PEIR including general MPs such as conducting a site assessment, following appropriate treatment procedures, training personnel in proper use of pesticides, and enforcing runoff and drift prevention. (See Statewide PEIR, Volume 1_Main Body, Section 2.11 Program Management Practices.)

The addition of the JB turf treatment with Merit® 2F would be added as PDEP-EP-E-08 scenario, a residential, turf, groundcover and ornamental treatment. The Human Health (HHRA) and Ecological Risk Assessments' (ERA) (Appendix 1A) analysis of PDEP-EP-E-08 provides substantial evidence that the proposed modification would not have any adverse environmental effects and would not change the conclusions of the previously-certified Final PEIR. (See Appendix 1A, Executive Summary HHRA and ERA, Problem Statement HHRA and ERA and Conclusions.)

5. Analysis of Potential Environmental Impacts Associated with the Proposed Modifications

Appendix 1A includes an ERA and HHRA. The ERA and HHRA were conducted to determine if the Merit® 2F PDEP-EP-E-08 turf application scenario would result in any additional or more severe environmental impacts other than those addressed in the Statewide PEIR. This scenario was analyzed as a turf drench application using a mechanically pressurized sprayer with low pressure application with Merit® 2F for the eradication of JB. The methods used in the ERA and HHRA largely follow those methods used in the previous risk assessments in the Statewide PEIR. Where methods differ, the new assumptions or receptors are discussed.

The Merit® 2F Residential Turf ERA along with the Statewide PEIR was used to assist CDFA in assessing the potential to affect particular species and develop site-specific measures to protect these species. This ERA did not identify new significant effects beyond those identified in the PEIR. No alterations or mitigation measures to PD/EP-E-08 scenario that were not already indicated for other scenarios in the Statewide PEIR are recommended for the protection of biological resources. (See Appendix 1A ERA.)

The Merit® 2F HHRA along with the Statewide PEIR was used to assist CDFA in assessing potential impacts to human health. The HHRA did not identify any new significant human health impacts or any substantial increase in the severity of the significant effects identified in the PEIR. No alterations to PD/EP-E-08 that were not already indicated for other scenarios in the PEIR are recommended. (See Appendix 1A HHRA).

6. Conclusions

The "Merit® 2F Residential Turf, Japanese Beetle Eradication Program, Human Health and Ecological Risk Assessment" did not identify any new significant environmental effects or a substantial increase in the severity of the significant effects identified in the Final PEIR. (See Appendix 1A.)

7. References

"Action Plan for Japanese Beetle, *Popillia japonica* (Newman)", May 2000, California Department of Food and Agriculture, Plant Health and Pest Prevention Services.

California Department of Food and Agriculture. 2016. Japanese Beetle (JB). (Accessed July 11, 2016) https://www.cdfa.ca.gov/plant/JB/index.html.

Japanese Beetle California Exterior Quarantine, Section 3280, Title 3, California Code of Regulations.

Japanese Beetle Federal Domestic Quarantine, Section 301.48, Title 7, Code of Federal Regulations.

"Merit® 2F Residential Turf, Japanese Beetle Eradication Program, Human Health and Ecological Risk Assessment", May 2016. Blankinship & Associates, Inc.

"Statewide Plant Prevention and Management Program Environmental Impact Report", certified December 24, 2014. Accessed June 28, 2016: http://www.cdfa.ca.gov/plant/peir/.

U.S. Domestic Japanese Beetle Harmonization Plan", Revised March 4, 2016. National Plant Board. Accessed June 28, 2016: http://nationalplantboard.org/japanese-beetle-harmonization-plan/.

APPENDIX 1A

California Department of Food and Agriculture
Statewide Plant Pest Prevention and Management Program

Human Health and Ecological Risk Assessments

Merit 2F Residential Turf, Japanese Beetle Eradication Program

Prepared for:

California Department of Food and Agriculture
1220 N Street
Sacramento, CA 95814

Contact:
Laura Petro
(916) 654-0317

Prepared by:

Blankinship & Associates, Inc.
1590 Drew Ave, Suite 120
Davis, CA 95616

Contact:
Mike Blankinship
530-757-0941

and

Ardea Consulting
10 1st Street
Woodland, CA 95695

Contact:
Joseph P. Sullivan, Ph.D.
(530) 669-1645

July 12, 2016

APPENDIX 1A

Contents

Tab 1: Ecological Risk Assessment (67 pages)

Tab 2: Human Health Risk Assessment (57 pages)

Tab 1:

Ecological Risk Assessment (67 pages)

APPENDIX 1A

California Department of Food and Agriculture
Statewide Plant Pest Prevention and Management Program

Ecological Risk Assessment

Merit 2F Residential Turf, Japanese Beetle Eradication Program

Prepared for:

California Department of Food and Agriculture
1220 N Street
Sacramento, CA 95814

Contact:
Laura Petro
(916) 654-0317

Prepared by:

Joseph P. Sullivan, Ph.D.
Primary Author
Ardea Consulting
10 1st Street
Woodland, CA 95695

and

Blankinship & Associates, Inc.

1590 Drew Ave, Suite 120
Davis, CA 95618

Contact:

Mike Blankinship
530-757-0941

July 12, 2016

TABLE OF CONTENTS

TABLE OF CONTENTS **2**
LIST OF TABLES **3**
LIST OF FIGURES **3**
LIST OF APPENDICES **3**
LIST OF ABBREVIATIONS **4**
Executive Summary **8**
1 Introduction **10**
1.1 Purpose of the Ecological Risk Assessment 10
1.2 Approach 10
2 Problem Formulation **11**
2.1 Chemical Use Scenarios 11
2.2 Active and Inert Ingredients of Concern and Environmental Fate Properties 12
2.3 Environmental and Ecological Settings 12
2.4 Assessment Endpoints and Measures of Ecological Effect 12
2.4.1 Assessment Endpoints 13
2.4.2 Measurement Endpoints 13
2.5 Surrogate Species Selection 14
2.6 Conceptual Site Models 14
2.6.1 Pest Detection/Emergency Programs (PD/EP) 15
2.7 Analysis Plan 15
3 Exposure Assessment **18**
3.1 Acute and Chronic Exposure 18
3.2 Assumptions for Exposure Following Turf Drench Application 18
3.2.1 Soil Concentrations 19
3.2.2 Concentration in/on Vegetation 19
3.2.3 Concentrations in Insects 20
3.3 Aquatic Estimated Environmental Concentrations 20
3.3.1 Surface Water Concentrations of Pesticide Active and Inert Ingredients and Adjuvants 20
3.3.2 Tissue Concentrations in Aquatic Organisms 23
3.4 Terrestrial Exposure Assessment 23
3.4.1 Estimated Environmental Concentrations (EECs) 23
3.4.2 Area Use Factor 23
3.4.3 Honey Bee and Nontarget Insect Exposure 24
4 Effects Assessment **24**
5 Risk Characterization **26**
5.1 Potential for a Species to Be Present at the Application Site 27
5.2 Foraging Diet 27
5.3 Dilution and Degradation of Chemicals 28
5.4 Risk Analysis for the Pest Detection/Emergency Programs Turf Drench Applications 28
5.4.1 Risk Associated with Turf Drench Applications with Merit 2F 29
6 Uncertainties **33**
6.1 Exposure Assessment Uncertainties 33
6.1.1 Application Scenarios 34

6.1.2 Aquatic Exposure Assessment 34
6.1.3 Marine/Estuarine Exposure Assessment 35
6.1.4 Terrestrial Exposure Assessment 35
6.1.5 Exposure of Birds and Mammals to Aquatic Prey 36
6.2 Effects Assessment Uncertainties 36
6.2.1 Use of Surrogate Species Effects Data 36
6.2.2 Sublethal Effects 37
6.2.3 Dermal or Inhalation Effects 37
7 Conclusions 37
8 Literature 38

LIST OF TABLES

Table Eco-1. Acute Ecotoxicity Categories for Terrestrial and Aquatic Organisms. 25
Table Eco-2. Potential risk associated with Application Scenario PD/EP-E-08: Turf drench applications of Merit 2F at 0.4 lb a.i./Acre to 640 acres in a residential/urban setting. 32

LIST OF FIGURES

Figure Eco-1. Conceptual Site Model for residential applications that may be made as part of CDFA's Pest Detection/Emergency Programs. 17

LIST OF APPENDICES

Appendix A – Toxicity Reference Values .... Eco-A
Appendix B – Estimated Environmental Concentrations .... Eco-B
Appendix C – Surrogate Species Life History Information .... Eco-C
Appendix D – Surface Water Concentration Calculator Results .... Eco-D
Appendix E – Program Material Data Sheet (PMDS) .... Eco-E

LIST OF ABBREVIATIONS

A.....Applicator
Ac.....Acre
ACP.....Asian Citrus Psyllid
a.i.....Active Ingredient
AI.....Acute Intake
AIUF.....Aquatic Invertebrate Uptake Factor
ATSDR.....Agency for Toxic Substances Disease Registry
AUF.....Area Use Factor
BCF.....Bioconcentration Factor
BMF.....Biomagnification Factor
BMP.....Best Management Practices
bw.....Body Weight
CDFA.....California Department of Food and Agriculture
CF.....Conversion Factor
CSM.....Conceptual Site Model
DFR.....Dislodgeable Foliar Residue
DL.....Detection Limit
DPR.....California Department of Pesticide Regulation
DSD.....Droplet Size Distribution
DTSC.....California Department of Toxic Substances Control
dw.....Dry Weight
EC, E.....Emulsifiable Concentrate
EEC.....Estimated Environmental Concentration
EFH.....USEPA’s Exposure Factors Handbook: 2011 Edition (USEPA, 2011)
EGVM.....European Grapevine Moth
EIR.....Environmental Impact Report
ERA.....Ecological Risk Assessment
ESU.....Evolutionary Significant Units
ET.....Exposure Time
EXAMS.....Exposure Analysis Modeling System

EXPRESS ....EXAMS-PRZM Exposure Simulation Shell
F ....Flowable
FIFRA ....Federal Insecticide, Fungicide and Rodenticide Act
FIR ....Food Intake Rate
GRAS..Generally Recognized As Safe
GWSS ....Glassy-Winged Sharpshooter
HHRA ....Human Health Risk Assessment
HLB...Huanglongbing
IGR...Insect Growth Regulator
IPC ....Integrated Pest Control
IRIS ....Integrated Risk Information System
I_{rs} ....Soil Ingestion Rate
IRV...Vegetation Ingestion Rate
KABAM...K_{ow} Aquatic BioAccumulation Model
K_d ....Soil-Water Partition Coefficient
K_{oa} ....Octanol-Air Partition Coefficient
K_{oc} ....Organic Carbon Absorption Coefficient
K_{ow} ....Octanol-Water Partition Coefficient
LBAM ....Light Brown Apple Moth
LO(A)EL/LOAEL..Lowest Observable (Adverse) Effect Level
LOC...Level of Concern
LOEC ....Lowest Observable Effect Concentration
MAT..Male Attractant Technique
MCL ....Maximum Contaminant Level
MW ....Molecular Weight
NA...Not Applicable
NDA ....No Data Available
NO(A)EL/ NO(A)EL ....No Observable (Adverse) Effect Level
NOC ....Not Of Concern
NOEC..No Observable Effect Concentration
NRCS ....National Resources Conservation Service
NWI...Normalized Water Intake Rate
OEHHA...Office of Environmental Health Hazard Assessment

PDCP..Pierce's Disease Control Program
PDEP-D..Pest Detection/Emergency Projects - Detection
PE5..PRZM-EXAMS Model Shell Version 5.0
PEDP-D..Pest Detection/Emergency Projects - Detection
PEIR..Programmatic Environmental Impact Report
PHI ....Pre Harvest Intervals
PRZM..Pesticide Root Zone Model
PUR...Pesticide Use Reporting
RED...Reregistration Eligibility Decision
REI ....Restricted Entry Interval
RQ ....Risk Quotient
S ....Solution
SC..Suspension Concentrate
SCLP ....Straight Chain Lepidopteran Pheromone
SG ....Water Soluble Granule
SL ....Slurry
SLN ....Special Local Needs
SPLAT ....Specialized Pheromone and Lure Application Technology
Statewide PEIR ....Statewide Plant Pest Prevention and Management Program, Environmental Impact Report, Volume 2 - Appendix A, Ecological Risk Assessment, SCH # 2011062057
SWCC ....Surface Water Concentatration Calculator
TGAI ....Technical grade of the active ingredient
T-REX..Terrestrial Residue Exposure
TRV...Toxicity Reference Value
TWA ....Time Weighted Average
UE ....Unit Exposure
UF ....Uncertainty Factor
UH...Upland Hydrology
ULV ....Ultra Low Volume
USEPA..U.S. Environmental Protection Agency
VADOFT ....Vadose Zone Fate and Transport Model

VFSMOD-W...Vegetative Filter Strip Modeling System
VUF...Vegetation Uptake Factor
WHO ....World Health Organization
WI ....Water Intake Rate
WP..Wettable Powder
WSP ....Water Soluble Packet

Executive Summary

This Ecological Risk Assessment is conducted as an addition to the Ecological Risk Assessment conducted as part of the Statewide PEIR. A new scenario for a turf drench application with Merit 2F for the eradication of Japanese Beetles was assessed. The methods used in this risk assessment largely follow those methods used in the previous risk assessment in the Statewide PEIR. Where methods differ, the new assumptions or receptors are discussed.

The application of Merit 2F could occur in residential settings with drench applications made to turf and ornamental ground cover using a mechically pressurized sprayer. Urban residential settings considered included homes, parks, schools, sports fields, commercial settings, cemeteries, greenbelts, and road sides. For example, larger areas such as school athletic fields or cemetaries could receive applications made with a boom sprayer. Either spray equipment can be adjusted for low pressure applications low to the ground to reduce or eliminate spray drift. Either application area would be followed by water to wash the pesticide product into the soil. No adjuvants were included in the application scenario.

Similar methods were used to identify toxicity endpoints as were used for the Statewide PEIR. Similar surrogate species were used with the addition of being able to assess chronic effects on insects such as the honey bee since new assessment methods have been developed. Where appropriate and necessary, assumptions regarding exposure routes were used due to the somewhat unique nature of a turf drench application with the pesticide initially applied directly to foliage to be washed off into the soil beneath. Updated U.S. EPA models such as the Surface Water Concentration Calculator were used in an effort to employ the most current methods and models available.

The ERA relied upon the three stage process for risk assessments: problem formulation, analysis, and risk characterization. In the problem formulation phase, CDFA and its risk assessment team consulted with DPR and OEHHA to determine the appropriate scenarios to assess, models to evaluate exposure, default data assumptions, and appropriate toxicity effects representations based on scientific literature. The problem formulation stage concluded with a CSM that identified the complete exposure pathways carried forward in the analysis based on information that was available to evaluate the potential exposure pathway. During the analysis phase of the ERA, detailed exposure was estimated with models incorporating appropriate data and conservative assumptions. Also in the analysis phase, effect values were developed which incorporated the toxicity properties of the chemicals along with safety factors used to address uncertainty. The risk characterization phase provided conclusions on the potential for adverse effects to occur to ecological receptors. The risk characterization phase utilized both a quantitative and qualitative assessment. If the estimated RQ was below the LOC, it was concluded that the potential for adverse effects is low. If the estimated RQ was above the LOC, a qualitative assessment was conducted to incorporate information that the quantitative models are not capable of considering appropriately.

In some situations where the quantitative assessment indicated the RQ was below the LOC, it was concluded that the potential for adverse effects was low. When the RQ was above the LOC, several qualitative considerations typically resulted in a conclusion that the potential for adverse

effects would be low. This includes an assessment of the potential for species presence at an actual site, incorporation of foraging range and diet, in addition to fate and transport processes such as dilution and degradation.

In the ERA, few groups of ecological receptors were found to have RQs that exceeded LOCs. These include terrestrial-phase amphibians that consume largely terrestrial insects, insectivorous birds, mammals that feed on turf or insects, aquatic invertebrates, soil-dwelling invertebrates, and insects. CDFA's BMPs are designed to greatly reduce, if not eliminate, movement to surface water. Therefore actual impacts to aquatic invertebrates are anticipated to be minimal. Because of the targeted nature of the application on turf and low-growing groundcover, only those insects dwelling on those plant types would be directly exposed. Most insects, such as flying insects, would receive very limited exposure. Thus, most insects and insectivorous species are anticipated to be exposed to a limited extent and impacts would be minimal.

This ERA will be used to assist CDFA in assessing potential to affect particular species and developing site-specific measures to protect these species.

1 Introduction

This Ecological Risk Assessment (ERA) is for a single application scenario within the California Department of Food and Agriculture's (CDFA) Pest Detection/Emergency Program (PD/EP) for the eradication of Japanese Beetles in an urban setting. This document is an addendum to the Statewide Plant Pest Prevention and Management Program, Environmental Impact Report, Volume 2 - Appendix A, Ecological Risk Assessment, SCH # 2011062057 (Statewide PEIR).

1.1 Purpose of the Ecological Risk Assessment

The ERA assesses potential future activities to be conducted under CDFA's Proposed Program. Specifically, the ERA focuses on chemical applications that may be conducted under the Proposed Program to eradicate Japanese Beetle. The ERA evaluates the potential risk to terrestrial and aquatic species following such chemical applications.

1.2 Approach

A detailed discussion of the approach for the ERA process is provided in the Statewide PEIR.

This ERA was conducted by using models and exposure data developed primarily by the US EPA in the context of typical application methods and settings in California. The ERA depends on these US EPA exposure models to estimate environmental concentrations and risk estimates in lieu of observed adverse effects. The majority of these models, described in detail in the applicable sections of the Statewide PEIR, are Microsoft Excel-based user interface packages which allow for input of information specific to the Proposed Program, as well as default data when site-specific data is not available. Since multiple models were required for this ERA and some models require the output of previous models as its input, it was convenient to integrate several models into one Excel workbook so that information from all models could be combined into a single risk estimate as the final output for each pesticide application scenario. This Excel workbook is referred to as the Comprehensive Risk ANalysis Kalculator (CRANK), providing a consolidated tool to estimate risk for the ERA (as well as the Human Health Risk Assessment).

To present information that serves as inputs for the various models used in this ERA in an organized and efficient manner, a Microsoft Access database with a custom user interface was created. This Microsoft Access database is referred to as the **Dashboard Database**.

The database specifically contains the following information:

- Specific details of each chemical application scenario, including application rates, number of applications, application intervals, method of application, application area, etc.
- Pesticide product formulations, including concentration of active ingredient and to the extent information is available, inert ingredients and adjuvents.
- Physical properties of the chemicals considered in the ERA, including half life, degradation rate, vapor pressure, solubility, molecular weight, octanol-water coefficient (Log K_{OW}) and soil adsorption coefficient (Log K_{OC})
- Toxicological properties of the chemicals considered in the ERA, such as toxicity reference values (TRVs)

- Summary of active ingredient fate characteristics and environmental effects based on published literature
- Model specific inputs and outputs
- Tissue concentrations based on dietary exposure model results
- Size of species home and foraging ranges
- Soil concentration estimation results
- Water concentration estimation results
- Individual RQs for all surrogate species for each chemical ingredient
- Total RQs for all surrogate species for combined chemical ingredients used in an application scenario.

2 Problem Formulation

Problem formulation is the first step in the ERA process. Its purpose is to establish the goals, breadth, and focus of the assessment through a systematic process to identify the major factors to be considered in the assessment. As discussed in the Statewide PEIR, CDFA and the risk assessment team involved staff from DPR and OEHHA during the problem formulation to facilitate the exchange of information to ensure this ERA meets both the public outreach and scientific goals desired by CDFA for the Proposed Program.

Problem Formulation integrates available information (sources, contaminants, effects, and environmental setting) and serves to provide focus to the ERA. Additional details regarding the Problem Formulation are available in the Statewide PEIR.

2.1 Chemical Use Scenarios

Details regarding the application of chemicals that impact the estimation of potential risk are:

- Type of chemical
- Concentration of chemical
- Application method (*e.g.*, soil injection, fumigation, spraying)
- Duration and frequency of applications
- Rate of application
- Area of application
- Setting in which activity would occur (*e.g.*, agriculture, residential)

The primary objectives of the Pest Detection/Emergency Program (PD/EP) are the early detection and prompt eradication of serious agricultural pests from California including, but not limited to, exotic fruit flies, Japanese beetle, light brown apple moth, khapra beetle, gypsy moth, European corn borer, and European pine shoot moth. Eradication activities conducted under PD/EP are performed under the Pest Detection/Emergency Program – Eradication. Activities vary based on target pest and include pesticide application in a residential setting.

As part of the Statewide PEIR, seven application scenarios were analyzed with in the PD/EP. The application scenario analyzed in this ERA was not substantially similar to any of those scenarios. In the PEIR, a soil drench, rather than a turf drench application, with Merit 2F was analyzed. In this assessment, a single pesticide product applied in a single manner was considered. The use of Merit 2F (a.i.-imidacloprid, inert-glycerin) for the eradication of Japanese beetles in an urban/residential setting was considered. The application of Merit 2F could occur in residential settings with drench applications made to turf and ornamental ground cover using a mechically pressurized sprayer. Additionally, larger areas such as school athletic fields or cemetaries could receive applications made with a boom sprayer. Either spray equipment can be adjusted for low pressure applications low to the ground to reduce or eliminate spray drift. Either application area would be followed by water to wash the pesticide product into the soil. No adjuvants were included in the application scenario.

In a manner similar to what was done in the PEIR, CDFA defined the product application rate and other application specifics for the scenario PDEP-E-08 in the Program Material Data Sheet and the Request for Preliminary Analysis found in **Appendix E - PMDS**. The scenario defined application rate of imidacloprid is 0.4 lb/Ac; the application rate of glycerin is 0.19 lb/Ac.

2.2 Active and Inert Ingredients of Concern and Environmental Fate Properties

The risk assessment team investigated Merit 2F label and Safety and Data Sheet to determine the list of active and inert ingredients. Merit 2F contains 10% glycerin in addition to 21.4% imidacloprid. No other ingredients were named. Note that inert ingredients are often considered confidential business information and are consequently not available to the public. No other chemicals were listed on the label or SDS and therefore could not be evaluated. These active and inert ingredients were researched for their chemical characteristics, including toxicity, as well as their environmental fate properties. All environmental fate characteristics for these chemicals can found in the relevant sections of the Dashboard Database associated with the Statewide PEIR.

2.3 Environmental and Ecological Settings

The chemical use scenario evaluated in this ERA may be applied to lawns/golf courses, recreational areas, and ornamental plants (includes flowers, containerized plants, and ground cover areas. Urban residential settings include: homes, parks, schools, sports fields, commercial settings, cemeteries, greenbelts, and road sides.To determine the types of species which could be exposed as a result of these scenarios, the range of locations where the scenario could occur, and the ecological characteristics of those locations, was investigated. A more detailed discussion of the Environmental and Ecological Settings can be found in the Statewide PEIR.

2.4 Assessment Endpoints and Measures of Ecological Effect

An endpoint is a characteristic of an ecological component, for instance, increased mortality of fish due to a pesticide application. An assessment endpoint is the specific statement of the environmental effect that is going to be protected, such as the prevention of fish mortality due to a pesticide application. Measurement endpoints are measurable attributes used to evaluate the risk hypotheses and are predictive of effects on the assessment endpoints (US EPA, 1998e). Since a specific individual species may have different mortality susceptibility compared to other individuals of the same species, it is common to use a statistical representation to define what is meant by the assessment endpoint. For instance, it is common to assess mortality by using the lethal dose at which 50 percent of the population in a study did not survive (LD_{50}).

Assessment endpoints are the ultimate focus in risk characterization and link the measurement endpoints with the risk decision making process. The ecological effects that the ERA intends to evaluate are determined by the assessment endpoint which is characterized by a specific measurement endpoint. The specific assessment and measurement endpoints that form the basis of this ERA are discussed in the following sections.

2.4.1 Assessment Endpoints

Three principal criteria are used to select ecological characteristics that may be appropriate for assessment endpoints: (1) ecological relevance, (2) susceptibility to known or potential stressors, and (3) relevance to management goals. Of these, ecological relevance and susceptibility are essential for selecting assessment endpoints that are scientifically defensible (US EPA, 1998). Although stressors can consist of many different environmental factors, the stressors addressed in this ERA are those effects related to chemical exposure. This ERA's endpoints focus on organism-level outcomes. These include adverse effects such as mortality, reproductive effects, and pathological changes (*e.g.*, kidney or liver tissue damage) (US EPA, 2003).

The acute assessment endpoints selected in this ERA for the Proposed Program include the prevention of mortality in:

1. Soil-dwelling invertebrates, non-target insects, aquatic invertebrates, aquatic-phase amphibians, and fish;
2. Terrestrial-phase amphibians, reptiles, birds, and mammals that eat insects (*i.e.*, insectivores) or invertebrates (*i.e.*, invertivores);
3. Herbivorous reptiles, birds, and mammals;
4. Reptiles, birds, and mammals that eat fish (*i.e.*, piscivores);
5. Terrestrial-phase amphibians, reptiles, birds, and mammals that eat both plants and animals (*i.e.*, omnivores);
6. Bird and mammals that eat seeds (*i.e.*, granivores); and
7. Carnivorous reptiles, birds, and mammals.

The chronic assessment endpoints selected for the ERA include the protection of survival and reproduction of the same species groups.

Typically, reproduction is a more sensitive endpoint than survival, thus this endpoint has been used over survival when it is available, to result in a more conservative analysis. Adverse reproductive effects generally do not materialize until chronic exposures have occurred.

2.4.2 Measurement Endpoints

In terms of measurement endpoints, measures of exposure have been used to evaluate levels at which exposure may occur whereas measures of effect have been used to evaluate the response of the assessment endpoints if exposed to stressors. Concentration of a chemical in water is a measure of exposure for an aquatic species, and daily intake of a chemical in dietary items is a measure of exposure for terrestrial species. The concentration in water or the amount of daily ingestion of chemical that causes adverse effects are measures of effects. The quantitative analysis assumed that a given species was present, and did not address the likelihood that the species may actually occur in proximity to a specific chemical application. The likelihood of presence at the application site is addressed qualitatively in the risk characterization.

In this ERA, toxicity is reported as TRVs, which are numerical representations of the measurement effects that are used in the risk assessment. A TRV is a toxicological index that, when compared with exposure, is used to quantify a risk to ecological receptors. The way in which TRVs are developed depends on available data on a chemical's toxicological effects and commonly accepted assumptions that address uncertainty regarding the available data. TRVs are developed according to a highly structured and demanding approach. This process often includes adjustments to observed laboratory values to account for uncertainty and application of safety factors to ensure that results of the risk assessment are conservative and ensure protection against the adverse effect. TRVs are used to represent measurement endpoints of the environmental concentrations or daily doses (mg/kg bw-day) with uncertainty factors incorporated, such that values above the TRV are likely to cause adverse effects for a species. If the estimated environmental concentration (EEC) or the daily dose of a chemical exceeds the TRV, concern is triggered regarding the potential for an adverse effect to an organism.

Specific measurement endpoints used to develop the TRVs include No observable adverse effect level (NOAELs), lowest observable adverse effects levels (LOAELs), and the median lethal (or effective) dose or concentration (*e.g.*, LD_{50}, ED_{50}, LC_{50}, or EC_{50}).

The methods for developing TRVs for the chemicals and species evaluated in this ERA are described in Section 4 of the Statewide PEIR. These TRVs were the measurement endpoint for that active/inert ingredient-species combination. For many amphibians and reptiles, toxicity data from other taxonomic groups were used for TRV development. For the aquatic-phase for amphibians, fish such as the rainbow trout was the species often used to derive an appropriate TRV. For reptiles and terrestrial-phase amphibians, bird toxicity values act in place of specific toxicity values for reptile or terrestrial amphibian species (US EPA, 2004).

2.5 Surrogate Species Selection

A very large number of species occur in California. This ERA does not assess risk for every one of these species, as such an assessment would be infeasible. The selection criteria and process by which surrogate species were selected along with a complete list of species and their life history traits can be found in the Statewide PEIR as well as the relevant sections of the associated Dashboard Database.

2.6 Conceptual Site Models

Development of CSMs is a fundamental part of the risk assessment process, and their inclusion in the ERA is intended to allow the reader to understand the exposure pathways which were evaluated for the chemical use scenario. The CSM is a written and visual representation of predicted relationships among stressors (*e.g.* a pesticide application), exposure pathways (*e.g.* eating vegetation contaminated with the pesticide), and assessment endpoints (*e.g.* mortality). It outlines the potential routes of exposure for each assessment endpoint and includes a description of the complete exposure pathways. An exposure pathway demonstrates how a chemical would be expected to travel from a source (application of chemical) to a plant or animal that can be affected by that chemical. An exposure pathway that is not complete means that it is unlikely for that organism to be exposed to the chemical by that means. An application-specific CSM is presented below.

The ecological CSM covers the multiple pathways through which ecological receptors could be exposed to active and inert ingredients that may be applied under the Proposed Program. The starting point of each CSM is the application technique, which determines the characteristics of release of the chemical into the environment. The possible pesticide application technique addressed in this ERA for PD/EP-E-08 is a spray drench through turf and ornamental ground cover.

Additional details regarding the development and interpretation of CSMs can be found in Section 2.6 of the Ecological Risk Assessment of the Statewide PEIR.

2.6.1 Pest Detection/Emergency Programs (PD/EP)

Figure Eco-1 provides details for applications that can occur in urban/residential settings. For PD/EP-E-08, potential applications in urban/residential areas would consist of turf drench applications. Incomplete exposure pathways exist for inhalation for ecological receptors since the turf drench application is made with a large droplet nozzle one to two feet above the ground, greatly reducing the amount of drift. The exposure to terrestrial insects is complete for exposure via ingestion of foliage, pollen or nectar following uptake from treated soil or from deposition following foliar sprays, and toxicity data are available so this pathway has been analyzed. Exposure pathways for terrestrial vertebrates were complete for dermal contact and ingestion of surface water, vegetation, and soil. Adequate exposure and toxicity data exist only for the ingestion pathway for terrestrial vertebrates, so the dermal, although potentially complete, has not been quantitatively evaluated. The exposure pathway for fish and aquatic invertebrates is complete via surface water following movement through or over soil beneath treated plants and from the possibility of limited drift to adjacent surface water, but adequate toxicity data for ingestion of contaminated food items or ingestion of water does not exist, so only effects from exposure from immersion in surface water containing pesticide residues have been quantitatively analyzed.

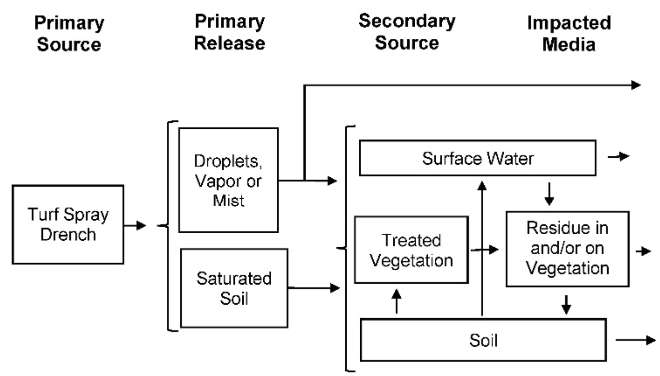
2.7 Analysis Plan

This ERA uses both reported values in the scientific literature and widely used models specific to ecological risk assessment to estimate the exposures outlined by the CSM. In addition, effects data for the measurement endpoints uses data available from the scientific literature. Since the applications adhering to PD/EP-E-08 could occur in various locations in California, many of which would be unlikely to occur on a routine basis, it has not been considered practical to collect and utilize field or site specific data.

The analysis plan with the CSMs has been implemented in the next phase of the ecological risk assessment process, analysis. The analysis phase is broken out into two sections: exposure assessment and effects assessment.

APPENDIX 1A

Conceptual Site Model (CSM) for PD/EP-Eradication - Residential Turf Drench
Ecological Risk Assessment



Receptor Groups

Exposure Routes	Amphibian (terr)	Reptile	Bird	Mammal	Soil Invert	Terr Insect	Amphibian (aq)	Fish	Aq. Invert (1)
Inhalation	o	o	o	o	o	o	o	o	o
Dermal	‡	‡	‡	‡	o	x	o	o	o
Ingestion	x	x	x	x	o	‡	‡	‡	‡
Dermal	‡	‡	‡	‡	o	‡	x	x	x
Ingestion	x	x	x	x	o	x	o	o	o
Dermal	‡	‡	‡	‡	o	‡	o	o	o
Ingestion	x	x	x	x	x	‡	o	o	o
Dermal	‡	‡	‡	‡	x	‡	o	o	o

Abbreviations
Soil Invert: Soil Invertebrate
Terr. Insect: Terrestrial Insect
Aq. Invert: Aquatic Invertebrate

Notes:
x - Complete Exposure Pathway
‡ - Although complete, this pathway is not evaluated due to lack of toxicological or exposure data.
o - Incomplete, Inconsequential, or De Minimus Exposure Pathway
(1) Includes sediment-dwelling invertebrates.

Figure Eco-1. Conceptual Site Model for residential applications that may be made as part of CDFA's Pest Detection/Emergency Programs.

3 Exposure Assessment

The exposure assessment is part of the analysis phase of the risk assessment process which follows the problem formulation phase described in Section 2. The exposure assessment provides a description and quantification of the nature and magnitude of the interaction between chemicals in surface water, sediment, soil, or groundwater and the ecological receptors. This quantitative accounting of the amount of exposure is known as the Estimated Environmental Concentration (EEC) and is the main outcome of the exposure assessment. The EEC is defined as the predicted concentration of a chemical within an environmental compartment (*i.e.* within soil, water, plant tissue, or a specific organism) based on estimates of quantities released, discharge patterns and inherent disposition of the substance (*i.e.* fate and distribution), as well as the nature of the specific receiving ecosystems. The results of the exposure assessment (*i.e.* the EECs) are combined with the effects assessment to derive the risk characterization results in the final phase of the risk assessment process.

The exposure assessments are broken down between acute (short term) and chronic (long term) exposures, described in detail below. Several exposure models and assumptions are required to estimate the amount of chemicals that an organism is exposed to as the chemical gets transported along the various exposure pathways. The exposure models and assumptions for acute and chronic exposures, for each receptor group in general, in aquatic and terrestrial environments, and under each application scenario were described in the Ecological Risk Assessment of the Statewide PEIR. Only those pathways or models new or unique to PD/EP-E-08 are included below.

Since it is not possible for this ERA to evaluate exact concentrations and exposures in the field, EECs are estimated using various conservative models that have been developed for use in risk assessments. These models are designed to use conservative assumptions and in many cases are not capable of modeling all of the complex fate and transport processes that can occur once the chemicals are released into the environment. Typical fate properties which tend to decrease the concentration of a chemical include aerobic degredation, anaerobic degradation, photolysis, hydrolysis, absorption, solubilization, and volatilization. Key transport properties that may not be accounted for are dilution and partial transfer between media such as plants, soil, water, and air. Therefore, most of the EECs will represent an upper-bound value since not all fate and transport properties have been modeled.

3.1 Acute and Chronic Exposure

Please refer to the Statewide PEIR for an explanation of how acute and chonic exposures were determined.

3.2 Assumptions for Exposure Following Turf Drench Application

The basic exposure estimate procedures and models remained the same as were used in the Statewide PEIR. However, some assumptions differ between a turf application and the bare soil drench application that were simulated in the Statewide PEIR. The assumptions specific to a turf application are presented below. If not discussed below, the approach to estimated concentrations was the same as described in the Statewide PEIR.

3.2.1 Soil Concentrations

Exposure to soil residues occurs via three pathways: dietary consumption, uptake by plants, and direct contact with soil (for soil-dwelling invertebrates). The application modeled in this scenario is made as a foliar spray directly to turf or ornamental gound cover like low-growing broad-leafed plants, and as a soil drench to bare ground under other host plants. After application to turf and broad-leafed plants, these areas are 'watered-in' so the pesticide moves into the soil. Some pesticide residue was assumed to remain on the turf or broad-leafed vegetation with the rest washed off into the soil. Based on available literature, 33% of the applied pesticide was assumed to remain on the vegetation and 67% was assumed to wash off to soil (CDPR 2012, CDPR 2013). Bare ground areas beneath host plants are assumed to have received 100% of the applied chemical.

To account for the dietary intake of soil, soil consumed by receptors is assumed to contain residue based on 100% of the application rate.

Turf and broad-leafed vegetation uptake from the soil was estimated by assuming that 67% of the applied chemical was available for uptake. For seed, fruit, pollen, nectar uptake, 100% of the application rate was assumed to be applied to soil. For exposure of soil-dwelling invertebrates, 100% of the application rate was assumed to be applied to soil.

3.2.2 Concentration in/on Vegetation

The only vegetation assumed to receive surface residues following a turf drench application would be turf (short grass) and broad-leafed ornamental ground cover. The surface residues were estimated using the U.S. EPA T-REX model. These categories of vegetation retained 33% of the applied chemical after being "watered-in". The outputs for short grass and broad-leafed vegetation were selected and multiplied by 33% to account for the "watering-in" after application. No surface residues were assumed to occur on fruits, seeds, long grass or any category of vegetation that could be consumed.

Uptake from treated soil could occur for all categories of vegetation. Turf and broad-leafed vegetation uptake from the soil was estimated by assuming that 67% of the applied chemical was available for uptake. For seed and fruit uptake, 100% of the applied chemical was assumed to be applied to soil.

Uptake by plants from soil was estimated in a similar manner as in the Ecological Risk Assessment of the PEIR with the exception that a revised Briggs' Equation was used based on the updated version in U.S. EPA (2014a).

Terrestrial VUF (dry weight) = $([10^{(0.95 \times \text{Log } K_{ow} - 2.05)} + 0.82] \times \text{TSCF} \times \left[\frac{\rho}{\theta + \rho \times K_{oc} \times f_{oc}}\right]) \times$ soil concentration

TSCF = $[-0.648 \times (\text{Log } K_{ow})^2 + 0.241 \times \text{Log } K_{ow} + 0.5822]$

Where:
TSCF = Transpiration Stream Concentration Factor
K_{ow} = Octanol/Water Partition Coefficient (unitless)
ρ = soil bulk density (g-dw/cm^3)
θ = soil-water content by volume (cm^3/cm^3)
K_{oc} = soil organic carbon-water partitioning coefficient (cm^3/g-organic carbon or L/kg-organic carbon)
f_{oc} = fraction of organic carbon in the soil

Complete details regarding how the Briggs' equation was used appear in the Ecotogical Risk Assessment of the Statewide PEIR. In keeping with the guidance in USEPA (2014a), if the Log K_{ow} was greater than 5.0, no uptake was assumed. When the Log K_{ow} is negative, the TSCF is assumed to be 1.0 (Collins *et al.* 2006*)*.

3.2.3 Concentrations in Insects

The U.S. EPA T-REX model and the Briggs' equation were used to estimate concentrations in insect prey items in a similar manner as was performed in the Statewide PEIR with the following exception. The concentration in insects was reduced to 33% of that estimated by T-REX for the following reasons. Since the majority of vegetation or other areas within the treated area would not receive a direct spray, only those insects in the turf or treated ornamental ground cover would be direcly sprayed. Many if not most insects present in the treated area and available as prey would contain little if any residues. Those insects that are sprayed with Merit 2F will be rinsed with water washing of at least some of the residues. Assuming 33% of the T-REX-estimated concentration is not based on empirical data, but is thought to be an over-estimation of what is likely to occur following a turf drench application. The residues that could be accumulated by insects eating treated vegetation was estimated using the Briggs' equation. Insects were assumed to consume vegetation where 100% of the applied chemical was assumed to be applied to soil. Thus, the concentration in/on insects was estimated by adding the 33% of the residue from T-REX and consumption of vegetation receiving 100% of the applied chemical as a spray drench.

3.3 Aquatic Estimated Environmental Concentrations

This section describes the assumptions and models used to estimate EECs related to aquatic environments, including surface water concentrations and tissue concentrations in aquatic organisms.

3.3.1 Surface Water Concentrations of Pesticide Active and Inert Ingredients and Adjuvants

U.S. EPA's newly developed Surface Water Concentration Calculator was used for estimating concentrations of Merit 2F in surface water and sediments.

3.3.1.1 Surface Water Concentrations from Soil Run-off and Aerial Drift

A new US EPA model was used to estimate water concentrations. The concentration of active and inert ingredients in surface water resulting from drift, runoff, or erosion during and after pesticide applications was estimated using the Surface Water Concentration Calculator (SWCC) (USEPA, 2014b). SWCC incorporates all necessary environmental fate characteristics for modeled chemicals. SWCC, developed by the Environmental Fate and Effects Division (EFED) of the Office of Pesticide Products (OPP) of the US EPA, is a graphical user interface that provides access with two distinct, but connected models to simulate transport from soil to water: the Pesticide Root Zone Model version 5.0+ (PRZM5) and the Variable Volume Water Body Model (VVWM), replacing the older PE5 shell (last updated November 2006), which used PRZM3 and Exposure Analysis Modeling System (EXAMS). PRZM is a one-dimensional, dynamic, compartmental model that can be used to simulate pesticide movement in unsaturated soil systems within and immediately below the plant root zone. VVWM contains a set of process modules that link fundamental chemical properties to the limnological parameters that estimate the kinetics of fate and transport in aquatic systems. SWCC estimates pesticide concentrations in the water as the upper 90th ranked annual peak, 4-day average, 21-day average, 60-day average, and 365-day average of the simulation as well as the mean value of all daily concentrations in the simulation. SWCC also estimates the upper 90th ranked annual and 21-day average benthic pore water peak concentrations as well as the annual and 21-day concentration in sediment.

The standard PRZM/VWMM runoff modeling scenario is based on site-specific conditions of fields draining into water bodies for drinking water and aquatic exposure assessments. Each PRZM simulation represents a unique combination of climatic conditions, crop-specific management practices, soil-specific properties, site-specific hydrology, and pesticide-specific application and dissipation processes. Daily edge-of-field loadings of pesticides dissolved in runoff waters and adsorbed to entrained sediment, as predicted by PRZM, are discharged into a standard water body, and simulated by VWMM. VWMM accounts for volatilization, sorption, hydrolysis, biodegradation, and photolysis of the pesticide (USEPA, 2014c).

The PRZM5 standard scenario used, referred to in the model documentation as the “farm pond scenario,” is a 10-hectare (24.7-acre) agricultural field, releasing pesticide-containing runoff into a one-hectare (2.47-acre) body of water, 2 meters (6.56 feet) deep equaling 20,000 cubic meters (706,293 cubic feet). During analysis, the area releasing pesticide-containing runoff can be adjusted to reflect the actual treated area. This scenario was used for pesticide exposure assessments because it focuses on exposure to ecological receptors (Wild and Jones, 1992). Limnetic or water column concentrations in a waterbody were used for drinking water for wildlife as well as exposure for fish and other aquatic species. Sediment concentrations were used for exposure to benthic invertebrates.

SWCC provides the option of modeling water flowing into and out of the waterbody. When modeling water flow, SWCC estimates a pesticide detention time based on a VWMM analysis of evaporation and rainfall and daily PRZM runoff volumes. If water flow is not modeled, the water body volume does not change and the pesticide does not exit the body via outflow, however it may still undergo degradation such as hydrolysis or aerobic metabolism. To maintain a conservative estimate of the amount of pesticide retained within the waterbody or index reservoir, no water flow out of the water body was modeled.

It is possible that chemical applications under the Proposed Program could be made in proximity to flowing water such as rivers or streams or other water bodies with inflow and outflow. These waterbodies will experience dilution of water concentrations due simply to introduction of fresh water. Additionally, large streams or lakes, or ponds larger than the modeled waterbody will not achieve the modeled concentrations due to the dilution in a larger volume of water. Similarly, marine/estuarine environments will not achieve the modeled concentrations due to larger volumes of water and flushing due to tidal and wave action.

To simulate application efficiency and spray drift loadings to waterbodies resulting from drench applications to turf and groundcover, an Application Efficiency (fraction) value of 1 and Spray Drift (fraction) value of 0 have been selected to simulate all of the pesticide reaching the target site (*i.e.*, no application inefficiencies or spray drift loadings to waterbodies). Although described as a drench application, turf applications result in a significant degree of interception by grass foliage. To reflect this, all turf application scenarios were evaluated as foliar applications. Additionally, a canopy cover of 33% was selected to simulate watering-in of pesticide into turf. This approach results in a 3-fold reduction of pesticide on foliage and an equivalent increase of pesticide in soil (CDPR 2013c).

PRZM Scenario Files have been selected based on similarities between application location and setting and the environment modeled by the scenario file. The USEPA has prepared a scenario file intended to be used as a surrogate for all urban/suburban home and residential uses with parameters chosen to reflect residential turf areas, primarily lawns. This scenario, CAresidentialRLF, was selected to simulate residential turf applications. Additionally, to account for unintended applications to nearby impervious surfaces, such as pavement, sidewalks, and driveways, the California Department of Pesticide Regulation recommends that a parallel run of SWCC be performed with CAimperviousRLF and the area-weighted average of the two SWCC-predicted EEC's be reported as the final EEC (Luo, 2014). In estimating the area-weighted average, a weighting of 99.5% and 0.5% were applied to CAresidentialRLF and CAimperviousRLF runs, respectively, to account for the vast majority of applied pesticide reaching the target site with minimal spray to impervious surfaces.

For PD/EP-E-08, the treatment area covers 640 acres of urban landscape, of which only up to roughly a third may be treated (e.g., lawns, turf, groundcover, etc.). Therefore, the field area to which treatment occurs was defined as one-third of 640 acres, or 861,980 m^2. The hydraulic length was calculated as the square root of the area of field to provide the depth of a field assumed to be square. The hydraulic length was estimated to be 928 m. Consistent with slopes and soil types found in the National Resource Conservation Service Soil Survey in urban settings where current PDEP-E-08 applications are made, a land slope of 2% was selected (Soil Survey Staff, 2016).

SWCC determines a Henry's Law Constant based on the molecular weight, vapor pressure, and water solubility. Since the soil organic carbon/water partition coefficient (K_{oc}) better predicts the mobility of organic contaminants in soil, K_{oc} values have been used in preference to the soil/water partition coefficient (K_d). Water bodies modeled through SWCC are fixed at pH 7 (pers. comm. D.F. Young, US EPA), therefore neutral hydrolysis half-lives (pH 7) are used as inputs. If a chemical is known to be stable to a given degradation pathway, the entry field is entered as 0, which instructs SWCC to treat the chemical as stable to that pathway. If a particular degradation pathway half-life value is not available in the literature, the half-life of a suitable surrogate chemical can be selected based on substantial structural similarities to the analyzed chemical. If water column-aerobic metabolism or foliar half-life values are not available in the literature, the aerobic soil degradation half-life can be used to extrapolate values for either or both unavailable half-lives. If a particular degradation pathway half-life is not available in the literature and neither a suitable surrogate chemical half-life nor extrapolation method are available, the chemical has been assumed to be stable for that particular degradation pathway and the input field was left empty. A reference temperature of 25°C was selected for each degradation pathway and a value of 40°N was selected for the photolysis reference latitude.

SWCC uses weather files from a number of weather stations to incorporate real world weather data that will affect how pesticides move from the application site to a water body. These files contain weather data from 1961 through 1990. The Sacramento meteorological file, Sacramento.dvf, was selected to represent turf applications in California.

Per discussion with CDFA program staff, an application rate of 0.44834 kg/ha (0.4 lb/acre) is used for Merit 2F urban turf treatments and was selected for SWCC simulations. The starting application date selected for this scenario is April 1st.

The surface water concentrations for glycerin and imidacloprid estimated and used in this assessment can be found in **Appendix Eco-A.**

3.3.2 Tissue Concentrations in Aquatic Organisms

As described Section 3.3.2 of Appendix A, the Ecological Risk Assessment of the Statewide PEIR, tissue concentrations in aquatic organisms were estimated using the U.S. EPA's KABAM model (K_{ow} (based) Aquatic BioAccumulation Model) (US EPA, 2009).

3.4 Terrestrial Exposure Assessment

3.4.1 Estimated Environmental Concentrations (EECs)

Except for the changes discussed in Section 3.2 regarding assumptions specific to a turf drench application, the models and assumptions for estimating exposure to terrestrial ecological receptors is the same as described in the Statewide PEIR. The EECs estimated and used in this assessment appear in **Appendix Eco-B.**

3.4.2 Area Use Factor

To acknowledge that some species' food could be acquired from outside the area receiving pesticide treatments, an Area Use Factor (AUF) was calculated for each species and each pesticide application scenario based on the species' foraging range and typical treatment areas. The treatment areas for the different scenarios have been described for each program. In addition to the size of the treated area, the size of the species home range or foraging range was used to calculate the AUF as follows:

$$AUF = \frac{\text{Foraging Range}}{\text{Treated Area}}$$

For species with a home range or foraging area smaller than the size of the treated plot, all their food was assumed to be gathered from a treated plot. For species with a home range larger than the size of the treated plot, the proportion of diet containing pesticide residues could be assumed to be comparable to the AUF.

In the assessment of acute risk, the AUF was always set to 1.0. An animal could potentially spend a short time within a treated area and become acutely exposed shortly after an application. Therefore, no reduction in the exposure estimate has been made based on the AUF. In the chronic assessment for terrestrial species, three exposure estimates were made. One exposure estimate used the calculated AUF based on the species' foraging or home range and the application area. A second estimate set the AUF to 1.0 to assess the potential situation where applications might have been made to the entire home range. The third estimate used the mid-point between the estimated AUF and 1.0. For example, if the estimated AUF would have been 0.45, the mid-point AUF would be 0.725. In the chronic assessment of aquatic species, the AUF was always 1.0. By presenting a range of exposures estimated from different AUF (*i.e.*, no AUF, Mid-Point AUF, and AUF), other species represented by the surrogate species that have similar diets, but a differing foraging range, were better included in the exposure estimates.

Given the large geographic scope of the Proposed Program, it was not possible to predict the number of treatment plots that might occur within a species home range. Assuming an AUF equal to 1.0 would likely be overly conservative, but using the AUF based on the species home range, might not be conservative enough. Inclusion of the mid-point AUF was an attempt to capture this uncertainty. Therefore, both ends of this spectrum, as well as the mid-point, were developed and the full range of possibilities presented.

3.4.3 Honey Bee and Nontarget Insect Exposure

The US EPA recently released (US EPA, 2014a) guidance for assessing risk of pesticides to honey bees. The methods in the guidance document are essentially the same as those presened in the Statewide PEIR based on the proposed methods (US EPA, 2012a).

4 Effects Assessment

The effects assessment consists of an evaluation of available toxicity or other adverse effects information that can be used to relate the exposures to pesticides and inert ingredients and adverse effects in ecological receptors. Toxicity is a property of a chemical, and the toxicity of a chemical alone does not indicate its potential to harm a given organism. A key to understanding the effects of a chemical on an organism is the dosage of the chemical that the organism receives or the concentration to which it is exposed. For example, certain substances are considered toxic (*e.g.*, caffeine), but are harmless in small dosages. Conversely, an ordinarily harmless substance (*e.g.*, water) can be lethal if over-consumed. This relationship between exposure and effect on an organism is called a dose-response effect and is discussed in Section 5: Risk Characterization. Data that can be used to define the toxicity of a chemical include literature-derived or site-specific single-chemical toxicity data, site-specific ambient-media toxicity tests, and site-specific field surveys (Suter et al. 2007). For this ERA, data were restricted to single-chemical toxicity data from literature sources because specific toxicity data for the mixtures of interest were not available.

In this ERA, the toxicity has been reported as a toxicity reference values (TRVs) that are a numerical representation of the measurement effects that are used in the risk assessment. TRVs are a toxicological index that, when compared with exposure, is used to quantify a risk to ecological receptors. The way in which TRVs are developed depends on available data on the chemical's toxicological effects and commonly accepted assumptions that address uncertainty regarding the available data. TRVs were developed using the same methods as described in the Statewide PEIR. TRVs for glycerin and imidacloprid can be found in **Appendix Eco-C.**

The US EPA has developed acute toxicity categories for pesticides ranging from the most toxic category of very highly toxic to the least toxic category of practically nontoxic (**Table Eco-1**). These are strictly based on the results of laboratory toxicity tests and do not reflect the exposure or dose received by an organism that determines if there is an adverse effect following a pesticide application. This classification only gives a description of the numerical toxicity property of the chemical. It is not until it is combined with a specific dose that adverse effects may occur. The detailed description of the toxicity classification from **Table Eco-**1is provided for each application scenario below.

Table Eco-1. Acute Ecotoxicity Categories for Terrestrial and Aquatic Organisms.

Toxicity Category	Avian: Acute Oral LD_{50} (mg/kg)	Aquatic Organisms: Acute LC_{50} (ppm)	Wild Mammals: Acute Oral LD_{50} (mg/kg)	Non-Target Insects: Acute LD_{50} (μg/bee)
very highly toxic	<10	<0.1	<10	
highly toxic	10-50	0.1 - 1	10 - 50	<2
moderately toxic	51-500	>1 - 10	51 - 500	2 - 11
slightly toxic	501-2000	>10 - 100	501 - 2000	
practically nontoxic	>2000	>100	>2000	>11

Taken from U.S. EPA 2012b

The active ingredient in Merit 2F, is imidacloprid. Imidacloprid is slightly toxic to aquatic-phase amphibians. Imidacloprid is slightly toxic to freshwater and estuarine/marine aquatic invertebrate species. Imidacloprid is moderately to slightly toxic to freshwater fish and estuarine/marine fish species. No toxicity information was available for terrestrial-phase amphibians or reptiles, so the toxicity of imidacloprid to terrestrial-phase amphibians and reptiles was assumed to be similar to that in birds. Imidacloprid is highly to moderately toxic to birds and moderately toxic to mammals. Imidacloprid is highly toxic to bees.

5 Risk Characterization

Risk characterization is the final phase in the risk assessment process. The purpose of the risk characterization phase is to integrate the two pieces from the analysis phase: exposure and effects assessment. In the risk characterization, exposure and effects data are integrated to allow the risk assessor to draw conclusions concerning the presence, nature, and magnitude of effects that may exist under the application scenarios. This includes both quantitative and qualitative assessments in order to properly characterize the complete risk assessment outcome. The quantitative assessment is based on a comparison of the numerical value from combining exposure and effects – the Risk Quotient (RQ) – against a target value – the Level of Concern (LOC). For scenarios that have RQs below the LOC, a risk assessor can conclude that there is a low potential for adverse effects from implementation of the scenario. This conclusion is due to the conservative assumptions that were consistently used throughout the risk assessment process. For situations where the RQ exceeds the LOC, a risk assessor conducts a qualitative analysis of the risk which incorporates information that is not able to be incorporated into the quantitative analysis and makes a qualitative determination of the potential for adverse effects from implementation of the scenario.

In ecological risk assessments for pesticides, EECs or Daily Dose determined in the exposure assessment (Section 3) are compared to TRVs developed in the effects assessment (Section 4) to calculate an RQ (US EPA 2004).

$$\text{RQ} = \frac{\text{EEC or Daily Dose}}{\text{TRV}}$$

Where:
RQ = Risk Quotient (unitless)
EEC = Estimated Environmental Concentration (mg dw/kg or ug/L)
Daily Dose (mg/kg bw-day)
TRV = Toxicity Reference Value (mg/kg bw-day or ug/L)

When the RQ is equal to or exceeds an LOC of 1.0, a potential risk has been presumed to exist for the non-threatened or non-endangered ecological receptor being assessed. For listed threatened or endangered species, the LOC was reduced to 0.5, to represent the heightened concern for these species; this LOC is referred to as the T&E LOC. It is important to remember that whenever an RQ was shown to exceed the standard LOC suggesting exposures to all species might be harmful, the T&E LOC providing additional protection to special-status species is necessarily exceeded.

RQs for both acute and chronic risk have been calculated in the same manner using the appropriate acute or chronic EEC or estimated Daily Dose paired with appropriate acute or chronic TRV. When all chemical ingredients including active, inert, adjuvants, or tank spray additives were assessed, the RQs for all chemicals present were assumed to be additive in nature and thus totaled together to determine the Total RQ which was compared to the applicable LOC. The risk analysis focused on whether the total RQs from all ingredients in the pesticide product along with any additives could exceed the LOCs, either the standard LOC of 1.0 or the T&E LOC of 0.5.

For those application scenarios that had RQs above the applicable LOC, a qualitative assessment was conducted. Several common qualitative assessments were utilized and the discussion below presents the rationale forming the basis of these qualitative assessments. It also includes specific measures that can be implemented to decrease the potential for adverse effects. This logic is referred to for specific application scenarios later in this section, but the reader is referred to the full rationale presented here.

5.1 Potential for a Species to Be Present at the Application Site

One of the first qualitative assessments to consider is the actual likelihood of the specific species being present at a particular application site. This ERA was conducted assuming all species would be present at an application site. This is clearly not likely as species exist in particular habitats and not all habitats can occur at a single application site. For instance, if the application site does not contain suitable foraging habitat for a particular species, it is relatively unlikely to come into the area and be exposed to chemicals by ingestion. Pollinating species are less likely to be present if there are no flowers present. Some locations are unlikely to have species present, such as the loading dock area of a nursery. Marine/estuarine species would not be present if the application site is not near the coastline.

CDFA's standard practice prior to implementing any pesticide application scenarios is to identify whether any special-status species habitat is nearby, and if so, identify appropriate measures to avoid adversely affecting the species. As part of this, CDFA obtains technical assistance from CDFW, NMFS, and/or USFWS. Examples of these measures include:

- Conduct application at times when species is unlikely to be present.
- Ensure an adequate buffer distance is maintained to minimize the concentrations of chemicals that reach surrounding habitat by drift or run-off.
- Spray pots on impermeable surfaces to prevent leaching chemicals to native soil.

With implementation of this standard practice, the potential for adverse effects on these species as a result of Proposed Program pesticides applications would be low.

5.2 Foraging Diet

The extent to which a particular species consumes food from the application area will greatly influence their exposure. Different species forage over vastly different areas. The analysis presented three different assumptions for the percentage of foraging range that would be within the application area. This was done to show the range of variabilities that may occur depending on the extent to which a particular species consumes vegetation or other organisms from within the application area. Species with large foraging areas are unlikely to consume all their diet from within an application area. Long-term exposures (chronic) are reduced or diluted in such species because a portion of their diets area is likely acquired off the application area. Refer to the discussion of AUFs in Section 3.4.

5.3 Dilution and Degradation of Chemicals

Through time, concentrations of chemnicals following pesticides applications generally decrease. The models used in the quantitative risk assessment have limited capabilities to fully incorporate the numerous fate mechanisms which cause the chemicals to dissipate in the environment. Thus, in many instances, the concentrations that would likely occur would be less than the values used in the quantitative risk assessment, and in the case of chronic exposures the concentrations would be considerably lower than estimated. This applies in particular to soil and water concentrations. In addition to overestimation of concentrations due to chemical breakdown, dilution (or reduction in concentration when mixed) will occur when the chemical residues combine with environmental media that is not contaminated. For instance, during a rain event that assists in transporting chemical residue from foliage and soil to a waterbody, additional water that is not contaminated will add to the volume of water in the waterbody itself. This also applies to water concentrations as the chemical continues to move from various waterbodies such as drainage ditches, streams, and rivers. Due to dilution and low probability of application scenarios being adjacent to a marine/estuarine waterbody, the potential for elevated concentrations in marine/estuarine waterbodies would be relatively low, and the potential for adverse effects to marine/estuarine species would be correspondingly low.

It is CDFA’s practice to ensure measures are taken to prevent pesticide applications from directly reaching a waterbody. CDFA’s protection measures for surface waters were presented in Section 6.7 of the main body of the Statewide PEIR. Indirect pathways would likely have lower concentrations than predicted by the quantitative model, therefore the actual risk to organisms would be lower than predicted. Specific BMPs are required for specific applications conducted by CDFA under their NPDES permit.

5.4 Risk Analysis for the Pest Detection/Emergency Programs Turf Drench Applications

The risk analysis focused on whether the RQ resulting from summing the individual RQs from each ingredient in Merit 2F exceeds the LOCs, either the standard LOC of 1.0 or the T&E LOC of 0.5. It is important to remember that whenever an RQ was shown to exceed the standard LOC suggesting exposures to all species might be harmful, the T&E LOC providing additional protection to special-status species is necessarily exceeded. The RQs for imidaclorprid or glycerin alone, on which the total RQs are based can be found in **Appendix Eco-D.**

Considerable detail was included in the analysis of risk for control of beetles. This detail was provided to discuss specifics of exposures for various surrogate species and how such exposures could influence whether LOCs were exceeded. Applications of Merit 2F for eradication of beetles, principally Japanese beetles, would be made primarily to turf, but also to some broad-leaf ground cover, as well as to bare soil beneath some host plants. Applications would be made once per year in a urban/residential setting. Ground application of Merit 2F to turf (includes lawns/golf courses), recreational areas, and ornamental plants (includes flowers, containerized plants, and ground cover areas/followed by watering in" of material through "thatch" per label. Mitigations include; no application within 48 hrs of predicted rain, buffer areas maintained around food crop plants per label, residents provided information & material/ post treatment precautions. Urban residential settings include: homes, parks, schools, sports fields, commercial settings, cemeteries, greenbelts, and road sides. Registered beekeepers within 1 mile of application site will be notified prior to application. Large lawn areas will be mowed prior to application to remove pollination resources. Additionally, as described in Section 2.10.2 of the Main Body of the Statewide PEIR, CDFA will consult as necessary with CDFW to ensure that there are no adverse effects on the species by implementing suitable buffers or other suitable measures.

5.4.1 Risk Associated with Turf Drench Applications with Merit 2F

In the Pest Detection/Emergency Programs, Merit 2F (PD/EP-E-08) applied as a turf drench treatment in an urban/residential setting once annually was not already evaluated in the Statewide PEIR. **Table Eco-2** presents the acute and chronic RQs associated with scenarios PD/EP-E-08. Those RQs that exceeded the standard LOC of 1.0 appear as bold text, whereas those RQs that exceeded both the T&E LOC of 0.5 and standard LOC appear in bold italics.

5.4.1.1 Risk to Amphibians

No acute or chronic RQs for aquatic-phase amphibians exceeded LOCs. Therefore, uses of Merit 2F was not thought likely to be harmful for aquatic-phase amphibians. Turf drench applications of Merit 2F resulted in no acute RQs that exceeded LOCs for terrestrial phase amphibians when applications were made in residential settings. Following turf drench applications of Merit 2F, the chronic RQs for terrestrial-phase California tiger salamander, arroyo toad, foothill yellow-legged frog, and western spadefoot exceeded the T&E LOC only. In locations where amphibian species that exceed any LOCs or other special status species they represent may be present, CDFA will consult with CDFW to ensure that there are no adverse effects on the species by implementing suitable buffers or other suitable measures. With implementation of the recommended measures by CDFW, the potential for adverse effects is low.

The terrestrial amphibians that had chronic RQs that exceeded the T&E LOC all have diets that consist of more than 50% terrestrial insects. Many of the insects that acquire body burdens of imidaclorprid are likely to die from that exposure. The proportion of exposed insects that die from exposure is not known, but because at least some insects will die and will be unavailable as prey, the exposure for the insectivorous terrestrial amphibians will be lower than modeled here.

5.4.1.2 Risk to Aquatic Invertebrates

Applications of Merit 2F did not result in acute RQs that exceeded LOCs for vernal pool fairy shrimp or the marine/estuarine species, mimic tryonia and black abalone. Turf drench treatments in urban/residential areas resulted in acute RQs that exceeded the T&E LOC for Tomales isopod, California freshwater shrimp, and Shasta crayfish. Similarly, applications of Merit 2F did not result in chronic RQs that exceeded LOCs for vernal pool fairy shrimp or the marine/estuarine species, mimic tryonia and black abalone. Turf drench treatments in urban/residential areas did result in chronic RQs that exceeded the standard LOC for Tomales isopod, California freshwater shrimp, and Shasta crayfish. In locations where aquatic invertebrate species that exceed any LOCs or other special status species they represent may be present, CDFA will consult with CDFW to ensure that there are no adverse effects on the species by implementing suitable buffers or other suitable measures. With implementation of the recommended measures by CDFW, the potential for adverse effects is low.

Implementation of the Program Management Practices presented in Section 2.11 of the Statewide PEIR will greatly reduce the amount of imidacloprid that might move to surface waters. Whereever the nearby surface water is estuarine or marine, there will be tremendous dilution from wave action and the large volume of water present as compared to the size of the surface water body modeled in the SWCC. Additionally, flowing water will represent a considerable dilution as compared the concentrations modeled by the SWCC. Water concentrations in surface water following applications of Merit 2F are anticipated to be much lower than the modeled concentrations because of model limitations and Program Management Practices in the PEIR.

5.4.1.3 Risk to Fish

No acute or chronic RQs for marine/estuarine or freshwater fish exceeded LOCs. Therefore, use of Merit 2F as a turf drench treatment was not thought likely to be harmful for fish.

5.4.1.4 Risk to Reptiles

No acute or chronic RQs for reptiles exceeded LOCs. Therefore, use of Merit 2F as a turf drench treatment was not thought likely to be harmful for reptiles.

5.4.1.5 Risk to Birds

The acute and chronic RQs for mourning dove, osprey, California brown pelican, California condor, white-tailed kite, Cooper's hawk, and fulvous whistling-duck did not exceed LOCs following turf drench treatments with Merit 2F. The acute RQ for yellow rail did not exceed LOCs following turf drench applications of Merit 2F in urban/residential areas.

Acute RQs exceeded LOCs for tricolored blackbird, western yellow-billed cuckoo, and purple martin. All these species have a large component of their diets consisting of terrestrial insects. The chronic RQs for tricolored blackbirds, western yellow-billed cuckoo, purple martin, and yellow rail exceeded LOCs following turf drench applications of Merit 2F in urban/residential areas. Only the tricolored blackbird had a foraging area larger than the 640-acre treatment area, so was the only species where the AUF affected whether there were exceedances. If exposures were proportional to the Mid-Point AUF or no AUF, the RQs for tricolored blackbird exceededboth T&E and standard LOCs. In locations were tricolored blackbird, western yellow-billed cuckoo, purple martin, yellow rail or other special status species they represent may be present, CDFA will consult with CDFW to ensure that there are no adverse effects on the species by implementing suitable buffers or other suitable measures. With implementation of the recommended measures by CDFW, the potential for adverse effects is low.

As discussed for terrestrial amphibians that consume terrestrial insects, the exposure of insectivorous birds is anticipated to be lower than modeled. This will be the case in particular for insectivorous birds that consume flying insects. Insects that have acquired body burdens of imidacloprid are likely to be dead, or at least unable to fly, and would be unavailable as prey.

5.4.1.6 Risk to Mammals

The acute RQs for all surrogate mammals did not exceed LOCs following turf drench treatments with Merit 2F in urban/residential areas. The only surrogate mammals with chronic RQs that exceeded LOCs were the riparian brush rabbit, big free-tailed bat, southern grasshopper mouse, and Nelson's antelope squirrel when it was assumed all food was gathered from the treatment area. The riparian brush rabbit has a diet of mixed vegetation that could be directly sprayed as part the turf and ornamental ground covers treated. The other species focus on terrestrial insect prey. In locations were riparian brush rabbit, big free-tailed bat, southern grasshopper mouse, or Nelson's antelope squirrel or other special status species they represent may be present, CDFA will consult with CDFW to ensure that there are no adverse effects on the species by implementing suitable buffers or other suitable measures. With implementation of the recommended measures by CDFW, the potential for adverse effects is low.

There is a low likelihood that special-status herbivorous mammals represented by the riparian brush rabbit will occur in residential or commercial areas being treated for eradication of Japanese beetles. Avoidance of critical habitat for special-status species will greatly reduce any chance that such species will be at risk. As discussed previously, insectivorous species are unlikely to experience exposures has high as what was modeled here.

5.4.1.7 Risk to Earthworms

The acute and chronic RQs for earthworms exceeded the LOCs in native soils following applications of Merit 2F in urban/residential settings. No models were available that allowed estimates of reduced soil concentrations at distances from the application site, so it was not possible to estimate the distance needed to allow RQs to reduce to less than LOCs. However, since many areas will not be treated, there will likely be a reservoir of earthworms and other soil-dwelling invertebrates to repopulate any areas impacted.

5.4.1.8 Risk to Terrestrial Insects

Oral exposure to pollen, nectar, or foliage of plants treated with Merit 2F as a turf drench application leads to acute and chronic RQs that exceeded LOCs. However, the majority of flowering plants will not be treated since they are not hosts for Japanese beetles. Whether a host plant or not, no plants currently flowering will be treated in accordance with label instructions. Since it was not possible to determine a proportion of flower plants that would be accidentally treated or accumulate residues via uptake from the soil following treatment, the worst-case scenario that all flowering plants were treated was used to estimate exposure. Since few if any flowering plants would be treated, the estimated exposure is assumed to be exaggerated.

If pollinators or other special-status terrestrial insects are present, CDFA will implement its pollinator protection practices as described in Appendix K of the Statewide PEIR and consult with CDFW to determine suitable measures such as buffers to ensure there are no adverse effects on these species. With implementation of the recommended measures for pollinators and by CDFW, the potential for adverse effects is low.

Table Eco-2. Potential risk associated with Application Scenario PD/EP-E-08: Turf drench applications of Merit 2F at 0.4 lb a.i./Acre to 640 acres in a residential/urban setting.

Surrogate Species	Acute	Chronic AUF	Chronic Midpoint AUF	Chronic No AUF
aquatic California tiger salamander	0.000	0.001	0.001	0.001
aquatic southern torrent salamander	0.000	0.001	0.001	0.001
aquatic California red-legged frog	0.000	0.001	0.001	0.001
aquatic foothill yellow-legged frog	0.000	0.001	0.001	0.001
aquatic arroyo toad	0.000	0.001	0.001	0.001
aquatic western spadefoot	0.000	0.001	0.001	0.001
terrestrial California tiger salamander	0.143	***0.730***	***0.730***	***0.730***
terrestrial southern torrent salamander	0.028	0.266	0.266	0.266
terrestrial California red-legged frog	0.024	0.132	0.132	0.132
terrestrial foothill yellow-legged frog	0.098	***0.535***	***0.535***	***0.535***
terrestrial arroyo toad	0.153	***0.784***	***0.784***	***0.784***
terrestrial western spadefoot	0.175	***0.894***	***0.894***	***0.894***
giant garter snake	0.001	0.009	0.009	0.009
Alameda whipsnake	0.000	0.002	0.002	0.002
northern red diamond rattlesnake	0.002	0.001	0.001	0.001
western pond turtle	0.001	0.008	0.008	0.008
desert tortoise	0.029	0.100	0.100	0.100
East Pacific green sea turtle	0.000	0.000	0.000	0.001
western fence lizard	0.028	0.096	0.096	0.096
blunt-nosed leopard lizard	0.031	0.105	0.105	0.105
tidewater goby	0.000	0.000	0.000	0.000
delta smelt	0.000	0.000	0.000	0.000
Sacramento splittail	0.000	0.000	0.000	0.000
arroyo chub	0.000	0.001	0.001	0.001
coastal cutthroat trout	0.000	0.000	0.000	0.000
desert pupfish	0.000	0.001	0.001	0.001
Chinook salmon	0.000	0.000	0.000	0.000
tricolored blackbird	**1.163**	0.214	**3.454**	**6.693**
mourning dove	0.000	0.002	0.002	0.002
osprey	0.028	0.000	0.044	0.087
California brown pelican	0.032	0.000	0.051	0.102
California condor	0.017	0.000	0.003	0.006
white-tailed kite	0.054	0.019	0.019	0.019
Cooper's hawk	0.033	0.002	0.006	0.010
fulvous whistling-duck	0.001	0.003	0.003	0.003
western yellow-billed cuckoo	**4.057**	**20.753**	**20.753**	**20.753**
purple martin	**2.721**	**15.110**	**15.110**	**15.110**
yellow rail	0.334	***0.627***	***0.627***	***0.627***
mule deer	0.082	0.278	0.278	0.278
riparian brush rabbit	0.490	**1.650**	**1.650**	**1.650**
southern sea otter	0.006	0.040	0.040	0.040
southwestern river otter	0.010	0.038	0.048	0.058
American badger	0.016	0.036	0.036	0.036
northwestern San Diego pocket mouse	0.023	0.077	0.077	0.077
big free-tailed bat	0.385	0.011	***0.657***	**1.302**
southern grasshopper mouse	0.349	**1.168**	**1.168**	**1.168**
Nelson's antelope squirrel	0.330	**1.114**	**1.114**	**1.114**

Table Eco-2. Continued.

Surrogate Species	Acute	Chronic AUF	Chronic Midpoint AUF	Chronic No AUF
vernal pool fairy shrimp	0.000	0.000	0.000	0.000
Tomales isopod	***0.916***	**2.848**	**2.848**	**2.848**
California freshwater shrimp	***0.916***	**2.848**	**2.848**	**2.848**
Shasta crayfish	***0.916***	**2.848**	**2.848**	**2.848**
mimic tryonia	0.000	0.001	0.001	0.001
black abalone	0.000	0.001	0.001	0.001
earthworm	***0.866***	**5.219**	**5.219**	**5.219**
honey bee-adult (contact)	0.000			
honey bee-adult (oral)	**2707.724**	**358.422**	**2419.352**	**4480.281**
Honey bee-larvae		**9.700**	**65.476**	**121.252**
Blennosperma vernal pool andrenid bee (contact)	0.000			
Blennosperma vernal pool andrenid bee (oral)	**2707.724**			
San Joaquin tiger beetle (contact)	0.000			

6 Uncertainties

Uncertainty in ecological risk assessment derives partly from biological variability. The response of ecological receptors following exposure to contaminants will vary among individuals within a species as well as across species. Also, literature values from different species were used to predict the response of the surrogate species of interest in this ERA. The differences among species always introduces unavoidable uncertainty to an ERA. Uncertainty regarding predictions in a risk assessment may be due to inherent randomness, limited knowledge, or lack of knowledge (Suter, 2007: p. 69).

A common practice in ERAs is to apply uncertainty factors to various values used in calculations to estimate potential risk. In this ERA, we applied uncertainty factors to toxicity endpoints in the development of TRVs when the ideal value (*e.g.*, acute or chronic NOAELs) was not available. In the development of TRVs (Section 4), the uncertainty factors suggested by the U.S. Army (2000) and US EPA (2004) were used. Uncertainty factors were also applied when using the BMF to estimate tissue concentration in predatory terrestrial vertebrates. In this instance, using the BMF from shrews developed by Armitage and Gobas (2007) and applying that BMF terrestrial vertebrates is novel and no published references were available for determining appropriate uncertainty factors. Professional judgment was used in assigning uncertainty factors to the shrew BMF.

6.1 Exposure Assessment Uncertainties

In this ERA, exposure of ecological receptors could not be directly measured. Models were used to estimate exposure following applications of Merit 2F. The use of models to estimate exposure necessarily introduces uncertainty regarding how well those models will predict the exposure that actually occurs following applications. Reliance on exposure models developed by the US EPA was intended to standardize the approach here and to reduce the potential of underestimating exposure.

6.1.1 Application Scenarios

Merit 2F application scenarios were based on descriptions provided by CDFA staff. Where a range of conditions were possible, such as the area of an application site, CDFA staff were requested to provide conditions that were ‘reasonably foreseeable’ and tending toward worse case. The most common conditions under which applications were likely to be made were analyzed, but some uncommon conditions that could lead to greater or lesser exposure than the scenarios represented in the risk assessment were not analyzed. For example, to produce a quantitative estimate of risk, the area of application needed to be defined. It is certainly possible that smaller or larger application areas than used in this ERA could occur in the future.

The application area was defined by an area surrounding a location where the pest was located and with a history for eradication of Japanese beetles. Within that application area, many features would not be treated with pesticides. For example, pavement and buildings would not treated. Generally only host plants for the pest of concern would be treated, which would also include lawns. Since it was not possible to know how many host plants would exist with the residential application areas, it was assumed approximately one-third of the entire area was treated.

6.1.2 Aquatic Exposure Assessment

Water concentrations used to estimate exposure for drinking water of terrestrial species or for uptake into aquatic prey were based on outputs from US EPA’s SWCC model (US EPA, 2014b). SWCC did not provide a means to appropriately estimate water concentrations in surface water that was not immediately adjacent to the application site. The inability to accurately model concentrations in water bodies not immediately adjacent to application sites tended to produce an overestimate for water concentrations. The resulting risk estimates would therefore be exaggerated.

Water concentrations in SWCC are based on what would occur in a 1-ha (2.471-acre) waterbody. In reality, a wide variety of water bodies could be adjacent to application sites. Where water bodies, such as vernal pools that are smaller and shallower than the modeled waterbody, were the appropriate habitat for species or provide drinking water for terrestrial species, the estimates from SWCC would be low. However, where water bodies were larger, the estimates were likely extremely exaggerated. SWCC did not allow for estimated water concentrations in a flowing water body. Any water movement would lead to an overestimation of water concentrations by SWCC.

Uptake from water into aquatic prey was estimated using KABAM (US EPA, 2009). KABAM had a limitation in the range of chemicals for which it provided appropriate tissue concentrations. Chemicals with Log K_{ow} outside the range of 4 to 8 were not appropriate for use with KABAM. However, KABAM is a model developed by US EPA for estimating tissue concentrations and no other US EPA model exists for chemical outside the range of Log K_{ow} of 4 to 8. It was not known whether use of KABM on chemicals with Log K_{ow} outside the ideal range would produce under or overestimates of tissue concentrations.

No attempt was made to eliminate food items, such as aquatic invertebrates or fish that might have died from exposure to the pesticide prior to being available for consumption. Since it was unlikely that dead prey would be consumed, failure to eliminate dead prey would have produced an overestimation of exposure.

6.1.3 Marine/Estuarine Exposure Assessment

No models were available for estimating water concentrations in marine/estuarine environments. Many of the same uncertainties existed for marine/estuarine environments as for freshwater environments. It is not known how a more saline environment might affect the outputs from the models. SWCC was expected to greatly exaggerate the water concentrations in marine/estuarine habitats because of the much larger volume of water present in the marine/estuarine environments and the routine flushing of the areas from tides and wave action.

6.1.4 Terrestrial Exposure Assessment

Whenever EECs are based on modeled residues, uncertainty exists regarding the representativeness of the model outputs. T-REX, the model used for many of the EECs in terrestrial food items was developed from empirical data for vegetation (Hoerger and Kenaga, 1972, Fletcher *et al.*, 1994), but also estimates residues on food items such as fruits, seeds and insects. The model was recently updated to better estimate residues on insects (US EPA, 2012c), but residues on seeds were not based on empirical data. Without empirical data to evaluate seed residues, the accuracy of the estimated concentrations is not known. However, by using models developed by the US EPA, every effort was made to reduce the chances that exposure was underestimated. Also, the husks of many seeds or fruits might be discarded when wildlife eat them, which would cause the EEC used in the ERA to be greater than actual exposure and risks overestimated.

Systemic residues taken up by plants or terrestrial invertebrates were based primarily on the K_{ow} of the chemical and assumed to be instantaneous. In reality, uptake from an environmental media such as soil or water would require time making any acute EECs selected shortly after an application an overestimation of what was actually present within the plant tissue. Many factors can influence the rate of uptake in plants. Water soluble chemicals are taken up more quickly when plants are actively transpiring and water is available for uptake (*i.e.*, they are not under drought conditions). Other chemicals will be taken up more quickly when plants are actively metabolizing and absorbing nutrients. The actual rate will depend on chemical characteristics and the conditions at the time of and following an application. The one thing that can be known for sure is that the uptake will not be instantaneous.

Concentrations of chemicals in soil were based on the amount concentrated in the upper 15 cm. Residues were assumed to instantaneously be distributed throughout the soil column. For an acute exposure to soil in the diet, such an assumption of instantaneous distribution would lead to an underestimation of exposure immediately following an application as the chemicals may not have had a chance to migrate through the full 15 cm. Since many chemicals are known to penetrate deeper than 15 cm (*e.g.*, Ramanand *et al*., 1988; Zhang *et al*., 2000), limiting the penetration zone to only 15 cm lead to an overestimation of chronic exposures.

Tissue concentrations in terrestrial vertebrate prey were assumed to be equivalent to the daily intake of a chemical. These residues would initially necessarily be concentrated in the gastrointestinal tract and not uniformly distributed throughout the body. Over the longer term, the concentration in other body tissues will depend on the degree to which chemical are absorbed from the gastrointestinal tract, the rate at which they are metabolized, and the rate at which they are excreted. The amounts of pesticide present in the gastrointestinal tract is generally higher than in other tissues because it will contain residues in from the diet that might pass through unabsorbed. If the gastrointestinal tract is preferentially selected or avoided in larger prey, exposure estimates could be systematically over or underestimated.

The only terrestrial vertebrate model for calculating a BMF for chronic exposures of predators is for the simple food chain of soil → earthworm → shrew (Armitage and Gobas, 2007). The applicability of using the shrew BMF to other mammals and other terrestrial vertebrate groups is not known. Whether use of this model produces a systematic over or underestimation of exposure is not known.

No attempt was made to eliminate food items, particularly insect prey that might have died from exposure to the pesticide prior to being available for consumption. Since it was unlikely that dead prey would be consumed by predators or insectivores, failure to eliminate dead or moribund prey would have produced an overestimation of exposure.

Since this ERA is attempting to address potential future applications of pesticides, the proximity of application sites is not known. For species with large foraging areas, an AUF was used to account for the difference between the area where pesticide applications occur and the full area where a terrestrial species could forage. Should more than one application site occur within a species' foraging range, use of an AUF would underestimate potential exposure. In addition to presenting RQs based on an AUF, RQs estimated from exposure based on no AUF and a Mid-point AUF were also presented. Without knowing the distribution of application sites across a species foraging range, the appropriateness of any of these estimates of exposure cannot be known. By including the full range of possibilities from using an AUF to assuming the full foraging range could be treated, the complete range of exposures and the resulting RQs were presented.

6.1.5 Exposure of Birds and Mammals to Aquatic Prey

Species such as the osprey or southwestern river otter that typically forage in freshwater habitats larger than the waterbody modeled in SWCC or the California brown pelican or southern sea otter that forage in marine/estuarine environments are likely to be exposed to prey from waters with lower concentrations than estimated by SWCC. The degree to which exposure for these species was overestimated is unknown.

6.2 Effects Assessment Uncertainties

6.2.1 Use of Surrogate Species Effects Data

Toxicity data were rarely available for the surrogate species considered in the risk assessment. Use of effects data from species other than the species inherently added uncertainty to the assessment. When toxicity data for more than one species was available, the more sensitive species was selected. Data from species as closely related as possible were used. For example, when toxicity data from a passerine species was available, it was used for the passerine birds in the assessment.

Toxicity data were not always available for all taxonomic groups. This was most common for amphibians and reptiles. Bird or fish toxicity data were used when no data were available for terrestrial-phase amphibians and reptiles or aquatic-phase amphibians, respectively. It was not known when this approach might lead to an over or underestimation of risk.

6.2.2 Sublethal Effects

Sublethal effects were not specifically addressed, but when ecologically relevant sublethal toxicity endpoints were available for on which to base TRVs, those results were preferentially selected.

6.2.3 Dermal or Inhalation Effects

In ERAs, it is standard practice to only address effects from oral exposure to terrestrial vertebrates. In general, focusing on effects from oral exposures in adequate (Suter, 2007: pp. 258-259). However, for terrestrial-phase amphibians, it is possible that dermal exposure to pesticide on surface soils might be readily absorbed and contribute to adverse effects in these species. Effects data for this pathway do not exist, so any effects from contact of terrestrial-phase amphibians to pesticides in soils are unknown. Also, inhalation exposure to airborne concentrations of pesticides, particularly fumigants, can occur. Effects data from inhalation exposure are also lacking for wildlife species. The inability to include any potential risk derived from dermal or inhalation exposure will necessarily underestimate total risk, but since these routes are thought to generally be negligible, exclusion of exposure from these routes did not seriously affect the assessment of risk.

7 Conclusions

This ERA was conducted to determine the potential harm to ecological receptors from implementation of turf drench treatments for eradication of Japanese Beetles. The ERA was conducted using procedures and methodologies commonly used by government agencies such as US EPA as well as the risk assessment profession. The ERA relied up on the three stage process for risk assessments: problem formulation, analysis, and risk characterization. In the problem formulation phase, CDFA and its risk assessment team consulted with DPR and OEHHA to determine the appropriate scenarios to assess, models to evaluate exposure, default data assumptions, and appropriate toxicity effects representations based on scientific literature. The problem formulation stage concluded with a CSM that identified the complete exposure pathways carried forward in the analysis based on information that was available to evaluate the potential exposure pathway. During the analysis phase of the ERA, detailed exposure was estimated with models incorporating appropriate data and conservative assumptions. Also in the analysis phase, effect values were developed which incorporated the toxicity properties of the chemicals along with safety factors used to address uncertainty. The risk characterization phase provided conclusions on the potential for adverse effects to occur to ecological receptors. The risk characterization phase utilized both a quantitative and qualitative assessment. If the estimated RQ was below the LOC, then it was concluded that the potential for adverse effects is low. If the estimated RQ was above the LOC, then a qualitative assessment was conducted to incorporate information that the quantitative models are not capable of considering appropriately.

Section 5 lists the detailed results of the risk characterization phase for every species class. In some situations where the quantitative assessment indicated the RQ was below the LOC, it was easily concluded that the potential for adverse effects was low. When the RQ was above the LOC, several qualitative considerations typically resulted in a conclusion that the potential for adverse effects would be low. As described in Section 5, this includes an assessment of the potential for species presence at an actual site, incorporation of foraging range and diet, fate and transport processes such as dilution and degradation.

In the ERA, few groups of ecological receptors were found to have RQs that exceeded LOCs. These include terrestrial-phase amphibians that consume largely terrestrial insects, insectivorous birds, mammals that feed on turf or insects, aquatic invertebrates, soil-dwelling invertebrates, and insects. CDFA’s BMPs are designed to greatly reduce, if not eliminate, movement to surface water. Therefore actual impacts to aquatic invertebrates are anticipated to be minimal. Because of the targeted nature of the application on turf and low-growing groundcover, only those insects dwelling on those plant types would be directly exposed. Most insects, such as flying insects, would receive very limited exposure. Thus, most insects and insectivorous species are anticipated to be exposed to a limited extent and impacts would be minimal.

This ERA along with the Statewide PEIR will be used to assist CDFA in assessing the potential to affect particular species and developing site-specific measures to protect these species. This ERA did not identify new significant environmental effects or substantial increases in the severity of the significant effects identified in the PEIR. No alterations to PD/EP-E-08 that were not already indicated for other scenarios in the PEIR are recommended for the protection of biological resources.

8 Literature

Armitage, J.M., and Frank A.P.C. Gobas. 2007. A terrestrial food-chain bioaccumation model for POPs. Environmental Science & Technology 41(11): 4019-4025

Bomann, W. 1989. NTN 33893-Study for acute oral toxicity to mice. Unpublished report from Bayer AG, report No. 18593 Submitted to WHO by Bayer AG,Mannheim, Germany. In International Programme on Chemical Safety (INCHEM). 2001. Toxicological evaluations: Imidacloprid. Available http://www.inchem.org/documents/jmpr/jmpmono/2001pr07.htm (Accessed: July 11, 2011).

California Department of Pesticide Regulation (CDPR). 2012g. Memorandum: Primary Review of Turf Reentry Exposure Monitoring and Residue Dissipation Study with Oxadiazon. Worker Health and Safety Branch. Sacramento, CA. HSM-12005. 23 pp.

California Department of Pesticide Regulation (CDPR). 2013c. Human Pesticide Exposure Assessment, Simazine (A Selective Pre- and Post-Emergence Herbicide). Worker Health and Safety Branch. Sacramento, CA. HSM-12005. 23 pp.

Collins, C., M. Fryer, and A. Grosso. 2006. Plant uptake of non-ionic organic chemicals. Environmental Science & Technology 40(1): 45-52.

European Commission (Eur. Com.). 2000e. European IUCLID Dataset - glycerol. European Chemicals Bureau. Ispra, Italy. 172 pp. Available http://esis.jrc.ec.europa.eu/doc/IUCLID/data_sheets/56815.pdf (Accessed: May 9, 2011).

European Food Safety Authority (EFSA). 2008. Conclusion regarding the peer review of the pesticide risk assessment of the active substance imidacloprid. EFSA Scientific Report 148. 120 pp.

Feng, S., Z. Kong, X. Wang, L. Zhao, and P. Peng. 2004. Acute toxicity and genotoxicity of two novel pesticides on amphibian, Rana N. Hallowell. Chemosphere 56: 457-463.

Fletcher, J.S., J.E. Nellessen and T.G. Pfleeger. 1994. Literature review and evaluation of the EPA food-chain (Kenaga) nomogram, an instrument for estimating pesticide residues on plants. Environmental Toxicology and Chemistry 13(9):1383-1391.

Hoerger, F. and E.E. Kenaga. 1972. Pesticide residues on plants: correlation of representative data as a basis for estimation of their magnitude in the environment. In: F. Coulston and F. Corte, eds., Environmental Quality and Safety: Chemistry, Toxicology and Technology. Vol 1. George Theime Publishers, Stuttgart, Germany. pp. 9-28.

Luo, Y., Y. Zang, Y. Zhong, and Z. Kong. 1999. Toxicological study of two novel pesticides on earthworm Eisenia foetida. Chemosphere 39(13): 2347-2356.

Luo. Y. 2014. Methodology for Evaluating Pesticides for Surface Water Protection III. Module for Urban Scenarios. California Department of Pesticide Regulation. Sacramento, CA. Available: http://www.cdpr.ca.gov/docs/emon/surfwtr/review/report3.pdf

Mayer, F.L., Jr. and M.R. Ellersieck. 1986. Manual of acute toxicity: Interpretation and data base for 410 chemicals and 66 species of freshwater animals. U.S. Geological Survey Columbia Environmental Research Center. 29 pp. Available http://www.cerc.usgs.gov/pubs/center/pdfDocs/90506-intro.pdf

Ramanand, K., M. Sharmila, D. Panda, N. Sethunathan. 1988. Leaching of carbofuran in flooded field under puddled and nonpuddled conditions. Journal of Environmental Science and Health, Part B: Pesticides, Food Contaminants, and Agricultural Wastes 23(3): 225-234.

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. 2016. Web Soil Survey. Available online at http://websoilsurvey.nrcs.usda.gov/. (Accessed 4/5/2016).

Suter, G.W., II. 2007. Ecological Risk Assessment. Second Edition. CRC Press. Boca Raton, FL. 643 pp.

U.S. Environmental Protection Agency (USEPA). 1990a. Imidacloprid and Japanese quail, Pesticide Ecotoxicity Database. Office of Pesticide Programs. USEPA. Available http://www.ipmcenters.org/Ecotox/index.cfm (Accessed: February 10, 2011). U.S. Environmental Protection Agency (USEPA). 1990h. Imidacloprid and house sparrow, Pesticide Ecotoxicity Database. Office of Pesticide Programs. USEPA. Available http://www.ipmcenters.org/Ecotox/index.cfm (Accessed: February 10, 2011).

U.S. Environmental Protection Agency (USEPA). 1990c. Imidacloprid and water flea, Pesticide Ecotoxicity Database. Office of Pesticide Programs. USEPA. Available http://www.ipmcenters.org/Ecotox/index.cfm (Accessed: February 10, 2011).

U.S. Environmental Protection Agency (USEPA). 1990cg. Imidacloprid and bobwhite quail, Pesticide Ecotoxicity Database. Office of Pesticide Programs. USEPA. Available http://www.ipmcenters.org/Ecotox/index.cfm (Accessed: February 10, 2011).

U.S. Environmental Protection Agency (USEPA). 1990do. Imidacloprid and bluegill sunfish, Pesticide Ecotoxicity Database. Office of Pesticide Programs. USEPA. Available http://www.ipmcenters.org/Ecotox/index.cfm (Accessed: November 26, 2013).

U.S. Environmental Protection Agency (USEPA). 1990e1990b. Imidacloprid and mysid, Pesticide Ecotoxicity Database. Office of Pesticide Programs. USEPA. Available http://www.ipmcenters.org/Ecotox/index.cfm (Accessed: February 10, 2011).

U.S. Environmental Protection Agency (USEPA). 1990ef. Imidacloprid and sheepshead minnow, Pesticide Ecotoxicity Database. Office of Pesticide Programs. USEPA. Available http://www.ipmcenters.org/Ecotox/index.cfm (Accessed: February 10, 2011).

U.S. Environmental Protection Agency (USEPA). 1990fi. Imidacloprid and honey bee, Pesticide Ecotoxicity Database. Office of Pesticide Programs. USEPA. Available http://www.ipmcenters.org/Ecotox/index.cfm (Accessed: February 10, 2011).

U.S. Environmental Protection Agency (USEPA). 1991ea. Imidacloprid and eastern oyster, Pesticide Ecotoxicity Database. Office of Pesticide Programs. USEPA. Available http://www.ipmcenters.org/Ecotox/index.cfm (Accessed: February 10, 2011).

U.S. Environmental Protection Agency (USEPA). 1991fb. Imidacloprid and rainbow trout, Pesticide Ecotoxicity Database. Office of Pesticide Programs. USEPA. Available http://www.ipmcenters.org/Ecotox/index.cfm (Accessed: February 10, 2011).

U.S. Environmental Protection Agency (USEPA). 1998. Guidelines for ecological risk assessment. Risk Assessment Forum. EPA/630/R-95/002F. 124 pp. Available http://www.epa.gov/raf/publications/pdfs/ECOTXTBX.PDF U.S. Environmental Protection Agency (USEPA). 1998e. Mineral oil and bobwhite quail, Pesticide Ecotoxicity Database. Office of Pesticide Programs. USEPA. Available http://www.ipmcenters.org/Ecotox/index.cfm (Accessed: February 10, 2011).

U.S. Environmental Protection Agency (USEPA). 2003. Generic Ecological Assessment Endpoints (GEAEs) for ecological risk assessment. Washington, D.C: Risk Assessment Forum. EPA/630/P-02/004F. 27 pp. Available http://www.epa.gov/raf/publications/pdfs/GENERIC_ENDPOINTS_2004.PDF U.S. Environmental Protection Agency (USEPA). 2003b. Pesticide fact sheet: clothianidin: conditional registration. Office of Prevention, Pesticides and Toxic Substances. 19 pp. Available http://www.epa.gov/opp00001/chem_search/reg_actions/registration/fs_PC-044309_30-May-03.pdf

U.S. Environmental Protection Agency (USEPA). 2004b. Pesticide fact sheet: dinotefuran. Office of Prevention, Pesticides and Toxic Substances. 63 pp. Available http://www.epa.gov/opp00001/chem_search/reg_actions/registration/fs_PC-044312_01-Sep-04.pdf

U.S. Environmental Protection Agency (USEPA). 2004j. Overview of the ecological risk assessment process in the Office of Pesticide Programs, U.S. Environmental Protection Agency. Endangered and Threatened Species Effects Determinations. U.S. Environmental Protection Agency, Office of Prevention, Pesticides and Toxic Substances, Office of Pesticide Programs, Washington, D.C. 92 pp. Available http://www.epa.gov/espp/consultation/ecorisk-overview.pdf

U.S. Environmental Protection Agency (USEPA). 2009s. User's guide and technical documentation: KABAM version 1.0 (Kow (based) Aquatic BioAccumulation Model). Environmental Fate and Effects Division, Office of Pesticide Programs. USEPA. Washington DC.

U.S. Environmental Protection Agency (USEPA). 2011. Exposure Factors Handbook: 2011 Edition. 1466 pp. Available at: http://cfpub.epa.gov/ncea/risk/recordisplay.cfm?deid=236252 (Accessed: January 18, 2012).

U.S. Environmental Protection Agency (USEPA). 2012b. Technical overview of ecological risk assessment. Available http://www.epa.gov/oppefed1/ecorisk_ders/index.htm. Accessed 10/22/2012.

U.S. Environmental Protection Agency (USEPA). 2012ci. User's guide T-Rex version 1.5 (Terrestrial Residue Exposure model). Office of Pesticide Programs. Washington, D.C. Available http://www.epa.gov/oppefed1/models/terrestrial/trex/t_rex_user_guide.htm (Accessed: June 5, 2012).

U.S. Environmental Protection Agency (USEPA). 2012ga. White paper in support of the proposed risk assessment process for bees, submitted to the FIFRA Scientific Advisory Panel for Review and Comment September 11 – 14, 2012. Document ID: EPA-HQ-OPP-2012-0543-0004. Available http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OPP-2012-0543-0004. (Accessed: 10/22/2012).

U.S. Environmental Protection Agency (USEPA). 2014a. Guidance for Assessing Pesticide Risk to Bees. Office of Pesticide Programs, United States Environmental Protection Agency, Washington DC. 59 pp.

U.S. Environmental Protection Agency (USEPA). 2014b. Surface Water Concentration Calculator User Manual. Office of Pesticide Programs. Available: https://www.epa.gov/pesticide-science-and-assessing-pesticide-risks/models-pesticide-risk-assessment (Accessed: May 17, 2016)

U.S. Environmental Protection Agency (USEPA). 2014c. The Variable Volume Water Model. Office of Pesticide Programs. Available: https://www.epa.gov/pesticide-science-and-assessing-pesticide-risks/models-pesticide-risk-assessment (Accessed: May 17, 2016)

U.S. Environmental Protection Agency (USEPA). 2016. Preliminary Pollinator Assessment to Support the Registration Review of Imidacloprid. Office of Pesticide Programs, Environmental Fate and Effects Division, Washington DC. 305 pp/

Wild, S.R. and K.C. Jones. 1992. Organic chemicals entering agricultural soils in sewage sludges screening for their potential to transfer to crop plants and livestock. Science of The Total Environment. 119:85-119.

Zhang L, SU Khan, MH Akhtar, and KC Ivarson. 1984. Persistence, degradation, and distribution of deltamethrin in an organic soil under laboratory conditions. Journal of Agricultural and Food Chemistry 32 (6): 1207-1211.

Appendix Eco-A. Estimated water concentrations using the Surface Water Concentation Calculator.

Estimated Water Concentrations following Application Scenario PD/EP-E-08: Turf drench applications of Merit 2F at 0.4 lb a.i./Acre to 640 acres in a residential/urban setting

Chemical	Inst. Limnetic C_w (ug/L)	Inst. Benthic C_w (ug/L)	21 Day Limnetic C_w (ug/L)	21 Day Benthic C_w (ug/L)	31 Day Limnetic C_w (ug/L)	31 Day Benthic C_w (ug/L)	60 Day Limnetic C_w (ug/L)	Average Water Temp of EXAMS Pond (ºC)
Imidacloprid	1.74	0.17	0.54	0.16	0.54	0.16	0.29	25
Glycerin	2.08	0.16	1.04	0.14	1.04	0.14	0.43	25

Appendix Eco-B. Estimated Environmental Concentrations.

Estimated Environmental Concentrations following Application Scenario PD/EP-E-08: Turf drench applications of Merit 2F at 0.4 lb a.i./Acre to 640 acres in a residential/urban setting

EcoRisk Model Run	Baseline- No Drift Buffer to Water or Habitat			
Application Scenario	PD/EP-E-08			
Chemical	Glycerin		Imidacloprid	
Acute or Chronic	Acute EECs (maximum instantaneous)	Chronic EECs (TWA)	Acute EECs (maximum instantaneous)	Chronic EECs (TWA)
Bee (Contact) (mg/bee)	0.00E+00	-	0.00E+00	-
Pollen & Nectar (mg/bee)	2.01E-03	3.03E-05	4.22E-03	7.17E-04
Pollen & Nectar Larval (mg/bee)	8.65E-04	1.29E-05	1.82E-03	3.06E-04
Terrestrial Insects (mg dw/kg)	3.94E+01	5.94E-01	8.27E+01	1.40E+01
Terrestrial Invertebrates (mg dw/kg)	1.53E-03	2.39E-04	2.60E-01	1.95E-01
Aquatic Invertebrates (mg dw/kg)	5.67E+00	2.85E+00	5.88E+00	1.85E+00
Aquatic Insects (mg dw/kg)	1.05E+01	5.30E+00	1.15E+01	3.62E+00
Aquatic Vegetation (mg dw/kg)	1.04E-03	9.06E-04	7.81E-04	7.46E-04
Mixed Terrestrial Vegetation (mg dw/kg)	7.84E+01	1.17E+00	1.65E+02	2.80E+01
Terrestrial Broad-Leafed Vegetation (mg dw/kg)	5.65E+01	8.45E-01	1.19E+02	2.02E+01
Terestrial Grass (mg dw/kg)	1.25E+02	1.87E+00	2.64E+02	4.48E+01
Seeds (mg dw/kg)	1.19E-02	1.87E-03	1.88E-04	1.41E-04
Fruit (mg dw/kg)	4.71E-02	7.36E-03	7.42E-04	5.55E-04
Mammals (mg dw/kg)	3.22E+00	9.61E-03	6.78E+00	2.28E-01
Birds (mg dw/kg)	1.82E+00	1.88E-02	3.43E+00	5.16E-02
Reptiles (mg dw/kg)	2.32E-01	3.27E-02	4.73E-01	3.18E-01
Amphibians (mg dw/kg)	1.87E-01	7.64E-02	3.70E-01	4.80E-01
Fish (mg dw/kg)	6.44E+00	3.24E+00	6.13E+00	1.92E+00
Acute Soils (mg dw/kg)	9.46E-02	-	1.99E-01	-
31-Day Soil TWA (mg dw/kg)	-	1.48E-02	-	1.49E-01
56-Day Soil TWA (mg dw/kg)	-	8.19E-03	-	1.20E-01

Notes:
"-" – Indicates that an EEC is not applicable to the media

Appendix Eco-C. Toxicity Reference Values

Toxicity Reference Values for Imidacloprid

Species	Acute/ Chronic	TRV	Reference	Notes
Aquatic Arroyo Toad	Acute	16700 ug/L	Feng et al., 2004	based on a NOEL for mortality in a LC50 test for the Asian grass frog (Rana limnocharis)
Aquatic Arroyo Toad	Chronic	278.3 ug/L	Feng et al., 2004	based on 1/60th of the NOEL for mortality in a LC50 test for the Asian grass frog (Rana limnocharis)
Aquatic California Tiger Salamander	Acute	16700 ug/L	Feng et al., 2004	based on a NOEL for mortality in a LC50 test for the Asian grass frog (Rana limnocharis)
Aquatic California Tiger Salamander	Chronic	278.3 ug/L	Feng et al., 2004	based on 1/60th of the NOEL for mortality in a LC50 test for the Asian grass frog (Rana limnocharis)
Terrestrial Western Spadefoot	Acute	3.1 mg/kg(bw)-day	USEPA, 1990a	based on NOEL for acute effects for the Japanese quail
Terrestrial Western Spadefoot	Chronic	0.103 mg/kg(bw)-day	USEPA, 1990a	based on 1/30th the NOEL for acute effects for the Japanese quail
Terrestrial Arroyo Toad	Acute	3.1 mg/kg(bw)-day	USEPA, 1990a	based on NOEL for acute effects for the Japanese quail
Terrestrial Arroyo Toad	Chronic	0.103 mg/kg(bw)-day	USEPA, 1990a	based on 1/30th the NOEL for acute effects for the Japanese quail
Terrestrial Foothill Yellow-legged Frog	Acute	3.1 mg/kg(bw)-day	USEPA, 1990a	based on NOEL for acute effects for the Japanese quail
Terrestrial Foothill Yellow-legged Frog	Chronic	0.103 mg/kg(bw)-day	USEPA, 1990a	based on 1/30th the NOEL for acute effects for the Japanese quail
Terrestrial California Red-legged Frog	Acute	3.1 mg/kg(bw)-day	USEPA, 1990a	based on NOEL for acute effects for the Japanese quail
Terrestrial California Red-legged Frog	Chronic	0.103 mg/kg(bw)-day	USEPA, 1990a	based on 1/30th the NOEL for acute effects for the Japanese quail

Species	Acute/ Chronic	TRV		Reference	Notes
Terrestrial Southern Torrent Salamander	Acute	3.1	mg/kg(bw)-day	USEPA, 1990a	based on NOEL for acute effects for the Japanese quail
Terrestrial Southern Torrent Salamander	Chronic	0.103	mg/kg(bw)-day	USEPA, 1990a	based on 1/30th the NOEL for acute effects for the Japanese quail
Aquatic Western Spadefoot	Acute	16700	ug/L	Feng et al., 2004	based on a NOEL for mortality in a LC50 test for the Asian grass frog (Rana limnocharis)
Aquatic Western Spadefoot	Chronic	278.3	ug/L	Feng et al., 2004	based on 1/60th of the NOEL for mortality in a LC50 test for the Asian grass frog (Rana limnocharis)
Aquatic Foothill Yellow-legged Frog	Acute	16700	ug/L	Feng et al., 2004	based on a NOEL for mortality in a LC50 test for the Asian grass frog (Rana limnocharis)
Aquatic Foothill Yellow-legged Frog	Chronic	278.3	ug/L	Feng et al., 2004	based on 1/60th of the NOEL for mortality in a LC50 test for the Asian grass frog (Rana limnocharis)
Aquatic California Red-legged Frog	Acute	16700	ug/L	Feng et al., 2004	based on a NOEL for mortality in a LC50 test for the Asian grass frog (Rana limnocharis)
Aquatic California Red-legged Frog	Chronic	278.3	ug/L	Feng et al., 2004	based on 1/60th of the NOEL for mortality in a LC50 test for the Asian grass frog (Rana limnocharis)
Aquatic Southern Torrent Salamander	Acute	16700	ug/L	Feng et al., 2004	based on a NOEL for mortality in a LC50 test for the Asian grass frog (Rana limnocharis)
Aquatic Southern Torrent Salamander	Chronic	278.3	ug/L	Feng et al., 2004	based on 1/60th of the NOEL for mortality in a LC50 test for the Asian grass frog (Rana limnocharis)
Terrestrial California Tiger Salamander	Acute	3.1	mg/kg(bw)-day	USEPA, 1990a	based on NOEL for acute effects for the Japanese quail
Terrestrial California Tiger Salamander	Chronic	0.103	mg/kg(bw)-day	USEPA, 1990a	based on 1/30th the NOEL for acute effects for the Japanese quail
Tomales Isopod	Acute	1.9	ug/L	USEPA, 1990b	TRV based on 1/20th the LC50 in the mysid.

Species	Acute/ Chronic	TRV	Reference	Notes
Tomales Isopod	Chronic	0.19 ug/L	USEPA, 1990b	TRV based on 1/200th the LC50 in the mysid.
Vernal Pool Fairy Shrimp	Acute	4200 ug/L	USEPA, 1990c	TRV based on NOEC for acute effects in the water flea.
Vernal Pool Fairy Shrimp	Chronic	1800 ug/L	USEPA, 1990c	TRV based on NOEC for chronic effects in the water flea.
California Freshwater Shrimp	Acute	1.9 ug/L	USEPA, 1990b	TRV based on 1/20th the LC50 in the mysid.
California Freshwater Shrimp	Chronic	0.19 ug/L	USEPA, 1990b	TRV based on 1/200th the LC50 in the mysid.
Shasta Crayfish	Acute	1.9 ug/L	USEPA, 1990b	TRV based on 1/20th the LC50 in the mysid.
Shasta Crayfish	Chronic	0.19 ug/L	USEPA, 1990b	TRV based on 1/200th the LC50 in the mysid.
Mimic Tryonia	Acute	7250 ug/L	USEPA, 1991a	TRV based on 1/20th the EC50 for the eastern oyster.
Mimic Tryonia	Chronic	725 ug/L	USEPA, 1991a	TRV based on 1/200th the EC50 for the eastern oyster.
Black Abalone	Acute	7250 ug/L	USEPA, 1991a	TRV based on 1/20th the EC50 for the eastern oyster.
Black Abalone	Chronic	725 ug/L	USEPA, 1991a	TRV based on 1/200th the EC50 for the eastern oyster.
Osprey	Acute	15.23 mg/kg(bw)-day	USEPA, 1990c	based on 1/10th the LD50 in the northern bobwhite
Osprey	Chronic	1.523 mg/kg(bw)-day	USEPA, 1990c	based on 1/100th the LD50 in the northern bobwhite
White-tailed Kite	Acute	15.23 mg/kg(bw)-day	USEPA, 1990c	based on 1/10th the LD50 in the northern bobwhite
White-tailed Kite	Chronic	1.523 mg/kg(bw)-day	USEPA, 1990c	based on 1/100th the LD50 in the northern bobwhite
Mourning Dove	Acute	15.23 mg/kg(bw)-day	USEPA, 1990c	based on 1/10th the LD50 in the northern bobwhite

Species	Acute/ Chronic	TRV		Reference	Notes
Mourning Dove	Chronic	1.523	mg/kg(bw)-day	USEPA, 1990c	based on 1/100th the LD50 in the northern bobwhite
California Brown Pelican	Acute	15.23	mg/kg(bw)-day	USEPA, 1990c	based on 1/10th the LD50 in the northern bobwhite
California Brown Pelican	Chronic	1.523	mg/kg(bw)-day	USEPA, 1990c	based on 1/100th the LD50 in the northern bobwhite
California Condor	Acute	15.23	mg/kg(bw)-day	USEPA, 1990c	based on 1/10th the LD50 in the northern bobwhite
California Condor	Chronic	1.523	mg/kg(bw)-day	USEPA, 1990c	based on 1/100th the LD50 in the northern bobwhite
Fulvous Whistling-duck	Acute	15.23	mg/kg(bw)-day	USEPA, 1990c	based on 1/10th the LD50 in the northern bobwhite
Fulvous Whistling-duck	Chronic	1.523	mg/kg(bw)-day	USEPA, 1990c	based on 1/100th the LD50 in the northern bobwhite
Western Yellow-billed Cuckoo	Acute	3.1	mg/kg(bw)-day	USEPA, 1990a	based on NOEL for acute effects for the Japanese quail
Western Yellow-billed Cuckoo	Chronic	0.103	mg/kg(bw)-day	USEPA, 1990a	based on 1/30th the NOEL for acute effects for the Japanese quail
Purple Martin	Acute	3.1	mg/kg(bw)-day	USEPA, 1990a	based on NOEL for acute effects for the Japanese quail
Purple Martin	Chronic	0.103	mg/kg(bw)-day	USEPA, 1990a	based on 1/30th the NOEL for acute effects for the Japanese quail
Tricolored Blackbird /redwinged blackbird	Acute	3.1	mg/kg(bw)-day	USEPA, 1990a	based on NOEL for acute effects for the Japanese quail
Tricolored Blackbird /redwinged blackbird	Chronic	0.103	mg/kg(bw)-day	USEPA, 1990a	based on 1/30th the NOEL for acute effects for the Japanese quail
Yellow rail	Acute	15.23	mg/kg(bw)-day	USEPA, 1990c	based on 1/10th the LD50 in the northern bobwhite
Yellow rail	Chronic	1.523	mg/kg(bw)-day	USEPA, 1990c	based on 1/100th the LD50 in the northern bobwhite
Cooper's Hawk	Acute	15.23	mg/kg(bw)-day	USEPA, 1990c	based on 1/10th the LD50 in the northern bobwhite

Species	Acute/ Chronic	TRV		Reference	Notes
Cooper's Hawk	Chronic	1.523	mg/kg(bw)-day	USEPA, 1990c	based on 1/100th the LD50 in the northern bobwhite
Arroyo Chub	Acute	25000	ug/l(bw)-day	USEPA, 1990d	TRV based on the NOEL for the bluegill sunfish.
Arroyo Chub	Chronic	416.7	ug/l(bw)-day	USEPA, 1990d	TRV based on 1/60th the NOEL for the bluegill sunfish.
Tidewater Goby	Acute	58200	ug/L	USEPA, 1990e	TRV based on the NOEC for acute effects in the sheepshead minnow.
Tidewater Goby	Chronic	970	ug/L	USEPA, 1990e	TRV based on 1/60th the NOEC for acute effects in the sheepshead minnow.
Sacramento splittail	Acute	58200	ug/L	USEPA, 1990e	TRV based on the NOEC for acute effects in the sheepshead minnow.
Sacramento splittail	Chronic	970	ug/L	USEPA, 1990e	TRV based on 1/60th the NOEC for acute effects in the sheepshead minnow.
Coastal Cutthroat Trout	Acute	42000	ug/L	USEPA, 1991b	TRV based on NOEC for acute effects in the rainbow trout.
Coastal Cutthroat Trout	Chronic	1200	ug/L	USEPA, 1991b	TRV based on NOEC for chronic effects in the rainbow trout.
Desert Pupfish	Acute	25000	ug/L	USEPA, 1990d	based on the NOEC for acute effects in bluegill sunfish
Desert Pupfish	Chronic	416.7	ug/L	USEPA, 1990d	based on 1/60th the NOEC for acute effects in bluegill sunfish
Chinook Salmon--Central Valley spring-run ESU	Acute	42000	ug/L	USEPA, 1991e	TRV based on NOEC for acute effects in the rainbow trout.
Chinook Salmon--Central Valley spring-run ESU	Chronic	1200	ug/L	USEPA, 1991b	TRV based on NOEC for chronic effects in the rainbow trout.
Delta smelt	Acute	58200	ug/L	USEPA, 1990e	TRV based on the NOEC for acute effects in the sheepshead minnow.
Delta smelt	Chronic	970	ug/L	USEPA, 1990e	TRV based on 1/60th the NOEC for acute effects in the sheepshead minnow.

Species	Acute/ Chronic	TRV		Reference	Notes
Riparian brush rabbit	Acute	26	mg/kg(bw)-day	Bomann, 1989 in INCHEM, 2001	TRV based on 1/5th the LD50 in the mouse.
Riparian brush rabbit	Chronic	1.3	mg/kg(bw)-day	Bomann, 1989 in INCHEM, 2001	TRV based on 1/100th the LD50 in the mouse.
Southern (Ramona) Grasshopper Mouse	Acute	26	mg/kg(bw)-day	Bomann, 1989 in INCHEM, 2001	TRV based on 1/5th the LD50 in the mouse.
Southern (Ramona) Grasshopper Mouse	Chronic	1.3	mg/kg(bw)-day	Bomann, 1989 in INCHEM, 2001	TRV based on 1/100th the LD50 in the mouse.
Big Free-tailed Bat	Acute	26	mg/kg(bw)-day	Bomann, 1989 in INCHEM, 2001	TRV based on 1/5th the LD50 in the mouse.
Big Free-tailed Bat	Chronic	1.3	mg/kg(bw)-day	Bomann, 1989 in INCHEM, 2001	TRV based on 1/100th the LD50 in the mouse.
Mule Deer	Acute	26	mg/kg(bw)-day	Bomann, 1989 in INCHEM, 2001	TRV based on 1/5th the LD50 in the mouse.
Mule Deer	Chronic	1.3	mg/kg(bw)-day	Bomann, 1989 in INCHEM, 2001	TRV based on 1/100th the LD50 in the mouse.

Species	Acute/ Chronic	TRV	Reference	Notes
Northwestern San Diego Pocket Mouse	Acute	26 mg/kg(bw)-day	Bomann, 1989 in INCHEM, 2001	TRV based on 1/5th the LD50 in the mouse.
Northwestern San Diego Pocket Mouse	Chronic	1.3 mg/kg(bw)-day	Bomann, 1989 in INCHEM, 2001	TRV based on 1/100th the LD50 in the mouse.
Nelson's Antelope Squirrel	Acute	26 mg/kg(bw)-day	Bomann, 1989 in INCHEM, 2001	TRV based on 1/5th the LD50 in the mouse.
Nelson's Antelope Squirrel	Chronic	1.3 mg/kg(bw)-day	Bomann, 1989 in INCHEM, 2001	TRV based on 1/100th the LD50 in the mouse.
American Badger	Acute	26 mg/kg(bw)-day	Bomann, 1989 in INCHEM, 2001	TRV based on 1/5th the LD50 in the mouse.
American Badger	Chronic	1.3 mg/kg(bw)-day	Bomann, 1989 in INCHEM, 2001	TRV based on 1/100th the LD50 in the mouse.
Southwestern River Otter	Acute	26 mg/kg(bw)-day	Bomann, 1989 in INCHEM, 2001	TRV based on 1/5th the LD50 in the mouse.
Southwestern River Otter	Chronic	1.3 mg/kg(bw)-day	Bomann, 1989 in INCHEM, 2001	TRV based on 1/100th the LD50 in the mouse.

Species	Acute/ Chronic	TRV	Reference	Notes
southern sea otter	Acute	26 mg/kg(bw)-day	Bomann, 1989 in INCHEM, 2001	TRV based on 1/5th the LD50 in the mouse.
southern sea otter	Chronic	1.3 mg/kg(bw)-day	Bomann, 1989 in INCHEM, 2001	TRV based on 1/100th the LD50 in the mouse.
East Pacific Green Sea Turtle	Acute	26 mg/kg(bw)-day	Bomann, 1989 in INCHEM, 2001	TRV based on 1/5th the LD50 in the mouse.
East Pacific Green Sea Turtle	Chronic	1.3 mg/kg(bw)-day	Bomann, 1989 in INCHEM, 2001	TRV based on 1/100th the LD50 in the mouse.
Giant Garter Snake	Acute	26 mg/kg(bw)-day	Bomann, 1989 in INCHEM, 2001	TRV based on 1/5th the LD50 in the mouse.
Giant Garter Snake	Chronic	1.3 mg/kg(bw)-day	Bomann, 1989 in INCHEM, 2001	TRV based on 1/100th the LD50 in the mouse.
Alameda Whipsnake	Acute	26 mg/kg(bw)-day	Bomann, 1989 in INCHEM, 2001	TRV based on 1/5th the LD50 in the mouse.
Alameda Whipsnake	Chronic	1.3 mg/kg(bw)-day	Bomann, 1989 in INCHEM, 2001	TRV based on 1/100th the LD50 in the mouse.

Species	Acute/ Chronic	TRV	Reference	Notes
Northern red-diamond rattlesnake	Acute	26 mg/kg(bw)-day	Bomann, 1989 in INCHEM, 2001	TRV based on 1/5th the LD50 in the mouse.
Northern red-diamond rattlesnake	Chronic	1.3 mg/kg(bw)-day	Bomann, 1989 in INCHEM, 2001	TRV based on 1/100th the LD50 in the mouse.
Desert Tortoise	Acute	26 mg/kg(bw)-day	Bomann, 1989 in INCHEM, 2001	TRV based on 1/5th the LD50 in the mouse.
Desert Tortoise	Chronic	1.3 mg/kg(bw)-day	Bomann, 1989 in INCHEM, 2001	TRV based on 1/100th the LD50 in the mouse.
Western Fence Lizard	Acute	26 mg/kg(bw)-day	Bomann, 1989 in INCHEM, 2001	TRV based on 1/5th the LD50 in the mouse.
Western Fence Lizard	Chronic	1.3 mg/kg(bw)-day	Bomann, 1989 in INCHEM, 2001	TRV based on 1/100th the LD50 in the mouse.
Blunt-nosed Leopard Lizard	Acute	26 mg/kg(bw)-day	Bomann, 1989 in INCHEM, 2001	TRV based on 1/5th the LD50 in the mouse.
Blunt-nosed Leopard Lizard	Chronic	1.3 mg/kg(bw)-day	Bomann, 1989 in INCHEM, 2001	TRV based on 1/100th the LD50 in the mouse.

Species	Acute/ Chronic	TRV		Reference	Notes
Western Pond Turtle	Acute	26	mg/kg(bw)-day	Bomann, 1989 in INCHEM, 2001	TRV based on 1/5th the LD50 in the mouse.
Western Pond Turtle	Chronic	1.3	mg/kg(bw)-day	Bomann, 1989 in INCHEM, 2001	TRV based on 1/100th the LD50 in the mouse.
San Joaquin tiger beetle	Acute	0.18	g a.i./ha	EFSA, 2008	based on 40% of the contact LD50 for the cereal aphid parasite
San Joaquin tiger beetle	Acute	0.00156	ug/org	USEPA, 1990f	TRV based on 40% of the oral LD50 in the honey bee
Earthworm	Acute	0.23	mg/kg soil	Luo et al., 1999	based on 1/10th the LC50 for earthworms
Earthworm	Chronic	0.023	mg/kg soil	Luo et al., 1999	based on 1/100th the LC50 for earthworms
Honey Bee (adult)	Acute	0.0172	ug/bee	USEPA, 2016	TRV based on 40% of the contact LD50 in the honey bee
Honey Bee (adult)	Acute	0.00156	ug/bee	USEPA, 2016	TRV based on 40% of the oral LD50 in the honey bee
Honey Bee (adult)	Chronic	0.00016	ug/bee	USEPA, 2016	based on the NOAEC of a 10-day chronic oral toxicity test
Blennosperma vernal pool andrenid bee	Acute	0.18	g a.i./ha	EFSA, 2008	based on 40% of the contact LD50 for the cereal aphid parasite
Blennosperma vernal pool andrenid bee	Acute	0.00016	ug/org	USEPA, 2016	TRV based on the oral NOEL for the honey bee.
Honey Bee (larvae)	Acute				No toxicity data available on which to base a TRV
Honey Bee (larvae)	Chronic	0.0018	ug/Larvae	USEPA, 2016	based on the NOAEC of a 21-day chronic repeat dose test

Toxicity Reference Values for Glycerin

Species	Acute/ Chronic	TRV	Reference	Notes
Aquatic Arroyo Toad	Acute	3400000 ug/L	Mayer and Ellersieck, 1986	TRV based on 1/20th the LC50 in the rainbow trout.
Aquatic Arroyo Toad	Chronic	340000 ug/L	Mayer and Ellersieck, 1986	TRV based on 1/200th the LC50 in the rainbow trout.
Aquatic California Tiger Salamander	Acute	3400000 ug/L	Mayer and Ellersieck, 1986	TRV based on 1/20th the LC50 in the rainbow trout.
Aquatic California Tiger Salamander	Chronic	340000 ug/L	Mayer and Ellersieck, 1986	TRV based on 1/200th the LC50 in the rainbow trout.
Terrestrial Western Spadefoot	Acute			No toxicity data available on which to base a TRV
Terrestrial Western Spadefoot	Chronic			No toxicity data available on which to base a TRV
Terrestrial Arroyo Toad	Acute			No toxicity data available on which to base a TRV
Terrestrial Arroyo Toad	Chronic			No toxicity data available on which to base a TRV
Terrestrial Foothill Yellow-legged Frog	Acute			No toxicity data available on which to base a TRV
Terrestrial Foothill Yellow-legged Frog	Chronic			No toxicity data available on which to base a TRV
Terrestrial California Red-legged Frog	Acute			No toxicity data available on which to base a TRV
Terrestrial California Red-legged Frog	Chronic			No toxicity data available on which to base a TRV

Species	Acute/ Chronic	TRV	Reference	Notes
Terrestrial Southern Torrent Salamander	Acute			No toxicity data available on which to base a TRV
Terrestrial Southern Torrent Salamander	Chronic			No toxicity data available on which to base a TRV
Aquatic Western Spadefoot	Acute	3400000 ug/L	Mayer and Ellersieck, 1986	TRV based on 1/20th the LC50 in the rainbow trout.
Aquatic Western Spadefoot	Chronic	340000 ug/L	Mayer and Ellersieck, 1986	TRV based on 1/200th the LC50 in the rainbow trout.
Aquatic Foothill Yellow-legged Frog	Acute	3400000 ug/L	Mayer and Ellersieck, 1986	TRV based on 1/20th the LC50 in the rainbow trout.
Aquatic Foothill Yellow-legged Frog	Chronic	340000 ug/L	Mayer and Ellersieck, 1986	TRV based on 1/200th the LC50 in the rainbow trout.
Aquatic California Red-legged Frog	Acute	3400000 ug/L	Mayer and Ellersieck, 1986	TRV based on 1/20th the LC50 in the rainbow trout.
Aquatic California Red-legged Frog	Chronic	340000 ug/L	Mayer and Ellersieck, 1986	TRV based on 1/200th the LC50 in the rainbow trout.
Aquatic Southern Torrent Salamander	Acute	3400000 ug/L	Mayer and Ellersieck, 1986	TRV based on 1/20th the LC50 in the rainbow trout.
Aquatic Southern Torrent Salamander	Chronic	340000 ug/L	Mayer and Ellersieck, 1986	TRV based on 1/200th the LC50 in the rainbow trout.

Species	Acute/ Chronic	TRV	Reference	Notes
Terrestrial California Tiger Salamander	Acute	3400000 ug/L	Mayer and Ellersieck, 1986	TRV based on 1/20th the LC50 in the rainbow trout.
Terrestrial California Tiger Salamander	Chronic	340000 ug/L	Mayer and Ellersieck, 1986	TRV based on 1/200th the LC50 in the rainbow trout.
Tomales Isopod	Acute	500000 ug/L	Eur. Com., 2000e	TRV based on 1/20th the EC50 in the water flea.
Tomales Isopod	Chronic	50000 ug/L	Eur. Com., 2000e	TRV based on 1/200th the EC50 in the water flea.
Vernal Pool Fairy Shrimp	Acute	500000 ug/L	Eur. Com., 2000e	TRV based on 1/20th the EC50 in the water flea.
Vernal Pool Fairy Shrimp	Chronic	50000 ug/L	Eur. Com., 2000e	TRV based on 1/200th the EC50 in the water flea.
California Freshwater Shrimp	Acute	500000 ug/L	Eur. Com., 2000e	TRV based on 1/200th the EC50 in the water flea.
California Freshwater Shrimp	Chronic	50000 ug/L	Eur. Com., 2000e	TRV based on 1/20th the EC50 in the water flea.
Shasta Crayfish	Acute	500000 ug/L	Eur. Com., 2000e	TRV based on 1/20th the EC50 in the water flea.
Shasta Crayfish	Chronic	50000 ug/L	Eur. Com., 2000e	TRV based on 1/200th the EC50 in the water flea.
Mimic Tryonia	Acute			No toxicity data available on which to base a TRV
Mimic Tryonia	Chronic			No toxicity data available on which to base a TRV
Black Abalone	Acute			No toxicity data available on which to base a TRV

Species	Acute/ Chronic	TRV	Reference	Notes
Black Abalone	Chronic			No toxicity data available on which to base a TRV
Osprey	Acute			No toxicity data available on which to base a TRV
Osprey	Chronic			No toxicity data available on which to base a TRV
White-tailed Kite	Acute			No toxicity data available on which to base a TRV
White-tailed Kite	Chronic			No toxicity data available on which to base a TRV
Mourning Dove	Acute			No toxicity data available on which to base a TRV
Mourning Dove	Chronic			No toxicity data available on which to base a TRV
California Brown Pelican	Acute			No toxicity data available on which to base a TRV
California Brown Pelican	Chronic			No toxicity data available on which to base a TRV
California Condor	Acute			No toxicity data available on which to base a TRV
California Condor	Chronic			No toxicity data available on which to base a TRV
Fulvous Whistling-duck	Acute			No toxicity data available on which to base a TRV
Fulvous Whistling-duck	Chronic			No toxicity data available on which to base a TRV
Western Yellow-billed Cuckoo	Acute			No toxicity data available on which to base a TRV
Western Yellow-billed Cuckoo	Chronic			No toxicity data available on which to base a TRV
Purple Martin	Acute			No toxicity data available on which to base a TRV

Species	Acute/ Chronic	TRV	Reference	Notes
Purple Martin	Chronic			No toxicity data available on which to base a TRV
Tricolored Blackbird /redwinged blackbird	Acute			No toxicity data available on which to base a TRV
Tricolored Blackbird /redwinged blackbird	Chronic			No toxicity data available on which to base a TRV
Yellow rail	Acute			No toxicity data available on which to base a TRV
Yellow rail	Chronic			No toxicity data available on which to base a TRV
Cooper's Hawk	Acute			No toxicity data available on which to base a TRV
Cooper's Hawk	Chronic			No toxicity data available on which to base a TRV
Arroyo Chub	Acute	3400000 ug/L	Mayer and Ellersieck, 1986	TRV based on 1/20th the LC50 in the rainbow trout.
Arroyo Chub	Chronic	340000 ug/L	Mayer and Ellersieck, 1986	TRV based on 1/200th the LC50 in the rainbow trout.
Tidewater Goby	Acute			No toxicity data available on which to base a TRV
Tidewater Goby	Chronic			No toxicity data available on which to base a TRV
Sacramento splittail	Acute	3400000 ug/L	Mayer and Ellersieck, 1986	TRV based on 1/20th the LC50 in the rainbow trout.
Sacramento splittail	Chronic	340000 ug/L	Mayer and Ellersieck, 1986	TRV based on 1/200th the LC50 in the rainbow trout.

Species	Acute/ Chronic	TRV	Reference	Notes
Coastal Cutthroat Trout	Acute	3400000 ug/L	Mayer and Ellersieck, 1986	TRV based on 1/20th the LC50 in the rainbow trout.
Coastal Cutthroat Trout	Chronic	340000 ug/L	Mayer and Ellersieck, 1986	TRV based on 1/200th the LC50 in the rainbow trout.
Desert Pupfish	Acute	3400000 ug/L	Mayer and Ellersieck, 1986	TRV based on 1/20th the LC50 in the rainbow trout.
Desert Pupfish	Chronic	340000 ug/L	Mayer and Ellersieck, 1986	TRV based on 1/200th the LC50 in the rainbow trout.
Chinook Salmon--Central Valley spring-run ESU	Acute	3400000 ug/L	Mayer and Ellersieck, 1986	TRV based on 1/20th the LC50 in the rainbow trout.
Chinook Salmon--Central Valley spring-run ESU	Chronic	340000 ug/L	Mayer and Ellersieck, 1986	TRV based on 1/200th the LC50 in the rainbow trout.
Delta smelt	Acute			No toxicity data available on which to base a TRV
Delta smelt	Chronic			No toxicity data available on which to base a TRV
Riparian brush rabbit	Acute	2520 mg/kg(bw)-day	Eur. Com., 2000e	TRV based on 1/5th the LD50 in the rat.
Riparian brush rabbit	Chronic	126 mg/kg(bw)-day	Eur. Com., 2000e	TRV based on 1/100th the LD50 in the rat.
Southern (Ramona) Grasshopper Mouse	Acute	2520 mg/kg(bw)-day	Eur. Com., 2000e	TRV based on 1/5th the LD50 in the rat.

Species	Acute/ Chronic	TRV	Reference	Notes
Southern (Ramona) Grasshopper Mouse	Chronic	126 mg/kg(bw)-day	Eur. Com., 2000e	TRV based on 1/100th the LD50 in the rat.
Big Free-tailed Bat	Acute	2520 mg/kg(bw)-day	Eur. Com., 2000e	TRV based on 1/5th the LD50 in the rat.
Big Free-tailed Bat	Chronic	126 mg/kg(bw)-day	Eur. Com., 2000e	TRV based on 1/100th the LD50 in the rat.
Mule Deer	Acute	2520 mg/kg(bw)-day	Eur. Com., 2000e	TRV based on 1/5th the LD50 in the rat.
Mule Deer	Chronic	126 mg/kg(bw)-day	Eur. Com., 2000e	TRV based on 1/100th the LD50 in the rat.
Northwestern San Diego Pocket Mouse	Acute	2520 mg/kg(bw)-day	Eur. Com., 2000e	TRV based on 1/5th the LD50 in the rat.
Northwestern San Diego Pocket Mouse	Chronic	126 mg/kg(bw)-day	Eur. Com., 2000e	TRV based on 1/100th the LD50 in the rat.
Nelson's Antelope Squirrel	Acute	2520 mg/kg(bw)-day	Eur. Com., 2000e	TRV based on 1/5th the LD50 in the rat.
Nelson's Antelope Squirrel	Chronic	126 mg/kg(bw)-day	Eur. Com., 2000e	TRV based on 1/100th the LD50 in the rat.
American Badger	Acute	2520 mg/kg(bw)-day	Eur. Com., 2000e	TRV based on 1/5th the LD50 in the rat.
American Badger	Chronic	126 mg/kg(bw)-day	Eur. Com., 2000e	TRV based on 1/100th the LD50 in the rat.
Southwestern River Otter	Acute	2520 mg/kg(bw)-day	Eur. Com., 2000e	TRV based on 1/5th the LD50 in the rat.
Southwestern River Otter	Chronic	126 mg/kg(bw)-day	Eur. Com., 2000e	TRV based on 1/100th the LD50 in the rat.
southern sea otter	Acute	2520 mg/kg(bw)-day	Eur. Com., 2000e	TRV based on 1/5th the LD50 in the rat.

Species	Acute/ Chronic	TRV	Reference	Notes
southern sea otter	Chronic	126 mg/kg(bw)-day	Eur. Com., 2000	TRV based on 1/100th the LD50 in the rat.
East Pacific Green Sea Turtle	Acute			No toxicity data available on which to base a TRV
East Pacific Green Sea Turtle	Chronic			No toxicity data available on which to base a TRV
Giant Garter Snake	Acute			No toxicity data available on which to base a TRV
Giant Garter Snake	Chronic			No toxicity data available on which to base a TRV
Alameda Whipsnake	Acute			No toxicity data available on which to base a TRV
Alameda Whipsnake	Chronic			No toxicity data available on which to base a TRV
Northern red-diamond rattlesnake	Acute			No toxicity data available on which to base a TRV
Northern red-diamond rattlesnake	Chronic			No toxicity data available on which to base a TRV
Desert Tortoise	Acute			No toxicity data available on which to base a TRV
Desert Tortoise	Chronic			No toxicity data available on which to base a TRV
Western Fence Lizard	Acute			No toxicity data available on which to base a TRV
Western Fence Lizard	Chronic			No toxicity data available on which to base a TRV
Blunt-nosed Leopard Lizard	Acute			No toxicity data available on which to base a TRV
Blunt-nosed Leopard Lizard	Chronic			No toxicity data available on which to base a TRV

Species	Acute/ Chronic	TRV	Reference	Notes
Western Pond Turtle	Acute			No toxicity data available on which to base a TRV
Western Pond Turtle	Chronic			No toxicity data available on which to base a TRV
San Joaquin tiger beetle	Acute			No toxicity data available on which to base a TRV
Earthworm	Acute			No toxicity data available on which to base a TRV
Earthworm	Chronic			No toxicity data available on which to base a TRV
Honey Bee (adult)	Acute			No toxicity data available on which to base a TRV
Honey Bee (adult)	Chronic			No toxicity data available on which to base a TRV
Blennosperma vernal pool andrenid bee	Acute			No toxicity data available on which to base a TRV
Honey Bee (larvae)	Acute			No toxicity data available on which to base a TRV
Honey Bee (larvae)	Chronic			No toxicity data available on which to base a TRV

Appendix Eco-D. Risk Quotients for Individual Chemicals.

Potential risk associated with Imidicacloprid for Application Scenario PD/EP-E-08: Turf drench applications of Merit 2F at 0.4 lb a.i./Acre to 640 acres in a residential/urban setting.

Surrogate Species	Acute	Chronic AUF	Chronic Midpoint AUF	Chronic No AUF
aquatic California tiger salamander	0.000	0.001	0.001	0.001
aquatic southern torrent salamander	0.000	0.001	0.001	0.001
aquatic California red-legged frog	0.000	0.001	0.001	0.001
aquatic foothill yellow-legged frog	0.000	0.001	0.001	0.001
aquatic arroyo toad	0.000	0.001	0.001	0.001
aquatic western spadefoot	0.000	0.001	0.001	0.001
terrestrial California tiger salamander	0.143	***0.730***	***0.730***	***0.730***
terrestrial southern torrent salamander	0.028	0.266	0.266	0.266
terrestrial California red-legged frog	0.024	0.132	0.132	0.132
terrestrial foothill yellow-legged frog	0.098	***0.535***	***0.535***	***0.535***
terrestrial arroyo toad	0.153	***0.784***	***0.784***	***0.784***
terrestrial western spadefoot	0.175	***0.894***	***0.894***	***0.894***
giant garter snake	0.001	0.009	0.009	0.009
Alameda whipsnake	0.000	0.002	0.002	0.002
northern red diamond rattlesnake	0.002	0.001	0.001	0.001
western pond turtle	0.001	0.008	0.008	0.008
desert tortoise	0.029	0.100	0.100	0.100
East Pacific green sea turtle	0.000	0.000	0.000	0.001
western fence lizard	0.028	0.096	0.096	0.096
blunt-nosed leopard lizard	0.031	0.105	0.105	0.105
tidewater goby	0.000	0.000	0.000	0.000
delta smelt	0.000	0.000	0.000	0.000
Sacramento splittail	0.000	0.000	0.000	0.000
arroyo chub	0.000	0.001	0.001	0.001
coastal cutthroat trout	0.000	0.000	0.000	0.000
desert pupfish	0.000	0.001	0.001	0.001
Chinook salmon	0.000	0.000	0.000	0.000
tricolored blackbird	**1.163**	0.214	**3.454**	**6.693**
mourning dove	0.000	0.002	0.002	0.002
osprey	0.028	0.000	0.044	0.087
California brown pelican	0.032	0.000	0.051	0.102
California condor	0.017	0.000	0.003	0.006
white-tailed kite	0.054	0.019	0.019	0.019
Cooper's hawk	0.033	0.002	0.006	0.010
fulvous whistling-duck	0.001	0.003	0.003	0.003
western yellow-billed cuckoo	**4.057**	**20.753**	**20.753**	**20.753**
purple martin	**2.721**	**15.110**	**15.110**	**15.110**
yellow rail	0.334	***0.627***	***0.627***	***0.627***
mule deer	0.082	0.278	0.278	0.278
riparian brush rabbit	0.487	**1.649**	**1.649**	**1.649**
southern sea otter	0.006	0.039	0.039	0.039
southwestern river otter	0.010	0.037	0.047	0.057
American badger	0.016	0.036	0.036	0.036
northwestern San Diego pocket mouse	0.022	0.077	0.077	0.077

Surrogate Species	Acute	Chronic AUF	Chronic Midpoint AUF	Chronic No AUF
big free-tailed bat	0.384	0.011	***0.657***	**1.302**
southern grasshopper mouse	0.347	**1.168**	**1.168**	**1.168**
Nelson's antelope squirrel	0.328	**1.114**	**1.114**	**1.114**
vernal pool fairy shrimp	0.000	0.000	0.000	0.000
Tomales isopod	***0.916***	**2.848**	**2.848**	**2.848**
California freshwater shrimp	***0.916***	**2.848**	**2.848**	**2.848**
Shasta crayfish	***0.916***	**2.848**	**2.848**	**2.848**
mimic tryonia	0.000	0.001	0.001	0.001
black abalone	0.000	0.001	0.001	0.001
earthworm	***0.866***	**5.219**	**5.219**	**5.219**
honey bee-adult (contact)	0.000			
honey bee-adult (oral)	**2707.724**	**358.422**	**2419.352**	**4480.281**
Honey bee-larvae		**9.700**	**65.476**	**121.252**
Blennosperma vernal pool andrenid bee (contact)	0.000			
Blennosperma vernal pool andrenid bee (oral)	**2707.724**			
San Joaquin tiger beetle (contact)	0.000			

Potential risk associated with Glycerine for Application Scenario PD/EP-E-08: Turf drench applications of Merit 2F at 0.4 lb a.i./Acre to 640 acres in a residential/urban setting.

Surrogate Species	Acute	Chronic AUF	Chronic Midpoint AUF	Chronic No AUF
aquatic California tiger salamander	0.00	0.00	0.00	0.00
aquatic southern torrent salamander	0.00	0.00	0.00	0.00
aquatic California red-legged frog	0.00	0.00	0.00	0.00
aquatic foothill yellow-legged frog	0.00	0.00	0.00	0.00
aquatic arroyo toad	0.00	0.00	0.00	0.00
aquatic western spadefoot	0.00	0.00	0.00	0.00
terrestrial California tiger salamander	0.00	0.00	0.00	0.00
terrestrial southern torrent salamander				
terrestrial California red-legged frog				
terrestrial foothill yellow-legged frog				
terrestrial arroyo toad				
terrestrial western spadefoot				
giant garter snake				
Alameda whipsnake				
northern red diamond rattlesnake				
western pond turtle				
desert tortoise				
East Pacific green sea turtle				
western fence lizard				
blunt-nosed leopard lizard				
tidewater goby				
delta smelt				
Sacramento splittail	0.00	0.00	0.00	0.00
arroyo chub	0.00	0.00	0.00	0.00
coastal cutthroat trout	0.00	0.00	0.00	0.00
desert pupfish	0.00	0.00	0.00	0.00
Chinook salmon	0.00	0.00	0.00	0.00
tricolored blackbird				
mourning dove				
osprey				
California brown pelican				
California condor				
white-tailed kite				
Cooper's hawk				
fulvous whistling-duck				
western yellow-billed cuckoo				
purple martin				
yellow rail				
mule deer	0.00	0.00	0.00	0.00
riparian brush rabbit	0.00	0.00	0.00	0.00
southern sea otter	0.00	0.00	0.00	0.00
southwestern river otter	0.00	0.00	0.00	0.00
American badger	0.00	0.00	0.00	0.00
northwestern San Diego pocket mouse	0.00	0.00	0.00	0.00

Surrogate Species	Acute	Chronic AUF	Chronic Midpoint AUF	Chronic No AUF
big free-tailed bat	0.00	0.00	0.00	0.00
southern grasshopper mouse	0.00	0.00	0.00	0.00
Nelson's antelope squirrel	0.00	0.00	0.00	0.00
vernal pool fairy shrimp	0.00	0.00	0.00	0.00
Tomales isopod	0.00	0.00	0.00	0.00
California freshwater shrimp	0.00	0.00	0.00	0.00
Shasta crayfish	0.00	0.00	0.00	0.00
mimic tryonia				
black abalone				
earthworm				
honey bee-adult (contact)				
honey bee-adult (oral)				
Honey bee-larvae				
Blennosperma vernal pool andrenid bee (contact)				
Blennosperma vernal pool andrenid bee (oral)				
San Joaquin tiger beetle (contact)				

Appendix Eco E:
Program Material Data Sheet (PMDS)

California Department of Food & Agriculture Program Material Data Sheet (PMDS)

PMDS Status Summary

Prepared by (CDFA):**L. Petro** Date: 3/10/2016 ☒Reviewed, ☒ Revised, ☐ Approved by: (Blankinship): **J. Sullivan** Date: **3.16.16**
☒Reviewed, ☒ Revised, ☐ Approved by: (CDFA): **L. Petro** Date: 4/8/2016 ☒ Reviewed, ☒ Revised, ☐ Approved by: (Blankinship): **J. Sullivan** Date: **4/11/16**
☐Reviewed, ☒ Revised, ☒ Approved by: (CDFA): **L. Petro** Date: 4/12/16 ☐ Reviewed, ☒ Revised, ☒ Approved by: (Blankinship): **J. Sullivan** Date: **4/12/16**

INSTRUCTIONS:

1.) Fill in the PMDS template with the specific application scenario details.
2.) In the "Application Description" section, please provide a description of the application in thorough detail.
3.) Please refer to the Example PMDS (attached) to ensure the template has been filled in properly.
4.) Please attach product label and Safety Data Sheet.
5.) If the scenario involves fumigation, trapping, varying application intervals, or if multiple active ingredients are used, please contact Blankinship & Associates at (530) 757-0941.
6.) For PMDS revisions, do so in track changes and "save as" with the following file naming convention:
PMDS Program Name Pesticide Scenario App Method Author Initials Date
Ex.: PMDS JB Acelepryn Turf Spray Drench LP 4.2.16

Program Name: PDEP-E-08

Product Name	Specialty Label (e.g., Section 18, 24c) (Yes/No)	Active Ingredient(s)	Target Pest(s)	Target Host(s) (e.g., citrus tree, ornamental, turf, etc.)
Merit 2F	No	Imidacloprid	Beetle	Ornamental/turf/ground cover

General Scenario Setting (e.g., Large Production Nursery, Residential, etc.)	Specific Scenario Setting Description (e.g., containerized plants on loading dock)	Geographic Scenario Setting Description (Statewide or specific region)
Residential	Urban/residential on turf/ground* cover landscapes. See "*" definition below	Statewide

Non-target Areas Affected (e.g., potential overspray to turf)	Application Technique (e.g., broadcast, drench, spot spray, etc.)	Application Equipment (e.g., mechanically pressurized handgun, boom sprayer, etc.)
None	Spray drench	Mechanically pressurized sprayer, boom sprayer, hand sprayers, backpack sprayers

Applications per year	Application Interval	Application Rate	Application Rate Units	Tank Spray Volume per Area	Tank Spray Volume per Area Unit
1	Annual	0.6	Oz/1000 SF	3.75	gal/1000 SF

Application Area	Application Area Units	Area Treated/Day	Area Treated/Day Units
640	acres	20,000 (18)	sq. Ft with backpack (acres with boom) see attached

Adjuvant(s) or Additive(s) Product:	Adjuvant Application Rate	Adjuvant Application Rate Units
None	NA	NA

Application Description & Assumptions (please describe the application in as much detail as possible. Use the 2nd page if needed):

In a 200 meter radius around detections, * ground application of Merit 2F to turf (includes lawns/golf courses), recreational areas, and ornamental plants (includes flowers, containerized plants, and ground cover areas/followed by "watering in" of material through "thatch" per label. Mitigations include; no application within 48 hrs of predicted rain, buffer areas maintained around food crop plants per label, residents provided information & material/ post treatment precautions. Applications made under supervision of CDFA and CAC PUE. Urban residential settings include: homes, parks, schools, sports fields, commercial settings, cemeteries, greenbelts, and road sides. Applications may be made during off hours in school settings or business areas to avoid impacts. Hand pump & pressurized sprayer application except sports fields or other large areas may be treated using a tractor boom sprayer. Watering is done using similar ground spray equipment applied per label.

Follow all label requirements. Program staff will conduct a Site Assessment to verify each program area to determine if there are any specific conditions that need further evaluation.

APPENDIX 1A

CDFA PMDS (Add additional detail as needed below to fully describe the proposed activity):

Add text here.

- Application timing as early as June 15th.
- Applications will not be made if rainfall is predicted within 48 hrs. CDFA will make every effort to ensure the area is ready for treatment and corresponding watering in. Monitoring weather will ensure that chemicals will be applied under favorable weather conditions. Assumptions are all subject to weather models and predictions.
- Registered beekeepers within 1 mile of application site will be notified prior to application.
- Following the pesticide application, the watering in will be done with a minimum of two and up to three gallons per 1,000 square feet.
- Staff wearing PPE identical to the applicators will hold up a barrier to act as a shield to prevent drift on cement with residues on the edging board washed onto lawn.
- Application areas will be 20,000 sq. ft. with a backpack sprayer made by an individual applicator; 18 acres with a boom sprayer with a single applicator.
- Large lawn areas will be mowed prior to application to remove pollination resources.
- Treated landscape signs will be posted with a four hour re-entry period for landscape.

Tab 2:

Human Health Risk Assessment (57 pages)

APPENDIX 1A

California Department of Food and Agriculture
Statewide Plant Pest Prevention and Management Program

Human Health Risk Assessment

Merit 2F Residential Turf, Japanese Beetle Eradication Program

Prepared for:

California Department of Food and Agriculture
1220 N Street
Sacramento, CA 95814

Contact:
Laura Petro
(916) 654-0317

Prepared by:

Blankinship & Associates, Inc.
1590 Drew Ave, Suite 120
Davis, CA 95616

Contact:
Mike Blankinship
530-757-0941

July 12, 2016

TABLE OF CONTENTS

TABLE OF CONTENTS **2**
LIST OF TABLES **3**
LIST OF FIGURES **3**
LIST OF APPENDICES **4**
LIST OF ABBREVIATIONS **4**
1 Executive Summary **8**
2 Introduction **9**
2.1 Purpose of the Human Health Risk Assessment (HHRA) 9
2.2 Approach 9
3 Hazard Identification **9**
3.1 Active and Inert Ingredients of Concern and Environmental Fate Properties 11
4 Toxicity Dose-Response Assessment **11**
4.1 Mechanism of Action and Target Organs and Systems 12
4.2 Data Sources 12
4.3 Selection of Toxicity Endpoints for Risk Characterization 13
4.3.1 Imidacloprid 13
4.3.2 Glycerin 14
5 Exposure Assessment **14**
5.1 Conceptual Site Model 15
5.2 Estimating Pesticide Environmental Concentrations 18
5.2.1 Soil 19
5.2.2 Vegetation 19
5.2.3 Transferable Turf Residue 19
5.2.4 Edible Vegetation Residue 21
5.2.5 Pesticide Off-target Drift 21
5.2.6 Occupational Exposure Values 22
5.2.7 Water Ingestion, Surfacewater, and Groundwater 22
5.3 Exposure Models 22
5.3.1 Exposure Routes 23
5.3.2 Exposed Populations (Receptors) 23
6 Risk Characterization **36**
6.1.1 Non-Cancer Effects 36
6.1.2 Cancer Effects 37
6.2 Numeric Data Presentation 37
7 Risk Assessment Results **37**
7.1 Application Scenarios 38
7.2 Estimated Environmental Concentrations and Unit Exposure Values 40
7.3 Risk Results 42
7.4 Uncertainty Analysis 49
7.4.1 Exposure Assessment 49
7.4.2 Toxicity Assessment 50
7.5 Conclusions 51
8 References **53**

LIST OF TABLES

Table 1: Critical NO(A)ELs and Endpoints Identified by CDPR.. 13
Table 2: Critical NO(A)EL Selected for Risk Characterization of Imidacloprid 14
Table 3: Exposure Factors Used in Estimating TTR 20
Table 4: Exposure Factors Used in Estimating Acute/Subchronic Dermal Exposure to Turf...... 25
Table 5: Exposure Factors Used in Estimating Acute/Subchronic Hand-to-Mouth Ingestion of Turf Residues 28
Table 6: Exposure Factors Used in Estimating Acute/Subchronic Object-to-Mouth Ingestion of Turf Residue.. 29
Table 7: Exposure Factors Used in Estimating Acute/Subchronic Pica and Incidental Soil Ingestion.. 30
Table 8: Exposure Factors Used in Estimating Acute/Subchronic Dermal Exposure to Residues in Soil 31
Table 9: Exposure Factors Used in Estimating Acute/Subchronic Exposures to Residues through Ingestion of Edible Vegetation 32
Table 10: Exposure Factors Used in Estimating the LADD.. 33
Table 11: Application Scenarios for Japanese Beetle Control Activities 39
Table 12: PDEP-E-08a Herbicide Ingredient Concentrations on Turf and in Edible Vegetation 40
Table 13: PDEP-E-08b Herbicide Ingredient Concentrations on Turf and in Edible Vegetation 40
Table 14: PDEP-E-08a Herbicide Ingredient Concentrations in Soil.. 40
Table 15: PDEP-E-08b Herbicide Ingredient Concentrations in Soil 41
Table 16: PDEP-E-08a Spray Drift Exposure Values 41
Table 17: PDEP-E-08b Spray Drift Exposure Values 41
Table 18: PDEP-E-08a OPHED Unit Exposure Values 41
Table 19: PDEP-E-08b OPHED Unit Exposure Values.. 41
Table 20: PDEP-E-08a Acute/Subchronic MOEs for MLA.. 42
Table 21: PDEP-E-08a Chronic MOEs for MLA.. 42
Table 22: PDEP-E-08b Acute/Subchronic MOEs for MLA.. 43
Table 23: PDEP-E-08b Chronic MOEs for MLA.. 43
Table 24: PDEP-E-08a Acute/Subchronic MOEs for DWB 44
Table 25: PDEP-E-08a Chronic MOEs for DWB 44
Table 26: PDEP-E-08b Acute/Subchronic MOEs for DWB 45
Table 27: PDEP-E-08b Chronic MOEs for DWB 45
Table 28: PDEP-E-08a and PDEP-E-08b Acute/Subchronic MOEs for PAR 46
Table 29: PDEP-E-08a and PDEP-E-08b Chronic MOEs for PAR 46
Table 30: PDEP-E-08a Acute/Subchronic MOEs for DPAR 47
Table 31: PDEP-E-08a Chronic MOEs for DPAR... 47
Table 32: PDEP-E-08b Acute/Subchronic MOEs for DPAR.. 48
Table 33: PDEP-E-08b Chronic MOEs for DPAR.. 48

LIST OF FIGURES

Figure 1: Japanese Beetle Control Activities Residential Conceptual Site Model....................... 17

LIST OF APPENDICES

Appendix Human A – PMDS A-1

LIST OF ABBREVIATIONS

A........................Applicator
AADD........................Annual Average Daily Dose
ACP........................Asian Citrus Psyllid
ADD........................Average Daily Dose
a.i........................Active Ingredient
AI........................Acute Intake
AIUF........................Aquatic Invertebrate Uptake Factor
AR........................Application Rate
AT........................Averaging Time
ATSDR........................Agency for Toxic Substances Disease Registry
AUF........................Area Use Factor
BCF........................Bioconcentration Factor
BMF........................Biomagnification Factor
BMP........................Best Management Practices
BW........................Body Weight
CDFA........................California Department of Food and Agriculture
CDPH........................California Department of Public Health
CFAC........................California Food and Agricultural Code
CF........................Conversion Factor
CSM........................Conceptual Site Model
DAF........................Dermal Exposure Factor
DFR........................Dislodgeable Foliar Residue
DL........................Detection Limit
CDPR........................California Department of Pesticide Regulation
DSD........................Droplet Size Distribution
DTSC........................California Department of Toxic Substances Control
dw........................Dry Weight
EC, E........................Emulsifiable Concentrate

APPENDIX 1A

ED .... Exposure Duration

EEC .... Estimated Environmental Concentration

EF .... Exposure Frequency

EFH .... USEPA's Exposure Factors Handbook: 2011 Edition (USEPA, 2011p)

EGVM .... European Grapevine Moth

EIR .... Environmental Impact Report

ERA .... Ecological Risk Assessment

ESU .... Evolutionary Significant Units

ET .... Exposure Time

EXAMS .... Exposure Analysis Modeling System

EXPRESS .... EXAMS-PRZM Exposure Simulation Shell

F .... Flowable

FIFRA .... Federal Insecticide, Fungicide and Rodenticide Act

FIR .... Food Intake Rate

GRAS .... Generally Recognized As Safe

GWSS .... Glassy-Winged Sharpshooter

HHRA .... Human Health Risk Assessment

HLB .... Huanglongbing

IGR .... Insect Growth Regulator

IPC .... Integrated Pest Control

IRIS .... Integrated Risk Information System

I_{rs} .... Soil Ingestion Rate

IRV .... Vegetation Ingestion Rate

KABAM .... K_{ow} Aquatic BioAccumulation Model

K_d .... Soil-Water Partition Coefficient

K_{oa} .... Octanol-Air Partition Coefficient

K_{oc} .... Organic Carbon Absorption Coefficient

K_{ow} .... Octanol-Water Partition Coefficient

LADD .... Lifetime Average Daily Dose

LBAM .... Light Brown Apple Moth

LO(A)EL/LOAEL .... Lowest Observable (Adverse) Effect Level

LOC .... Level of Concern

APPENDIX 1A

LOEC .... Lowest Observable Effect Concentration
MAT... Male Attractant Technique
MCL .... Maximum Contaminant Level
MW .... Molecular Weight
NA.. Not Applicable
NDA .... No Data Available
NO(A)EL/ NOAEL....................................... No Observable (Adverse) Effect Level
NOC .... Not Of Concern
NOEC... No Observable Effect Concentration
NRCS .... National Resources Conservation Service
NWI.. Normalized Water Intake Rate
OEHHA.. Office of Environmental Health Hazard Assessment
OR .... Residue Available on Object
PDCP.. Pierce's Disease Control Program
PDEP-E .... Pest Detection/Emergency Projects - Eradication
PE5 .... PRZM-EXAMS Model Shell Version 5.0
PEDP-D.. Pest Detection/Eradication Projects - Detection
PEIR... Programmatic Environmental Impact Report
PHI .... Pre Harvest Intervals
PRZM... Pesticide Root Zone Model
PUR.. Pesticide Use Reporting
RED.. Reregistration Eligibility Decision
REI .... Restricted Entry Interval
RQ .... Risk Quotient
S .... Solution
SC... Suspension Concentrate
SCLP .... Straight Chain Lepidopteran Pheromone
SG .... Water Soluble Granule
SL .... Slurry
SLN .... Special Local Needs
SPLAT .... Specialized Pheromone and Lure Application Technology

Statewide PEIR ....Statewide Plant Pest Prevention and Management Program, Environmental Impact Report, Volume 2 - Appendix B, Human Health Risk Assessment, SCH # 2011062057

Tc ....Transfer Coefficient

TDE..Turf Dermal Exposure

TGAI ....Technical grade of the active ingredient

T-REX..Terrestrial Residue Exposure

TRV..Toxicity Reference Value

TTR ....Transferable Turf Residue

TWA ....Time Weighted Average

UE ....Unit Exposure

UF ....Uncertainty Factor

UH..Upland Hydrology

ULV ....Ultra Low Volume

USEPA...U.S. Environmental Protection Agency

VADOFT ....Vadose Zone Fate and Transport Model

VFSMOD-W...Vegetative Filter Strip Modeling System

VUF..Vegetation Uptake Factor

WHO ....World Health Organization

WI ....Water Intake Rate

WP..Wettable Powder

WRM..Water-in Reduction Multiplier

WSP ....Water Soluble Packet

1 Executive Summary

This Human Health Risk Assessment (HHRA) is conducted as an addition to the HHRA conducted as part of the Statewide PEIR. A new scenario for a turf drench application with Merit 2F for the eradication of Japanese Beetles was assessed. The methods used in this risk assessment largely follow those methods used in the previous risk assessment in the Statewide PEIR. Where methods differ, the new assumptions or receptors are discussed.

The application of Merit 2F could occur in residential settings with drench applications made to turf and ornamental ground cover using a mechically pressurized sprayer. Urban residential settings considered included homes, parks, schools, sports fields, commercial settings, cemeteries, greenbelts, and road sides. For example, larger areas such as school athletic fields or cemetaries could receive applications made with a boom sprayer. Either spray equipment can be adjusted for low pressure applications low to the ground to reduce or eliminate spray drift. Either application area would be followed by water to wash the pesticide product into the soil. No adjuvants were included in the application scenario.

Acute, subchronic and chronic dermal, inhalation and ingestion exposures were considered for residents present during and after the Merit 2F application and included the following age groups: 0-<2 year old, 2-<16 year old and 16-70 year old. Other receptors considered were the resident downwind of the Merit 2F application and personnel responsible for the handling and application of Merit 2F. The HHRA did not include cancer effects because neither imidacloprid nor glycerin are known carcinogens. Environmental media considered to contain imidacloprid and glycerin included edible vegetation, turf, soil and air.

Risk was quantitatively assessed using the Margin of Exposure (MOE) technique. For this HHRA, the target MOE value that indicates an unlikely adverse impact human health is 300. MOE values less than 300 indicate the potential for adverse impacts to health; MOE values greater than 300 indicate that adverse health impacts are unlikely. MOE values calculated for this HHRA ranged from approximately 700 to greater than 100,000,000,000. This indicates that exposure to Merit 2F during the Proposed Program is unlikely to result in adverse impacts to human health.

The magnitude of an MOE is indicative of the general safety of exposure, with larger MOEs generally indicating smaller potential health risk. Comparatively large MOEs should not, however, be interpreted as allowing a receptor to unnecessarily come into contact with environmental media containing imidacloprid and glycerin.

2 Introduction

This Human Health Risk Assessment (HHRA) evaluates pesticide application scenarios within the California Department of Food and Agriculture's (CDFA) Pest Detection/Emergency Program (PD/EP) for the eradication of Japanese Beetles in an urban setting, herein referred to as the "Proposed Program". This document is an addendum to the Statewide Plant Pest Prevention and Management Program, Environmental Impact Report, Volume 3 – Appendices B through G, SCH # 2011062057 (Statewide PEIR).

2.1 Purpose of the Human Health Risk Assessment (HHRA)

The purpose of this HHRA is to estimate the human health risk from pesticides used under the Proposed Program. The pesticide assessed in this HHRA is Merit 2F. Known ingredients of Merit 2F are imidacloprid (21.4%) and glycerin (10%).

This HHRA evaluates risk in the context of the specific application scenarios which may occur under the Proposed Program, taking into account Merit 2F's label language and other relevant regulatory requirements.

2.2 Approach

A detailed discussion of the approach for the HHRA process is provided in the Statewide PEIR.

This HHRA was conducted by using models and exposure data developed primarily by the USEPA in the context of typical pesticide application methods and settings in California. The HHRA depends on these USEPA exposure models to estimate chemical environmental concentrations and risk estimates. The majority of these models, described in detail in the applicable sections of the Statewide PEIR, are Microsoft Excel-based user interface packages that allow for input of information specific to the Proposed Program, as well as default data when site-specific data is not available. Since multiple models were required for this HHRA and some models require the output of previous models as its input, it was convenient to integrate several models into one Excel workbook so that information from all models could be combined into a single risk estimate as the final output for each Merit 2F application scenario. This Excel workbook, developed by Blankinship & Associates under contract with CDFA, is referred to as the Comprehensive Risk ANalysis Kalculator (CRANK), providing a consolidated tool to estimate risk for the HHRA (as well as the Ecological Risk Assessment).

As discussed in the Statewide PEIR, CDFA involved staff from CDPR, CDPH and OEHHA during all phases of the HHRA. The purpose of this involvement was to facilitate the exchange of information and collaborate on methods to assess and protect human health and the environment and clearly communicate these methods and results to the public.

3 Hazard Identification

The first step in conducting the HHRA is a planning process called Hazard Identification.

This included identification of the ingredients of Merit 2F and the use scenarios that are anticipated under the Proposed Program. Merit 2F's ingredients were determined from pesticide manufacturers' labels and safety data sheets (SDS).

Details regarding the application of chemicals that impact the estimation of potential risk are:

- Type of chemical
- Concentration of chemical
- Application method (*e.g.*, soil injection, fumigation, spraying)
- Duration and frequency of applications
- Rate of application
- Area of application
- Setting in which activity would occur (*e.g.*, agriculture, residential)

The primary objectives of the Pest Detection/Emergency Program (PD/EP) are the early detection and prompt eradication of serious agricultural pests from California including, but not limited to, exotic fruit flies, Japanese beetle, light brown apple moth, khapra beetle, gypsy moth, European corn borer, and European pine shoot moth. Eradication activities conducted under PD/EP are performed under the Pest Detection/Emergency Program – Eradication. Activities vary based on target pest and include pesticide application in a residential setting.

As part of the Statewide PEIR, seven application scenarios were analyzed with in the PD/EP. The application scenario analyzed in this ERA was not substantially similar to any of those scenarios. In the PEIR, a soil drench, rather than a turf drench application, with Merit 2F was analyzed. In this assessment, a single pesticide product applied in a single manner was considered. The use of Merit 2F (a.i.-imidacloprid, inert-glycerin) for the eradication of Japanese beetles in an urban/residential setting was considered. The application of Merit 2F could occur in residential settings with drench applications made to turf and ornamental ground cover using a mechically pressurized sprayer. Additionally, larger areas such as school athletic fields or cemetaries could receive applications made with a boom sprayer. Either spray equipment can be adjusted for low pressure applications low to the ground to reduce or eliminate spray drift. Either application area would be followed by water to wash the pesticide product into the soil. No adjuvants were included in the application scenario.

In a manner similar to what was done in the PEIR, CDFA defined the product application rate and other application specifics for the scenario PDEP-E-08 in the Program Material Data Sheet and the Request for Preliminary Analysis found in **Appendix Human A - PMDS**. The scenario defined application rate of imidacloprid is 0.4 lb/Ac; the application rate of glycerin is 0.19 lb/Ac.

To capture the different ways in which Merit 2F may be used in the Proposed Program, two use scenarios were developed for the HHRA: one for a mechanically pressurized sprayer and another for a boom sprayer. Details as specified in the PMDS were used to characterize these scenarios to allow for exposure estimates to be made in the HHRA.

3.1 Active and Inert Ingredients of Concern and Environmental Fate Properties

The HHRA utilized information found on the Merit 2F product label and Safety Data Sheet (SDS) to determine the list of active and inert ingredients. Merit 2F contains 10% glycerin as an inert ingredient and 21.4% imidacloprid as the active ingredient. Note that inert ingredients are often considered confidential business information and are consequently not available to the public. No other chemicals were listed on the label or SDS and therefore could not be evaluated. Imidacloprid and glycerin were researched for their chemical and physical characteristics, including toxicity, as well as their environmental fate properties.

4 Toxicity Dose-Response Assessment

The second step in the HHRA process is the assessment of toxicity. All chemicals have some degree of toxicity and no substances are completely non-toxic. This fundamental concept of toxicology is expressed by Philippus Von Hohenheim (also known as Paracelsus), a 16th century physician and scientist (Pachter 1951), in his famous maxim: "All things are poison, and nothing is without poison: only the dose permits something not to be poisonous." Accordingly, understanding the toxicity of the imidacloprid and glycerin, and the potential dose that human receptors might receive as part of Proposed Program, is critical. Two fundamentally different toxicological responses may transpire following exposure depending on the end response: cancerous and non-cancerous health effects. Toxicity values are quantitative values that describe the relationship between an estimated dose and the probability of developing cancer or the likelihood of producing non-cancerous health effects.

Non-cancerous health effects (e.g. difficulty breathing, neurological effects) were evaluated using no observable adverse effect levels (NO(A)ELs). A NO(A)EL is the highest exposure level at which there are no statistically or biologically significant increases in the frequency or severity of adverse effects between the exposed population and its control (USEPA 1993c). When multiple NO(A)ELs were available in the literature, the most sensitive effect level was selected. All NO(A)ELs used in this assessment are reported in units of milligrams of imidacloprid and glycerin per kilogram body weight per day (mg/kg-day). Extrapolations were made and uncertainty factors applied to NO(A)ELs selected from the literature for use in estimating risk. Extrapolations and uncertainty includes using animal studies and/or surrogate chemicals. Use of the most sensitive effect level along with conservative extrapolation and uncertainty factors are generally considered health-protective of a representative cross section of the general population.

NO(A)ELs were obtained for imidacloprid and glycerin for the available and relevant routes of exposure. Refer to Section 4.3 for a full discussion on the NO(A)EL selection process.

Because neither imidacloprid nor glycerin show evidence of carcinogenicity, cancer risk was not assessed in this HHRA.

Toxicity information was gathered on the chemical's carcinogenicity and non-cancerous health effects from government sources including the USEPA, OEHHA, ATSDR, CDPR, HSDB, and Health Canada.

4.1 Mechanism of Action and Target Organs and Systems

Toxicity studies are often conducted using single chemicals rather than a combination of chemicals that may be found in a specific pesticide formulation. An HHRA typically evaluates the chemicals individually, and then combines the risks from multiple chemicals with the same effects to get a final, combined representation of risk.

As a health-protective and conservative approach, the cumulative risk of imidacloprid and glycerin were estimated regardless of their mechanism of action (e.g., nicotinic acetylcholine receptor interference), target organ (e.g., liver), or target system (e.g., nervous system). The most sensitive effect considered to be relevant for imidacloprid and glycerin by the USEPA or other authoritative agency was used as the basis for risk characterization. By assuming exposure to imidacloprid and glycerin contribute toward cumulative hazard and adverse health effects, the potential hazard to human health was likely overestimated, and as a result health protective and conservative in nature. This methodology is consistent with the approaches described in the *USEPA Risk Assessment Guide to Superfunds (RAGS)* and *USEPA General Principles for Performing Aggregate Exposure and Risk Assessment* which provides guidance on assessing aggregate chemical risk and aggregate exposure pathway risk (USEPA, 2001e; USEPA, 2004i).

4.2 Data Sources

The toxicity assessment reviewed the following data sources, generally in the order presented below. In the event that no conflicting or suspect data was found, other sources were used to corroborate the initial data found. The most conservative and health-protective data was used when two or more data points existed:

- USEPA Reregistration Eligibility Decision Documents
- USEPA Human Health Assessment Scoping Documents
- CDPR Risk Characterization Documents
- ATSDR Toxicological Profile
- OEHHA Toxicity Criteria Database
- UNEP SIDS Initial Assessment Profile
- USDA Human Health and Ecological Risk Assessment
- OEHHA Chronic Toxicity Summary

Data on the physical, chemical, and environmental fate properties (e.g., solubility, soil degradation, dermal absorption, molecular weight, etc.) of imidacloprid and glycerin were gathered. Property data were gathered from various resources including:

- Hazardous Substances Data Bank (HSDB, 2011d)
- USEPA Reregistration Eligibility Decision Documents (USEPA, 2012p)
- CDPR Risk Characterization Documents (CDPR, 2012f)
- ATSDR Toxicological Profile (ATSDR, 2013)

Review of the available literature yielded no new applicable physical, chemical, or environmental fate studies for imidacloprid or glycerin. Therefore, all physical, chemical, and environmental fate properties utilized in this assessment are consistent with and may be found in the Statewide PEIR.

4.3 Selection of Toxicity Endpoints for Risk Characterization

4.3.1 Imidacloprid

Critical NO(A)ELs used for risk characterization of imidacloprid were selected based on findings presented in the California Department of Pesticide Regulation Risk (CDPR) *Risk Characterization Document for Imidacloprid* (CDPR, 2006b). Based on a thorough review of the toxicology database, CDPR (2006b) selected acute, subchronic, and chronic oral NO(A)ELs of 9, 7.3, 5.7 mg/kg-day, respectively, in their risk analysis. These values, summarized in Table 1, are based on the toxic endpoints of reduction in motor activity in rats (acute), changes in thyroid and liver (subchronic), and thyroid mineralization (chronic).

Table 1: Critical NO(A)ELs and Endpoints Identified by CDPR

Exposure Route	NO(A)EL (mg/kg-day)	Toxic endpoint	Study details
Acute Oral	9	Decrease in motor activity, decrease in triglycerides	CDPR BMD_{05} analysis for acute neurotoxicity.
			Supported by most conservative 10 mg/kg-d NOAEL found after 1 dose oral gavage Imidacloprid in Sprague-Dawley rats for same endpoint.
Subchronic Oral	7.3	Morphological changes in the thyroid and liver	4-week dietary study in dogs
Chronic Oral	5.7	Thyroid mineralization	Two-year (lifetime) dietary toxicity study in Wistar rats

Toxicological inhalation and dermal studies investigating imidacloprid are limited. Thus, the oral toxicity NO(A)ELs presented in Table 1 were selected in characterizing risk for imidacloprid through all routes of exposure (i.e., oral, dermal, and inhalation) in this HHRA analysis. Additionally, consistent with OEHHA (2016) imidacloprid turf risk assessment methodology, both acute and subchronic risk for imidacloprid were evaluated for all exposure routes by selecting the subchronic NO(A)EL and comparing to the daily dose estimated on the day of application, assuming no degradation occured. This method is likely protective of both acute and subchronic effects because the subchronic NO(A)EL is lower than the acute NO(A)EL. Additionally, this method is likely protective of chronic effects because the chronic NO(A)EL utilized is from a study investigating a two-year (lifetime) exposure study in rats, as compared to the five year exposure duration considered for the Proposed Program. The critical NO(A)ELs selected for risk characterization of imidacloprid in this HHRA are presented in Table 2

Table 2: Critical NO(A)EL Selected for Risk Characterization of Imidacloprid

Exposure Route	NO(A)EL (mg/kg-day)	Toxic endpoint
Acute/Subchronic Oral	7.3	Morphological changes in the thyroid and liver
Chronic Oral	5.7	Thyroid mineralization

4.3.2 Glycerin

Glycerin toxicity was previously evaluated in the Statewide PEIR. The scientific literature was reviewed for updated glycerin toxicity data; however, no appropriate new studies, methodology, or guidance documents were identified. Therefore, all toxicity data described previously in the Statewide PEIR were used in the risk characterization of glycerin.

5 Exposure Assessment

The third step in the HHRA was to estimate how much imidacloprid and glycerin exposure an exposed individual (referred to as a “sensitive receptor” for this HHRA) would receive. Exposure is commonly defined as contact of visible external physical boundaries (i.e., external boundaries such as the mouth, nostrils, and skin) with a chemical. Exposure is dependent upon the intensity, frequency, and duration of contact. The intensity of contact is typically expressed in terms of the concentration of chemical per unit mass or volume (i.e., µg/g, µg/L, mg/m3, ppm, etc.) in the media (i.e. soil, air, water, etc.) to which humans are exposed. Dose refers to the amount of chemical to which individuals are exposed that crosses the external boundary. Dose is dependent upon chemical concentration and the rate of intake (i.e., inhalation or ingestion) or uptake (i.e., dermal absorption) and may be normalized to body weight as a function of time (i.e., mg/kg/day). Average daily dose (ADD) rates may be estimated using the standard exposure assessment algorithm shown below:

$$ADD = \frac{C * CR * ED * F}{BW * AT}$$

where:

ADD = potential average daily dose (mg/kg/day);
C = chemical concentration (mg/L, mg/m^3; mg/cm^2);
CR = contact rate (L/day; m^3/day; cm^2/day);
ED = exposure duration (years);
F = frequency of exposure events (days/year);
BW = body weight (kg); and
AT = averaging time (days).

The chemical concentration (C), also referred to as an estimated environmental concentration (EEC), refers to the amount of imidacloprid and glycerin residue in the media of interest, and contact rate refers to the rate of ingestion, inhalation, or dermal deposition per day. Exposure duration refers to the length of time that contact occurs and is affected by activity patterns. For this HHRA, the duration of Proposed Program treatments at a single residence was assumed to be 5 years, which would be an estimate of the longest period of yearly treatment intervals for the Proposed Program. Frequency is the number of exposure events over a specified time period. Body weight and averaging time are specific to the population and exposure scenarios being evaluated. For chronic exposure, the annual average daily dose (AADD) is calculated using an averaging time (AT) factor, which is the number of days over which the exposure is averaged. In this HHRA, the chronic averaging time was assumed to be 5 years, which is consistant with the exposure duration. For exposure assessments used to support cancer risk assessments AT is replaced by lifetime (LT) (i.e., 25,550 days = 70 years * 365 days/year). The resulting exposure estimate is referred to as the potential lifetime average daily dose (LADD). ADD, AADD, and LADD are expressed in units of mg/kg/day. Absorbed doses (i.e., ADD, AADD, and LADD) may be estimated by applying an absorption factor.

The exposure assessment portion of the HHRA was divided into two parts. The first part was to estimate the concentration of the imidacloprid and glycerin in the environment (EEC) through fate and transport processes. This included determining the specific concentration of imidacloprid and glycerin that may be found in the air, water, soil, and contained in/on the plant. This took into account the total amount of Merit 2F applied, along with any mechanisms of dispersal or degradation of imidacloprid and glycerin that may occur during or shortly after application. The next part in determining human exposure (ADD, AADD, or LADD) was to estimate how much the human body would take up of the estimated concentration in the environment. The three main uptake pathways addressed in the HHRA were inhalation, ingestion, and dermal absorption. These two parts are each discussed in further detail below.

5.1 Conceptual Site Model

A conceptual site model (CSM) is a written and graphical presentation of predicted relationships between Merit 2F application scenarios and receptor exposure (i.e. inhaling pesticide, dermal contact with pesticide, or ingestion of pesticide). It includes a description of the complete exposure pathways and outlines the primary release mediums, impacted media, and potential routes of exposure for each receptor. A complete exposure pathway exists when Merit 2F can be traced, or expected to travel, from the point of application to a plant, soil, air and eventually a human receptor. An exposure pathway that is not complete means that it is unlikely for that human receptor to be exposed to Merit 2F. The CSM identifies the multiple pathways through which receptors can be exposed to Merit 2F as part of the Proposed Program.

The starting point of the CSM is the application technique which considers the release of Merit 2F into the environment. The next exposure step following an application depends on the environmental media that imidacloprid and glycerin reaches after application. These imidacloprid and glycerin residues may occur in the soil, air, water, turf, and vegetation, as well as non-target plants and possibly humans (i.e. applicator) present at the time of the application.

Turf or other plants present within the treated area can acquire residues via direct application and uptake from the soil.

Following an application, the potential exists for off-site movement via aerial drift (hereinafter referred to as "drift") such that residues of imidacloprid and glycerin may be present in surface water and adjacent untreated areas. Downwind bystanders may be present and be exposed to imidacloprid and glycerin by aerial drift through the inhalation or dermal pathways. Note that, for turf and groundcover applications of Merit 2F, off-site drift is minimal as applications are not made when wind is present, low-pressure nozzles are used, water droplet sizes are large, and all spray is directed at the ground.

Once the imidacloprid and glycerin residue is present in an environmental media, three routes of exposure exist for a human receptor to become exposed: ingestion, dermal, and inhalation. The CSM for the Proposed Program is presented in Figure 1 below.

Figure 1: Japanese Beetle Control Activities Residential Conceptual Site Model

Primary Source	Primary Release	Secondary Source	Impacted Media	Exposure Routes	Mixer/Loader/ Applicator (MLA) (a)	Adult, 2<16 Child, 0<2 Child Downwind Bystander (DWB)	Adult Post-Application Resident (PAR)	2<16 Child Post-Application Resident (PAR)	0<2 Child Post-Application Residents (PAR)	Adult During & Post-Application Residents (DPAR)	2<16 Child During & Post-Application Residents (DPAR)	0<2 Child During & Post-Application Residents (DPAR)
Backpack Sprayer Drench + Water-In			Air	Dermal	X	O (b)	O	O	O	O (b)	O (b)	O (b)
				Inhalation	X	O (b)	O	O	O	O (b)	O (b)	O (b)
	Large Droplets		Turf/ Ground cover	Dermal	O	O	X	X	X	X	X	X
		Saturated Soil		Hand-to-Mouth	O	O	O	X	X	O	X	X
				Object-to-Mouth	O	O	O	X	X	O	X	X
				Incid. Ingestion	O	O	O	X (c)	X (c)	O	X (c)	X (c)
			Landscape Vegetation	Dermal	O	O	O	O	O	O	O	O
				Hand-to-Mouth	O	O	O	O	O	O	O	O
				Intent. Ingestion	O	O	X	X	X	X	X	X
				Incid. Ingestion	O	O	O	X (f)	X (f)	O	X (f)	X (f)
			Soil/Thatch	Dermal	O	O	X (e)	X (e)	X (e)	X (e)	X (e)	X (e)
				Pica/Incid. Ingestion	O	O	O	X	X	O	X	X
Ground boom Turf + Water-In			Air	Dermal	X	X (b)	O	O	O	X (b)	X (b)	X (b)
				Inhalation	X	X (b)	O	O	O	X (b)	X (b)	X (b)
	Droplets, Vapor, or Mist		Turf	Dermal	O	O	X (d)	X (d)	X (d)	X (d)	X (d)	X (d)
		Saturated Soil		Hand-to-Mouth	O	O	O	X (d)	X (d)	O	X (d)	X (d)
				Object-to-Mouth	O	O	O	X (d)	X (d)	O	X (d)	X (d)
				Incid. Ingestion	O	O	O	X (d)	X (d)	O	X (d)	X (d)
			Soil/Thatch	Dermal	O	O	X (d)(e)	X (d)(e)	X (d)(e)	X (d)(e)	X (d)(e)	X (d)(e)
				Pica/Incid. Ingestion	O	O	O	X (d)	X (d)	O	X (d)	X (d)

General Notes:
CSM is for PD/EP-Eradication applications to turf and landscape areas that take place in residential environments.
X - Complete Exposure Pathway
O - Incomplete, Inconsequential, or De Minimis Exposure Pathway
Worker exposure scenarios assume that all appropriate personal protective equipment (PPE) is worn according to the product label.

Specific Notes:
(a) Exposure to MLA includes exposure to the product itself during handling.
(b) Resident is assumed to be exposed to drift from a groundboom application to a field and the post-application residues in his/her own yard. Ground-directed handheld sprayer applications are expected to result in De Minimis drift to bystanders.
(c) Exposure pathway expected to be De Minimis as compared to soil pica ingestion.
(d) Complete exposure pathway for the PAR Adult, 2<16 Child, and 0<2 Child exists but is identical to the exposure pathway from Turf and Soil/Thatch in the Backpack Sprayer Drench + Water-In, and will not be duplicated.
(e) Dermal exposure to treated soil below garden plants will be evaluated. Dermal exposure to treated soil below turf is expected to be Di Minimis as compared to dermal exposure to residues on turf.
(f) Exposure pathway expected to be De Minimis as compared to intentional ingestion of landscape vegetation.

5.2 Estimating Pesticide Environmental Concentrations

The estimated environmental concentration (EEC) is defined as the predicted concentration of imidacloprid and glycerin within an environmental compartment (i.e., within soil, water, plant tissue, or a specific organism) based on estimates of quantities released, discharge patterns and inherent disposition of the substance (*i.e.* fate and distribution) as well as the nature of the specific receiving ecosystems.

Since it is not possible for this HHRA to evaluate exact concentrations and exposures in the field, EECs are estimated using various conservative models that have been developed for use in risk assessments. These models are designed to use conservative assumptions and in many cases are not capable of modeling all of the complex fate and transport processes that can occur once imidacloprid and glycerin are released into the environment. Typical fate properties which tend to decrease the concentration of imidacloprid and glycerin include aerobic degradation, anaerobic degradation, photolysis, hydrolysis, absorption, solubilization, and volatilization. Key transport properties that may not be accounted for are dilution and partial transfer between media such as plants, soil, water, and air. Therefore, most of the EECs will represent an upper-bound value since not all fate and transport properties have been modeled.

The basic procedures and modeling for estimating environmental concentration of Merit 2F remained the same as were used in the Statewide PEIR; however, some assumptions differ between a turf application and the bare soil drench applications that were simulated in the Statewide PEIR. The assumptions specific to a turf application are presented below. If not discussed below, the approach to estimate environmental concentrations was the same as described in the Statewide PEIR.

CDFA defined Merit 2F application rate for the scenario PDEP-E-08 in the PMDS found in Appendix Human A - PMDS. The scenario defined application rate of imidacloprid is 0.4 lb/Ac; the application rate of glycerin is 0.19 lb/Ac.

The chemical and physical properties of imidacloprid and glycerin in Merit 2F previously provided in the Statewide PEIR were reviewed and compared to the current available literature. The chemical physical properties and environmental fate information as presented in the Statewide PEIR were left unchanged and were deemed to be applicable to the current risk assessment. Refer to the Statewide PEIR and the relevant sections of the Dashboard Database for physical, chemical, and environmental fate properties of imidacloprid and glycerin used in this HHRA.

The application modeled in this scenario is made as a foliar spray directly to turf or ornamental ground cover like low-growing broad-leafed plants, and as a soil drench to bare ground under other host plants. After application to turf and broad-leafed plants, these areas are ‘watered-in’ so the Merit 2F moves into the soil. Some Merit 2F residue was assumed to remain on the turf or broad-leafed vegetation with the rest washed off into the soil. Based on available data, 33% of the applied Merit 2F was assumed to remain on the vegetation and 67% was assumed to wash off into soil (CDPR 2012g, CDPR 2013b). Bare ground areas beneath host plants are assumed to have received 100% of the applied Merit 2F.

5.2.1 Soil

Concentrations in soil below garden plants or in bare spots on lawns were used to estimate exposure from dermal contact and ingestion of soil and edible vegetation. The soil was assumed to receive 100% of the applied Merit 2F prior to direct exposure or being taken up into plant tissue.

Soil concentrations for acute/subchronic duration exposure conditions are represented by the peak residue concentrations in soils immediately following an applications. For additional details on estimation methods, refer to the Statewide PEIR Section 2.3.

Soil concentrations for chronic duration exposure conditions represent the daily concentration averaged over a 365-day period. For additional details on estimation methods, refer to the Statewide PEIR Section 2.3. In the Statewide PEIR, a 31-day daily average soil concentration was used for chronic exposure assessments but was modified to a 365-day daily average to more realistically simulate how a resident may be exposed over one year.

Estimated imidacloprid and glycerin concentration in soil results are presented in Section 7.2.

5.2.2 Vegetation

Concentrations of imidacloprid or glycerin residues on turf surfaces and within the tissue of vegetation were used to estimate exposure from dermal contact and ingestion of edible vegetation. Applications are only made to turf, groundcover foliage, and bare soil below host plants or in lawns; therefore, residues on plant foliage other than turf and groundcover are not expected and were not considered. For the purposes of modeling, turf and groundcover were assumed to have the same properties and environmental characteristics. For estimating residue concentrations for dermal exposures, 33% of the applied Merit 2F was assumed to remain on the turf surface after "watering-in" of the applied material (CDPR 2012g, CDPR 2013b). The watering-in effect was expressed as a watering-in reduction multiplier (WRM) of 0.33 in the applicable equations in this HHRA. In contrast, 100% of the Merit 2F was assumed to be applied to soil before being taken up into plant tissue.

5.2.3 Transferable Turf Residue

Post-application imidacloprid and glycerin residues on turf surfaces that are available for dermal transfer to a receptor's skin are referred to as transferable turf residues (TTRs). The method for estimating the TTR was selected from USEPA's Standard Operating Procedures for Residential Pesticide Exposure Assessment (SOP) (USEPA, 2012l). The following equation was used to estimate the TTR:

$$TTR_t = AR * F_{AR} * (1 - F_D)^t * CF_1 * CF_2 * WRM$$

Where:

TTR_t = Transferable turf residue (t) days after application (ug/cm^2)
AR = Application rate (lb ai/acre)
F_{AR} = Fraction of transferable ai
F_D = Fraction of residue that dissipates per day
t = Time after application (days)
CF_1 = Weight conversion factor (ug/lb)
CF_2 = Area unit conversion factor (acre/cm^2)
WRM = Water-in reduction multiplier

The F_{AR} was left unchanged from the default USEPA SOP value of 0.01, and the F_D was modified to reflect the rate at which imidacloprid dissipates per day. The F_D was calculated by determining the percent of imidacloprid or glycerin remaining 1 day after application, using the foliar half-life of 4 days for imidacloprid and 0.6 days for glycerin and the equation for first order rate kinetics. Using this method, the residue concentration after 1 day was calculated to be 84.09% for imidacloprid; therefore, the percent of imidacloprid residue that dissipates per day is 15.91%. The residue concentration after 1 day was calculated to be 31.50% for glycerin; therefore, the percent of glycerin residue that dissipates per day is 68.50%. Refer to the relevant sections of the Dashboard for details. The equation of first order rate kinetics is given below:

$$C_t = C_O e^{-kt}$$

Where:

C_x = Concentration on Day x following the application
C_0 = Concentration on Day 0 (immediately following application)
e = 2.718
k = 0.693/half life
t = time (days)

A summary of the exposure factors used in estimating TTR is given in Table 3.

Table 3: Exposure Factors Used in Estimating TTR

F_{AR}	F_D	t (days)	WRM	Foliar Half-Life (days)
0.01	0.1591 (imidacloprid) 0.6850 (glycerin)	0-365	0.33	4 (imidacloprid) 0.6 (glycerin)

For estimating residue concentrations for acute/subchronic exposures, dermal contact was assumed to occur immediately after application without any degradation, and TTR value represents the peak concentration following an application. For chronic exposures, dermal contact was assumed to occur every day for 365 days, so the estimated daily soil concentration was averaged over a 365-day period. The chronic TTR value represents the 365-day average concentration in soil assessed over the course of a year.

TTR concentration results are presented in Section 7.2.

5.2.4 Edible Vegetation Residue

Uptake by plants from soil was estimated in a manner similar to that used in the the Statewide PEIR with the exception that a revised Briggs' Equation was used based on the updated version in U.S. EPA (2014).

$$\text{Terrestrial VUF} = \left([10^{(0.95 \times \text{Log } K_{ow} - 2.05)} + 0.82] \times TSCF \times \left[\frac{\rho}{\theta + \rho \times K_{oc} \times f_{oc}}\right]\right) \times \text{soil concentration}$$

$$TSCF = [-0.648 \times (\text{Log } K_{ow})^2 + 0.241 \times \text{Log } K_{ow} + 0.5822]$$

TSCF = Transpiration Stream Concentration Factor
K_{ow} = Octanol/Water Partition Coefficient (unitless)
ρ = soil bulk density (g-dw/cm^3)
θ = soil-water content by volume (cm^3/cm^3)
K_{oc} = soil organic carbon-water partitioning coefficient (cm^3/g-organic carbon or L/kg-organic carbon)
f_{oc} = fraction of organic carbon in the soil

Complete details regarding how the Briggs' equation was used appear in the Statewide PEIR. In keeping with the guidance in USEPA (2014), if the Log K_{ow} was greater than 5.0, no uptake was assumed. When the Log K_{ow} is negative, the TSCF is assumed to be 1.0 (Collins *et al.* 2006).

For estimating imidacloprid and glycerin concentrations in edible vegetation for acute/subchronic and chronic exposures, uptake by the plant from soil was conservatively assumed to occur without any degradation, and tissue concentrations were conservatively represented by the peak concentration in the plant following a single application.

Edible vegetation residue concentration results are presented in Section 7.2:

5.2.5 Pesticide Off-target Drift

Off-target drift of Merit 2F was estimated in a similar manner as presented in the Statewide PEIR. Methods for assessing ground applications in AgDRIFT were followed, and in accordance with USEPA's *Overview of Issues Related to the Standard Operating Procedures for Residential Exposure Assessment* (USEPA, 1999f), a "Flagger" unit exposure from USEPA's *Occupational Pesticide Handler Exposure Database* (OPHED) (USEPA, 2015) was used to assess exposure to off-target drift. Refer to Section 4.2.1.4.3 Pesticide Off-target Drift and Section 4.2.1.6.5 Downwind-Bystander of the Statewide PEIR for additional details.

Flagger unit exposures and AgDRIFT estimated percent deposition are presented in Section 7.2.

5.2.6 Occupational Exposure Values

For occupation exposure assessments (i.e., Mixer-loader-applicator), unit exposures from USEPA's OPHED (USEPA, 2015) were selected in accordance with methods described in USEPA's *Review of Worker Exposure Assessment Methods* (USEPA, 2007k). Selection of unit exposures was completed in a similar manner as presented in the Statewide PEIR. Refer to Section 4.2.1.6.1 Mixer-Loader-Applicator of the Statewide PEIR for additional details.

Occupational unit exposures selected are presented in Section 7.2.

5.2.7 Water Ingestion, Surfacewater, and Groundwater

Databases from authoritative and reliable sources such as the State Water Resources Control Board (SWRCB) California Environmental Data Exchange Network (CEDEN) and the California Department of Pesticide Regulation (CDPR) were queried for data on impacts to drinking water quality from the Proposed Program. Refer to the Statewide PEIR for presentation of the results.

Based on surfacewater data available from the State Water Resources Control Board (SWRCB) CEDAN database, imidacloprid and glycerin have not been reported in sources of drinkingwater. Based on the last 5 years of groundwater data from CDPR, imidacloprid has been detected once at so close to the detection limit that the detection requires confirmation. Glycerin has not been reported. Because of the lack of detections in surfacewater and unlikely detection in groundwater, exposure to imidacloprid and glycerin in drinking water by the ingestion pathway from these sources is not expected to occur. Accordingly, this pathway was not assessed.

5.3 Exposure Models

The exposure assessment estimates the dose, or amount of imidacloprid and glycerin that different types of human receptors may be exposed to under different application scenarios that would be a part of the Proposed Program. The exposure to imidacloprid and glycerin varies for different types of human receptors depending on the activities of a particular individual and proximity to the application site. The following four types of human receptors were assessed in this HHRA:

- Mixer-Loader-Applicator (MLA): Pesticide handlers
- Downwind Bystander (DWB): Residents or workers near the application site
- Post-Application Resident (PAR): Residents in the yard after application
- During & Post-Application Residents (DPAR): Residents near the application site during application and in yard after application

The potential health impacts, if any, to relevant receptors can be estimated by comparing estimated exposure doses with the measures of toxicity. Descriptions of the methodology used to assess toxicity are described in Section 4.

5.3.1 Exposure Routes

Depending on the activities and location of a particular individual six exposure routes could potentially occur under acute, subchronic, and chronic duration exposure scenarios. The exposure routes considered in this HHRA are the following:

- Inhalation: Aerosols and vapors
- Intentional Ingestion of Soil: Pica behavior (children that intentionally eat soil)
- Incidental Ingestion of Soil: Unintentional ingestion of soil, often through hand-to-mouth transfer
- Ingestion of Vegetation: Eating home-grown edible vegetation (fruits and vegetables)
- Dermal Exposure to Soil: Due to working or playing in treated areas
- Dermal Exposure to Turf: Due to activities in treated areas

Groundwater and surface water ingestion exposure was not considered as explained in Section 5.2.7.

5.3.2 Exposed Populations (Receptors)

A description of each of the four receptors identified in Section 5.3 is provided below. These receptor groups represent the groups with reasonable potential for exposure during the Proposed Program.

5.3.2.1 Mixer-Loader-Applicator

The mixer-loader-applicator (MLA) represents the combination exposure of a worker who may be occupationally exposed to imidacloprid or glycerin while loading, mixing and applying Merit 2F. The MLA is assumed to be exposed through dermal and inhalation routes. Ingestion was not evaluated for this receptor because the applicator is properly trained to minimize any hand-to-mouth transfers.

5.3.2.1.1 Mixer-Loader-Applicator Acute Exposure Assessment

Acute exposure for the MLA was evaluated in the same manner as in the Statewide PEIR. Refer to the Statewide PEIR Appendix B Section 2.3 for exposure assessment methodology. USEPA's Occupational Pesticide Handler Exposure Database (OPHED) was most recently updated in September 2015, and unit exposure values were selected from the updated version (USEPA, 2015). Refer to Section 7.2 for the OPHED unit exposures used for estimating exposure to the MLA.

5.3.2.1.2 Mixer-Loader-Applicator Chronic Non-cancer Exposure Assessment

Chronic exposure for the MLA was evaluated in the same manner as in the Statewide PEIR. Refer to the Statewide PEIR Appendix B Section 2.3 for exposure assessment methodology.

5.3.2.1.3 Mixer-Loader-Applicator Cancer Exposure Assessment

Chronic exposure for cancer assessment was not characterized in this risk assessment because imidacloprid and glycerin show no evidence of carcinogenicity.

5.3.2.2 Post-Application Resident

The post-application-resident (PAR) represents a typical individual living in an urban or residential environment who has the potential to be exposed after treatments have been conducted under the Proposed Program. The PAR was conservatively assumed to be active in the gardens and lawns on his/her property and to consume homegrown edible vegetation (e.g., fruits and vegetables). An adult resident was assumed to be exposed to residues on turf and soil through dermal contact and through ingestion of treated edible vegetation. Child residents, ages 0-<2 years old and 2-<16 years old, were assumed to be exposed to residues on turf and soil through dermal contact, incidental ingestion of residues on turf from hand-to-mouth and object-to-mouth activity, and ingestion of treated edible vegetation and soil. Post-application inhalation exposure to imidacloprid and glycerin was not considered because of each chemical’s low vapor pressure (imidacloprid vapor pressure of 7.00E-12 mmHg and glycerin vapor pressure of 1.58E-04 mmHg) and the fact that Merit 2F is watered into the soil immediately after application.

For the purposes of this risk assessment, the resident was analyzed over three lifestages: 0-<2 year old child, 2-<16 year old child, and a 16 to 70 year old adult (USEPA, 2005q). In order to estimate potential exposure for these three age-groups, guidance and exposure factors from sources including, but not limited to, USEPA’s Standard Operating Procedures for Residential Pesticide Exposure Assessment (SOP) (USEPA, 2012l), USEPA’s Risk Assessment Guidance for Superfund (RAGS) (USEPA, 2014), and USEPA’s Exposure Factor’s Handbook (EFH) (USEPA, 2011p) were selected. If exposure factors from various age-ranges (e.g., 1-<2 year olds) within each lifestage (e.g., 0-<2 year old child) were available, the exposure factor from the age-range that resulted in the highest exposure was selected for each lifestage. Using this approach resulted in the use of exposure factors that are health-protective for the entire lifestage. The SOP designates “index lifestages” for specific exposure assessments. An index lifestage represents “the lifestage of highest concern due to unique behavioral characteristics that may lead to higher levels of exposure.” The USEPA determined these index lifestages through both “quantitative (e.g., exposure assessments) and qualitative (e.g., exposure and activity data) considerations,” and assessment of the index lifestage is expected to “protect for the exposures and risks for all potentially exposed lifestages” (USEPA, 2012l). For estimating potential exposure in this risk assessment, the SOP index lifestage was assessed using the SOP guidance when available.

5.3.2.2.1 Post-Application Resident Acute/Subchronic Exposure Assessment

Dermal Exposure to Residues on Turf

The 0-<2 year child PAR’s, 2-<16 year child PAR’s, and adult PAR’s dermal exposure to imidacloprid and glycerin residues on turf were assessed using USEPA’s SOP guidance for “Lawns/Turf - High Contact Lawn Activities”.

The first step of the Lawns/Turf SOP equation was to estimate the Transferable Turf Residue (TTR) of imidacloprid and glycerin. Refer to Section 5.2.3 for the TTR equation and additional details.

The SOP recommended transfer coefficients (Tc) were used to estimate the transfer of residue from turf-surface to skin. The recommended Tcs were 49,000 cm^2/hour for a 1-<2 year old, 56,000 cm^2/hour for a 2-<3 year old, and 180,000 cm^2/hour for an adult (USEPA, 2012l). For the definition of Tcs, refer to Appendix B Section 2.3 of the Statewide PEIR. The default exposure factors used in the SOP for a child 1-<2 years old, a child 2-<3 years old, and an adult were left unchanged for the assessment of the 0-<2 year child PAR, 2-<16 year child PAR, and adult PAR, respectively.

In order to estimate the PAR's Average Daily Dose (ADD), the TTR was multiplied by the Tc, the number of hours per day the resident was expected to be exposed (i.e., exposure time), and a dermal absorption factor, and then divided by the resident's body weight. The following equation was used to estimate the ADD:

$$ADD = \frac{TTR_t * CF_3 * Tc * ET * DAF}{BW}$$

<u>Where:</u>
ADD = Average daily dose (mg/kg-day)
TTR_t = Transferable turf residue (t) days after application (ug/cm^2)
CF_3 = Weight unit conversion factor (mg/ug)
Tc = Transfer coefficient (cm^2/hour)
ET = Exposure time (hours)
DAF = Dermal absorption factor
BW = Body weight (kg)

A summary of the exposure factors used in estimating acute/subchronic dermal exposure to turf is given in Table 4:

Table 4: Exposure Factors Used in Estimating Acute/Subchronic Dermal Exposure to Turf

Receptor	Tc (cm^2/hour)[1]	ET (hours)[1]	DAF[2]	BW (kg)[1]
0-<2 PAR	49,000	1.5	0.0725 (imidacloprid) 1 (glycerin)	11.4
2-<16 PAR	56,000	1.5		13.8
Adult PAR	180,000	1.5		80

Note: [1]Values from USEPA SOP (USEPA, 2012l)
[2]USEPA, 2008n

Hand-to-Mouth Ingestion of Turf Residues

The 0-<2 year child PAR and 2-<16 year child PAR were assumed to come into contact with imidacloprid and glycerin by contacting residues on turf and then transferring that residue from his/her hand to mouth. Due to the higher likelihood of children placing their hands in their mouths, estimations of incidental ingestion for the two child PARs were considered health protective of the adult PAR. The USEPA's SOP (USEPA, 2012l) guidance for Lawns/Turf was used as a source of exposure factors and methods. Exposure factors for a 1-<2 year-old and a 3-<6 year-old were selected to represent the 0-<2 year child PAR and the 2-<16 year child PAR, respectively.

In accordance with the SOP, the dermal contact with turf exposure value (TDE), which was estimated using the TTR, dermal transfer coefficients, and exposure time in the Dermal Exposure to Turf assessment (above), was multiplied by the fraction of total residue on the child's hands compared to total body surface residue from the study used to derive the SOP's turf dermal transfer coefficient. The result was then divided by the typical surface area of a child's hands to estimate the potential amount of residue available on the PAR child's hands (HR). The following equation was used to estimate the HR:

$$HR = \frac{Fai_{hands} * TDE}{SA_H * 2}$$

Where:

HR = Residue available on hand (mg/cm^2)
Fai_{hands} = Fraction of total residue on hands
TDE = Turf dermal exposure (mg)
SA_H = Hand surface area (cm^2)

In order to estimate the ADD, the SOP accounts for the fraction of hand surface area mouthed each event, the typical surface area of one hand, the number of hours per day the child may be exposed, the number of times the child contacts treated turf per hour, the fraction of residue removed from saliva, the frequency of hand-to-mouth contacts per hour, and the child PAR's body weight (USEPA, 2012l). The following equation was used to estimate the ADD:

$$ADD = \frac{HR * F_M * SA_H * ET * N_{Rep} * (1 - (1 - SE)^{EV_{HtM}/N_{Rep}})}{BW}$$

Where:

ADD = Average daily dose (mg/kg-day)
HR = Residue available on hand (mg/cm^2)
F_M = Fraction of hand surface area mouthed per event
SA_H = Hand surface area (cm^2)
ET = Exposure time (hours/day)
N_{Rep} = Number of replenishment intervals per hour (intervals/hour)
SE = Extraction by siliva
EV_{HtM} = Frequency of HtM events per hour (events/hour)
BW = Body weight (kg)

A summary of the exposure factors used in estimating acute/subchronic hand-to-mouth ingestion of turf residues is given in Table 5:

APPENDIX 1A

Table 5: Exposure Factors Used in Estimating Acute/Subchronic Hand-to-Mouth Ingestion of Turf Residues

Receptor	Fai_{hands}	SA_H (cm^2)	F_M	ET (hours/day)	N_{Rep} (intervals/hour)	SE	EV_{HtM} (events/hour)	BW (kg)
0 -<2 PAR	0.06	150	0.127	1.5	4	0.5	13.9	11.4
2 -<16 PAR		225					8.5	18.6

Note: Values from USEPA SOP (USEPA, 2012l)

Object-to-Mouth Ingestion of Turf Residues

Both the 0-<2 year and 2-<16 year child PARs were assumed to come into contact with imidacloprid and glycerin through turf-to-object contact that subsequently transferred to his/her mouth from the object. Due to the higher likelihood of children placing objects in their mouth, estimations of incidental ingestion of the two child PARs were considered health protective of the adult PAR. The USEPA's SOP (USEPA, 2012l) guidance for Lawns/Turf was used as a source of exposure factors and methods. Exposure factors for a 1-<2 year-old and a 2-<3 year-old were selected to represent the 0-<2 year child and 2-<16 year child PARs, respectively.

In accordance with the SOP, the application rate was multiplied by the fraction of total residue on the object compared to total surface residue in order to estimate the potential amount of residue available on the object (OR). A 3-fold reduction factor was applied to the OR based on the reduction of residue available for transfer on the turf surface after the application has been watered-in (CDPR, 2013b).The following equation was used to estimate the OR:

$$OR = AR * F_O * CF_1 * CF_2 * WRM$$

Where:

OR = Residue available on object (ug/cm^2)
AR = Application rate (lb ai/acre)
F_O = Fraction of total residue on object
CF_1 = Weight unit conversion factor (ug/lb)
CF_2 = Area unit conversion factor (acre/cm^2)
WRM = Water-in reduction multiplier

To estimate the ADD, the SOP accounts for the residue available on the object, the object surface area mouthed for each event, the number of hours per day the child is assumed to be exposed (i.e., exposure time), the number of times the object contacts treated turf per hour, the fraction of residue removed by saliva, the frequency of object-to-mouth contacts per hour, and the child PAR's body weight (USEPA, 2012l). The following equation was used to estimate the ADD:

$$ADD = \frac{OR * CF_3 * SAM_O * ET * N_{Rep} * (1 - (1 - SE)^{(EV_{OtM}/N_{Rep})})}{BW}$$

Where:

ADD = Average daily dose (mg/kg-day)
OR = Residue available on object (ug/cm^2)
CF_3 = Weight unit conversion factor (mg/ug)
SAM_O = Object surface area mouthed per event (cm^2/event)
ET = Exposure time (hours/day)
N_{Rep} = Number of replenishment intervals per hour (intervals/hour)
SE = Extraction by saliva
EV_{OtM} = Frequency of OtM events per hour (events/hour)
BW = Body weight (kg)

A summary of the exposure factors used in estimating acute/subchronic object-to-mouth ingestion of turf residues is given in Table 6:

Table 6: Exposure Factors Used in Estimating Acute/Subchronic Object-to-Mouth Ingestion of Turf Residue

Receptor	F_O	WRM	SAM_O (cm^2/event)	ET (hrs/day)	N_{Rep} (intervals/hr)	SE	EV_{OtM} (events/hr)	BW (kg)
0-<2 PAR	0.01	0.33	10	1.5	4	0.48	8.1	11.4
2-<16 PAR	0.01	0.33	10	1.5	4	0.48	8.8	13.8

Pica and Incidental Ingestion of Soil

Both the 0-<2 year and 2-<16 year child PARs were assumed to be exposed to imidacloprid and glycerin through ingestion of treated soils underneath garden plants or bare spots on lawns. The two child PARs were assumed to exhibit soil pica behavior, which is the recurrent ingestion of unusually high amounts of soil of between 1,000 – 5,000 mg/day (OEHHA, 2012d). USEPA's EFH (USEPA, 2011p) states, "soil-pica should not be limited to intentional soil ingestion, primarily because children can consume large amounts of soil from their typical behaviors and because differentiating intentional and unintentional behavior in young children is difficult." The soil pica soil ingestion rate is based on a total mg soil per day, and accounts for both intentional and incidental soil ingestion (OEHHA, 2012d). Due to the higher likelihood of children to consume soil, estimations of soil ingestion of the two child PARs were considered health protective of the adult PAR.

Methods and exposure factors from the USEPA's RAGS (USEPA, 2014), USEPA EFH (USEPA, 2011p), and OEHHA's Air Toxics Hot Spots Program Risk Assessment Guidelines (Hot Spots) (OEHHA, 2012d) were used in this assessment. Exposure factors for a 1-<2 year-old and a 2-<3 year-old were selected to represent the 0-<2 year child and 2-<16 year child PARs, respectively.

To estimate the ADD, the peak concentration of imidacloprid or glycerin residue estimated to be in soil was multiplied by a soil ingestion rate, the fraction of soil ingested that had been treated, and then divided by the child's body weight. A soil ingestion rate of 5 g soil/day was selected from OEHHA's Technical Support Document (OEHHA, 2012d), and the fraction of soil ingested from a treated site was assumed to be 100%. The following equation was used to estimate the ADD:

$$ADD = \frac{EEC * CF * IR_s * FI}{BW}$$

Where:

ADD = Average daily dose (mg/kg-d)
EEC = Estimated environmental concentration (mg/kg)
CF = Conversion factor (kg/mg)
IR_s = Ingestion rate (mg/day)
FI = Fraction ingested
BW = Body weight (kg)

A summary of the exposure factors used in estimating acute/subchronic pica and incidental soil ingestion is given in Table 7]:

Table 7: Exposure Factors Used in Estimating Acute/Subchronic Pica and Incidental Soil Ingestion

Receptor	EEC (mg/kg)	IR_s (mg/kg-day)	FI	BW (kg)
0-<2 PAR	Refer to Section 7.2	5,000	1	11.4
2-<16 PAR				13.8

Dermal Exposure to Residues in Soil

The 0-<2 year child PAR, 2-<16 year child PAR, and the adult PAR were assumed to be dermally exposed to imidacloprid and glycerin residues in soil in gardens or bare spots on lawns. Methods and exposure factors from the USEPA's RAGS (USEPA, 2014), USEPA EFH (USEPA, 2011p), and USEPA's SOP (USEPA, 2012l) were used in this assessment. Exposure factors for a 1-<2 year-old and a 2-<3 year-old were selected to represent the 0-<2 year child and 2-<16 year child PARs, respectively.

To estimate the ADD, the peak concentration of imidacloprid or glycerin residue estimated to be in soil was multiplied by the resident's skin surface area that typically contacts soil, a soil-to-skin adherence factor, the number of times the resident is expected to come in contact with treated soil per day, a imidacloprid- and glycerin-specific dermal absorption factor, and divided by the resident's body weight. A surface area of 6,032 cm^2/event was selected for an adult PAR (USEPA, 2014), 2373 cm^2/event for a 2-<16 year child PAR (USEPA, 2014), and 610 cm^2/event for a 0-<2 year child PAR, based on the 95^{th} percentile for total body surface area of a 1-<2 year child (USEPA, 2011p). The soil adherence factor used was 0.07 mg/cm^2 for an adult PAR and 0.2 mg/cm^2 for both child PARs (USEPA, 2014). The adult and both child PARs were assumed to contact soil 71 times per hour, based on the 90th percentile soil contact rate of both hands of a child age 1 to 5 years old (USEPA, 2011p). The adult PAR was assumed to spend 2.2 hours per day outside in treated areas and the two child PARs were assumed to spend 1.1 hours per day outside in treated areas, based on USEPA's SOP guidance on activities in gardens (USEPA, 2012l). The following equation was used to estimate the ADD:

$$ADD = \frac{EEC * CF * SA * AF * ET * CR * DAF}{BW}$$

Where:

ADD = Average daily dose (mg/kg-day)
EEC = Estimated environmental concentration (mg/kg)
CF = Conversion factor (kg/mg)
SA = Surface area exposed per event (cm^2/event)
AF = Soil adherence factor (mg/cm^2)
ET = Exposure time (hours/day)
CR = Contact rate (events/hour)
DAF = Dermal absorption factor
BW = Body weight (kg)

A summary of the exposure factors used in estimating acute/subchronic dermal exposure to residues in soil is given in Table 8:

Table 8: Exposure Factors Used in Estimating Acute/Subchronic Dermal Exposure to Residues in Soil

Receptor	EEC (mg/kg)	SA (cm^2/event)	AF (mg/cm^2)	ET (hours/day)	CR (events/hour)	DAF	BW (kg)
0-<2 PAR	Refer to Section 7.2	610	0.2	1.1	71	0.0725 (imidacloprid) 1 (glycerin)	11.4
2-<16 PAR		2,373	0.2				13.8
Adult PAR		6,032	0.07	2.2			80

Ingestion of Edible Vegetation

The 0-<2 year child PAR, 2-<16 year child PAR, and the adult PAR were assumed to be exposed to imidacloprid and glycerin residues through consumption of edible vegetation (e.g., home-grown fruit). Although CDFA maintains spray buffers (i.e., 12 inches beyond the dripline) around edible vegetation, imidacloprid and glycerin were assumed to be translocated from the soil through the roots of edible vegetation plants. Imidacloprid and glycerin will be applied via drench application; therefore, foliar residue on edible vegetation is not expected and was not considered.

Methods and exposure factors from the USEPA's RAGS (USEPA, 2014) and USEPA EFH (USEPA, 2011p) were used in this assessment. Exposure factors for a 1-<2 year-old and a 3-<5 year-old were selected to represent the 0-<2 year child and 2-<16 year child PARs, respectively.

To estimate the ADD, the maximum estimated environmental concentration of imidacloprid or glycerin in edible vegetation, estimated in Section 5.2.4, was multiplied by the amount of vegetation a resident was expected to consume per day relative to his/her body weight. For the 0-<2 year child PAR assessment, a vegetation ingestion rate of 8.7 g/kg-day, based on mean intake of home-produced fruits for a 1-2 years old, was selected from USEPA's EFH (USEPA, 2011p). For the 2-<16 year child PAR assessment, a vegetation ingestion rate of 4.1 g/kg-day, based on mean intake of home-produced fruits for a 3-5 years old, was selected from USEPA's EFH (USEPA, 2011p). For the adult PAR assessment, a vegetation ingestion rate of 2.7 g/kg-day, based on mean intake of home-produced fruits for a 40-69 years old, was selected from USEPA's EFH (USEPA, 2011p). The following equation was used to estimate the ADD:

$$ADD = EEC * CF * IR_v$$

Where:

ADD = Average daily dose (mg/kg-day)
EEC = Estimated environmental concentration (mg/kg)
CF = Conversion factor (kg/g)
IR_v = Vegetation ingestion rate (g/kg-day)

A summary of the exposure factors used in estimating acute/subchronic exposure to residues through ingestion of edible vegetation is given in Table 9

Table 9: Exposure Factors Used in Estimating Acute/Subchronic Exposures to Residues through Ingestion of Edible Vegetation

Receptor	EEC (mg/kg)	IR_v (g/kg-day)
0-<2 PAR	Refer to Section 7.2	8.7
2-<16 PAR		4.1
Adult PAR		2.7

5.3.2.2.2 Post-Application Resident Chronic Exposure Assessment

In estimating the chronic exposure to the PAR, an annual average daily dose (AADD) was estimated by extrapolating the resident's average daily exposure to a long-term exposure. This AADD extrapolation involves multiplying the route-specific ADD by the number of days the resident had the potential to be exposed per year and the number of years the resident was expected to be exposed and then divided by the total duration of time assessed. The duration of Proposed Program treatments at a single residence was assumed to be 5 years, which would be an estimate of the longest period of yearly treatment intervals for the Proposed Program. The following equation was used to calculate the AADD:

$$AADD = \frac{ADD * EF * ED}{AT * CF}$$

Where:

AADD = Annual average daily dose (mg/kg-day)
ADD = Average daily dose (mg/kg-day)
EF = Exposure frequency (days/year)
ED = Exposure duration (years)
AT = Averaging time (years)
CF = Conversion factor (days/year)

A summary of the exposure factors used in estimating the AADD is given in Table 10:

Table 10: Exposure Factors Used in Estimating the AADD

Receptor	EF (days/year)	ED (years)	AT (years)
0-<2 PAR		2	2
2-<16 PAR	365	5	5
Adult PAR		5	5

Dermal Exposure to Residues on Turf

The 0-<2 year child PAR, 2-<16 year child PAR, and adult PAR were assumed to be exposed to imidacloprid and glycerin residues from dermal contact with turf every day of the year. The AADD was estimated by considering first-order environmental degradation and extrapolating the resident's average daily exposure to a long-term exposure. In order to complete this extrapolation, an ADD was calculated in the same way as in the acute assessment, except a 365-day average TTR was used instead of the peak concentration TTR estimated for acute exposures. This ADD was then multiplied by the number of days the resident had the potential to be exposed per year, the number of years the resident was expected to be exposed, and an imidacloprid- and glycerin-specific DAF, and then divided by the total duration of time assessed. Refer to Section 7.2 for additional details regarding estimating TTRs.

Hand-to-Mouth Ingestion of Turf Residues

The 0-<2 year child PAR and 2-<16 year child PAR were assumed to be exposed to imidacloprid and glycerin residues from hand-to-mouth activity every day of the year. The AADD was extrapolated from the post-application resident average daily exposure, considering first-order environmental degradation. In order to complete this extrapolation, an ADD was calculated in the same way as in the acute assessment, except the exposure estimated in the chronic *Dermal Exposure to Residues on Turf* section was used instead of the acute exposure. This ADD was then multiplied by the number of days the resident had the potential to be exposed per year and the number of years the resident was expected to be exposed, and then divided by the total duration of time assessed.

Object-to-Mouth Ingestion of Turf Residues

In evaluating the object-to-mouth incidental ingestion, the 0-<2 year child PAR and 2-<16 year child PAR were assumed to be exposed to imidacloprid and glycerin residues daily for the entire year. The AADD was estimated by multiplying the ADD by the number of potential exposure days and the number of years the resident was expected to be exposed, and then divided by the total duration of time assessed.

Pica and Incidental Soil Ingestion

The 0-<2 year child PAR and 2-<16 year child PAR were assumed to be exposed to imidacloprid and glycerin residues from ingestion of treated soil every day of the year. The AADD was estimated by considering first-order environmental degradation and extrapolating the resident's average daily exposure to a long-term exposure. In order to complete this extrapolation, an ADD was calculated in the same way as in the acute assessment, except a 365-day average soil residue concentration was used instead of the peak soil residue concentration estimated for acute exposures. This ADD was then multiplied by the number of days the resident had the potential to be exposed per year and the number of years the resident was expected to be exposed, and then divided by the total duration of time assessed. Refer to Section 7.2 for additional details regarding estimating soil residue concentrations.

Dermal Exposure to Residues in Soil

The 0-<2 year child PAR, 2-<16 year child PAR, and adult PAR were assumed to be exposed to imidacloprid and glycerin residues in soil daily for the entire year. The AADD was extrapolated from the post-application resident average-day exposure, considering first-order environmental degradation. In order to complete this extrapolation, an ADD was calculated in the same way as in the acute assessment, except a 365-day average soil residue concentration was used instead of the peak soil residue concentration estimated for acute exposures. This ADD was then multiplied by the number of days the resident had the potential to be exposed per year, the number of years the resident was expected to be exposed, and an imidacloprid- and glycerin-specific DAF, and then divided by the total duration of time assessed. Refer to Section 7.2 for additional details regarding estimating soil residue concentrations.

Ingestion of Edible Vegetation

The 0-<2 year child PAR, 2-<16 year child PAR, and adult PAR were assumed to be exposed to imidacloprid and glycerin residues in edible vegetation daily for the entire year. The AADD was estimated by extrapolating the resident's average daily exposure to a long-term exposure. In order to complete this extrapolation, an ADD was calculated in a similar manner as in the acute assessment. This ADD was then multiplied by the number of potential exposure days and the number of years the resident was expected to be exposed, and then divided by the total duration of time assessed. Refer to Section 7.2 for additional details regarding estimating edible vegetation residue concentrations.

5.3.2.2.3 Post-Application Resident Cancer Exposure Assessment

Cancer exposure was not characterized in this risk assessment because neither imidacloprid nor glycerin show evidence of carcinogenicity.

5.3.2.3 Downwind-Bystander

The downwind bystander (DWB) represents any adult or child that is downwind from an application site and has the potential to be exposed to off-site drift. In accordance with USEPA's *Overview of Issues Related to the Standard Operating Procedures for Residential Exposure Assessment* (USEPA, 1999f), the DWB was assumed to be 25 feet away from the application site.

Due to the fact that the DWB would most likely be a resident, a 0-<2 year-old child, a 2-<16 year-old child, and a 16-70 year-old adult were considered in the assessment (USEPA, 2005q). Off-target drift is unlikely for drench/ground-directed applications because the spray nozzles are operated under low pressure, generally remain low to the ground and the spray droplets are larger and less mobile than foliar applications; however, the DWB was assumed to be exposed to imidacloprid and glycerin off-target drift through dermal and inhalation pathways.

5.3.2.3.1 Downwind-Bystander Acute Exposure Assessment

Acute exposure for the DWB was evaluated in the same manner as in the Statewide PEIR, unless described differently in this paragraph. Refer to the Statewide PEIR Appendix B Section 2.3 for exposure assessment methodology. USEPA's Occupational Pesticide Handler Exposure Database (OPHED) was most recently updated in September 2015, and unit exposure values were selected from the updated version (USEPA, 2015). Refer to Section 7.2 for the OPHED "Flagger" unit exposures used for estimating exposure to the DWB. DWB exposure was estimated identically for the three age-groups, except the body weights selected were 11.4 kg for the 0-<2 year child DWB (data for 1<2 year olds), 13.8 kg for the 2-<16 year child DWB (data for 2<3 year olds), and 80 kg for the adult DWB (USEPA, 2011p).

5.3.2.3.2 Downwind-Bystander Chronic Exposure Assessment

Chronic exposure for the DWB was evaluated in the same manner as in the Statewide PEIR with exception to the exposure durations described in this paragraph. Refer to the Statewide PEIR Appendix B Section 2.3 for exposure assessment methodology. The maximum consecutive years that Proposed Program treatments would be expected to occur at a single residence is 5 years. Therefore, the exposure durations for the adult DWB and 2-<16 year child DWB were assumed to be 5 years, and the exposure duration for the 0-<2 year child DWB was assumed to be 2 years.

5.3.2.3.3 Downwind-Bystander Cancer Exposure Assessment

Cancer exposure was not characterized in this risk assessment because neither imidacloprid nor glycerin show evidence of carcinogenicity.

5.3.2.4 During and Post-Application Resident

The during-and-post-application-resident (DPAR) represents a combination exposure of a resident who is downwind at the time his/her property is being treated, and who has the potential to be exposed to imidacloprid or glycerin residues on the treated vegetation after the application. In other words, under this receptor analysis, the downwind-bystander and the post-application-resident were considered to be the same individual. A 0-<2 year-old child, a 2-<16 year-old child, and a 16-70 year-old adult were analyzed in the DPAR exposure assessment.

In order to estimate the DPAR's exposure, the DWB's and the PAR's exposure values were summed. For additional details about DWB and PAR exposure, refer to the Downwind-Bystander exposure assessment and the Mixer-Loader-Applicator exposure assessment. Further details of methods and equations can be found in the Statewide PEIR and Dashboard Database.

6 Risk Characterization

The risk characterization compared estimates of receptor-specific imidacloprid and glycerin exposure (i.e., ADD, AADD) to receptor-specific toxicity values (i.e., NO(A)ELs) to characterize the potential risk for each receptor.

6.1.1 Non-Cancer Effects

The method used to quantify non-cancer risk for imidacloprid and glycerin is the MOE. The MOE represents how close the receptor's daily intake of imidacloprid and glycerin is to the imidacloprid and glycerin's NO(A)EL. The target MOE accounts for uncertainty in inter-species extrapolation and intra-species variation through the use of two 10x safety factors for a total of 100 target MOE. Thus, calculated MOEs for the receptor's exposures greater than 100 are typically not considered to be of concern (USEPA 2007k). Consistent with recent methodology used to assess CDFA programs (OEHHA, 2016) a target MOE of 300 was selected for imidacloprid and glycerin and routes of exposure in this HHRA. It should be noted that MOEs are not probabilistic statements of risk.

The generic formula for estimating a MOE is as follows:

MOE = Toxicity (mg/kg-day) / ADD (mg/kg-day)

Where:

MOE = Margin of Exposure (unitless)

ADD = Average Daily Dose

In situations where multiple pathways are present or multiple applications are made, multiple exposures occur. A MOE was estimated for both imidacloprid and glycerin individually and the MOEs were summed without regard to mode of action or target organs and systems to conservatively estimate the hazard that may be associated with the combined exposure. This methodology is consistent with the approaches described in the *USEPA Risk Assessment Guide* *to Superfunds (RAGS*) and *USEPA General Principles for Performing Aggregate Exposure and Risk Assessment* which provides guidance on assessing aggregate chemical risk and aggregate exposure pathway risk (USEPA, 2001e; USEPA, 2004i). Consistent with the evaluation of individual MOEs in this HHRA, summed MOEs greater than 300 are not considered to be of concern (USEPA 2007k, OEHHA 2016).

The generic formula for summing MOEs is as follows:

$$MOE_{total} = 1/((1/MOE_1)+(1/MOE_2)+\ldots+(1/MOE_n))$$

Where:

MOE = Margin of Exposure (unitless)

To estimate the total risk associated with imidacloprid/glycerin exposure, we estimated MOEs for individual exposure pathways to Merit 2F and summed these MOEs.

Because the MOE calculated for combining multiple pathways is a reciprocal approach, the MOE_{Total} becomes more conservative the greater number of pathways evaluated. This accounts for any uncertainty in combining multiple pathways.

6.1.2 Cancer Effects

Cancer risk is not estimated in this HHRA because neither imidacloprid nor glycerin show evidence of carcinogenicity.

6.2 Numeric Data Presentation

Numeric data presented in the risk characterization section were very large numbers. In order to present these numbers in an easily readable format, scientific notation is used. For example, the value of 1,290,000 is expressed as 1.29E+06. Note that the “E” represents “exponent” or the number 10 raised to a power. The positive (“+”) sign following the “E” indicates the number of places the decimal point was moved to the left from the original number.

7 Risk Assessment Results

The following sections present the HHRA results for the Proposed Program. Application scenarios are first summarized, followed by a presentation of the CSM, estimated environmental concentrations, risk results (i.e., calculated MOEs), an uncertainty analysis, and conclusions.

Merit 2F applications were categorized into separate application scenarios and given a distinct application scenario identification number (Application Scenario ID). Each Application Scenario ID represents a unique combination of application method, application rate, number of applications, application interval, application area, and environmental setting.

The estimated environmental concentrations (EECs) of imidacloprid and glycerin resulting from these application scenarios are available in the Estimated Environmental Concentrations section.

Note that the estimated acute environmental concentrations did not account for degradation and dissipation processes that reduce the environmental concentrations. Degradation and dissipation include, but are not limited to, soil microbial metabolism, photodegradation, hydrolysis, and plant metabolism. Therefore, acute estimated environmental concentrations are likely to represent peak environmental concentrations that may, in reality, be substantially lower at the time that exposures occur.

Risk results, expressed as MOEs, are presented in the Risk Results section.

7.1 Application Scenarios

Merit 2F application scenarios were based on descriptions provided by CDFA staff. Where a range of conditions were possible, such as the area of an application site, CDFA staff were requested to provide conditions that were ‘reasonably foreseeable’ and tending toward worse case.

The two application scenarios for the Proposed Program are summarized in Table 11. Application scenarios with risk estimates above the level concern (LOC), if any, are highlighted red. In the case where risk was estimated to potentially exceed the LOC, alternative scenarios or other measures to reduce estimated risk below the LOC are identified. Such scenarios/measures are suggested as possibilities; other modifications to the scenarios may also reduce the risk below the LOC.

Table 11: Application Scenarios for Japanese Beetle Control Activities

Application Scenario ID	Product	Application Method*	Setting	Adjuvant	Application Rate (oz/1000 sq. ft)	Active Ingredient Application Rate (lb a.i./acre)	Application Area (acres)	Area Treated per Day (acre/day)	Applications per Year
PD/EP-E-08a	Merit 2F	Drench-Backpack Sprayer	Residential	NA	0.6	0.4	640	0.46	1
PD/EP-E-08b	Merit 2F	Drench-tank spray	Residential	NA	0.6	0.4	640	18	1

*In place of a backpack sprayer, mechanically-pressurized sprayer may be used for drench applications. As the USEPA OPHED unit exposure for backpack sprayer is higher than mechanically-pressurized sprayer, baseline risk was evaluated using USEPA OPHED data for backpack sprayer in order to yield health protective risk estimates for scenarios where this substitution could occur (i.e., where backpack sprayer is listed).
NA – Not applicable; formulation does not contain an adjuvant.

For all applications, exposure was evaluated by assuming application to the entire treatment area would be completed in a single day. In situations where applications may be made exclusively to just turf or select ground cover, and not to the whole residential area (i.e., the entire treatment area), this method is health protective because the modeled area treated would be substantially larger than the actual area treated.

7.2 Estimated Environmental Concentrations and Unit Exposure Values

Tables 12-19 present the estimated environmental concentrations and unit exposure values used to estimate risk for the Proposed Program.

Table 12: PDEP-E-08a Insecticide Ingredient Concentrations on Turf and in Edible Vegetation

Ingredient	Acute/Subchronic		Chronic	
	Transferable Turf Residue (µg/cm2 veg)	Edible Vegetation Residue (mg/kg veg)	Transferable Turf Residue (µg/cm2 veg)	Edible Vegetation Residue (mg/kg veg)
Imidacloprid	1.47E-02	1.71E-04	2.52E-04	1.71E-04
Glycerin	6.97E-03	1.08E-02	2.78E-05	1.08E-02

Table 13: PDEP-E-08b Insecticide Ingredient Concentrations on Turf and in Edible Vegetation

Ingredient	Acute/Subchronic		Chronic	
	Transferable Turf Residue (µg/cm2 veg)	Edible Vegetation Residue (mg/kg veg)	Transferable Turf Residue (µg/cm2 veg)	Edible Vegetation Residue (mg/kg veg)
Imidacloprid	1.47E-02	1.71E-04	2.52E-04	1.71E-04
Glycerin	6.97E-03	1.08E-02	2.78E-05	1.08E-02

Table 14: PDEP-E-08a Insecticide Ingredient Concentrations in Soil

Ingredient	Acute	Chronic
	Soil Residue Concentration (mg/kg soil)	Soil Residue Concentration (mg/kg soil)
Imidacloprid	1.99E-01	2.70E-02
Glycerin	9.46E-02	1.25E-03

Table 15: PDEP-E-08b Insecticide Ingredient Concentrations in Soil

Ingredient	Acute	Chronic
	Soil Residue Concentration (mg/kg soil)	Soil Residue Concentration (mg/kg soil)
Imidacloprid	1.99E-01	2.70E-02
Glycerin	9.46E-02	1.25E-03

Table 16: PDEP-E-08a Spray Drift Exposure Values

Ingredient	Flagger Dermal (ug/lb ai)	Flagger Inhalation (ug/lb ai)	AgDRIFT Percent Deposition
Imidacloprid	1.10E+01	3.50E-01	0.83%
Glycerin	1.10E+01	3.50E-01	0.83%

Table 17: PDEP-E-08b Spray Drift Exposure Values

Ingredient	Flagger Dermal (ug/lb ai)	Flagger Inhalation (ug/lb ai)	AgDRIFT Percent Deposition
Imidacloprid	1.10E+01	3.50E-01	0.83%
Glycerin	1.10E+01	3.50E-01	0.83%

Table 18: PDEP-E-08a OPHED Unit Exposure Values

Ingredient	Mixer-Loader-Applicator (MLA)		Mixer-Loader (ML)		Applicator (A)	
	Dermal (ug/lb ai)	Inhalation (ug/lb ai)	Dermal (ug/lb ai)	Inhalation (ug/lb ai)	Dermal (ug/lb ai)	Inhalation (ug/lb ai)
Imidacloprid	8.26E+03	2.58E+00	See MLA	See MLA	See MLA	See MLA
Glycerin	8.26E+03	2.58E+00	See MLA	See MLA	See MLA	See MLA

Table 19: PDEP-E-08b OPHED Unit Exposure Values

Ingredient	Mixer-Loader-Applicator (MLA)		Mixer-Loader (ML)		Applicator (A)	
	Dermal (ug/lb ai)	Inhalation (ug/lb ai)	Dermal (ug/lb ai)	Inhalation (ug/lb ai)	Dermal (ug/lb ai)	Inhalation (ug/lb ai)
Imidacloprid	See ML and A	See ML and A	3.76E+01	2.19E-01	1.61E+01	3.40E-01
Glycerin	See ML and A	See ML and A	3.76E+01	2.19E-01	1.61E+01	3.40E-01

7.3 Risk Results

Tables 20-33 present the calculated MOEs for the Proposed Program. Note that the target MOE value used for this HHRA is 300, which means that an exposure with an MOE of 300 or greater indicates that adverse impact to human health is not anticipated. For the scenarios evaluated in the HHRA, MOE values ranged from approximately 700 to greater than 100,000,000,000. Thus, exposure to imidacloprid and glycerin during the Proposed Program is unlikely to result in adverse impacts to human health.

The magnitude of an MOE is indicative of the general safety of exposure, with larger MOEs generally indicating lesser relative potential risk. Comparatively large MOEs should not, however, be interpreted as allowing a receptor to unnecessarily come into contact with environmental media containing imidacloprid and glycerin.

Table 20: PDEP-E-08a Acute/Subchronic MOEs for MLA

Receptor	Ingredient	Dermal MOE	Inhalation MOE	Total MOE
Mixer-Loader-Applicator	Imidacloprid	5.31E+03	1.52E+06	5.29E+03
	Glycerin	1.06E+05	7.74E+06	1.04E+05
	Summed	5.06E+03	1.27E+06	5.04E+03
Mixer-Loader	Imidacloprid	See Mixer-Loader-Applicator		
	Glycerin			
	Summed			
Applicator	Imidacloprid	See Mixer-Loader-Applicator		
	Glycerin			
	Summed			

Table 21: PDEP-E-08a Chronic MOEs for MLA

Receptor	Ingredient	Dermal MOE	Inhalation MOE	Total MOE
Mixer-Loader-Applicator	Imidacloprid	1.51E+06	3.51E+08	1.51E+06
	Glycerin	3.85E+06	2.82E+09	3.85E+06
	Summed	1.09E+06	3.12E+08	1.08E+06
Mixer-Loader	Imidacloprid	See Mixer-Loader-Applicator		
	Glycerin			
	Summed			
Applicator	Imidacloprid	See Mixer-Loader-Applicator		
	Glycerin			
	Summed			

Table 22: PDEP-E-08b Acute/Subchronic MOEs for MLA

Receptor	Ingredient	Dermal MOE	Inhalation MOE	Total MOE
Mixer-Loader-Applicator	Imidacloprid	2.08E+04	1.79E+05	1.87E+04
	Glycerin	4.14E+05	9.10E+05	2.85E+05
	Summed	1.98E+04	1.50E+05	1.75E+04
Mixer-Loader	Imidacloprid	2.98E+04	4.57E+05	2.79E+04
	Glycerin	5.91E+05	2.32E+06	4.71E+05
	Summed	2.83E+04	3.82E+05	2.64E+04
Applicator	Imidacloprid	6.95E+04	2.94E+05	5.62E+04
	Glycerin	1.38E+06	1.50E+06	7.18E+05
	Summed	6.62E+04	2.46E+05	5.21E+04

Table 23: PDEP-E-08b Chronic MOEs for MLA

Receptor	Ingredient	Dermal MOE	Inhalation MOE	Total MOE
Mixer-Loader-Applicator	Imidacloprid	5.94E+06	4.14E+07	5.19E+06
	Glycerin	1.51E+07	3.32E+08	1.44E+07
	Summed	4.26E+06	3.68E+07	3.82E+06
Mixer-Loader	Imidacloprid	8.48E+06	1.06E+08	7.85E+06
	Glycerin	2.16E+07	8.48E+08	2.10E+07
	Summed	6.09E+06	9.39E+07	5.72E+06
Applicator	Imidacloprid	1.98E+07	6.80E+07	1.53E+07
	Glycerin	5.04E+07	5.46E+08	4.61E+07
	Summed	1.42E+07	6.05E+07	1.15E+07

Table 24: PDEP-E-08a Acute/Subchronic MOEs for DWB

Receptor	Ingredient	Dermal MOE	Inhalation MOE	Total MOE
Downwind-Bystander Child 0-<2	Imidacloprid	6.85E+07	1.92E+08	5.05E+07
	Glycerin	1.36E+09	1.50E+09	7.14E+08
	Summed	6.52E+07	1.71E+08	4.72E+07
Downwind-Bystander Child 2-<16	Imidacloprid	8.29E+07	2.33E+08	6.11E+07
	Glycerin	1.65E+09	1.82E+09	8.64E+08
	Summed	7.89E+07	2.06E+08	5.71E+07
Downwind-Bystander Adult 16-70	Imidacloprid	4.81E+08	1.35E+09	3.54E+08
	Glycerin	9.55E+09	6.87E+09	3.99E+09
	Summed	4.58E+08	1.13E+09	3.26E+08

Table 25: PDEP-E-08a Chronic MOEs for DWB

Receptor	Ingredient	Dermal MOE	Inhalation MOE	Total MOE
Downwind-Bystander Child 0-<2	Imidacloprid	1.95E+10	4.45E+10	1.36E+10
	Glycerin	4.96E+10	5.48E+11	4.55E+10
	Summed	1.40E+10	4.11E+10	1.04E+10
Downwind-Bystander Child 2-<16	Imidacloprid	1.95E+10	4.45E+10	1.36E+10
	Glycerin	4.96E+10	5.48E+11	4.55E+10
	Summed	1.40E+10	4.11E+10	1.04E+10
Downwind-Bystander Adult 16-70	Imidacloprid	1.37E+11	3.12E+11	9.52E+10
	Glycerin	3.48E+11	2.51E+12	3.06E+11
	Summed	9.83E+10	2.78E+11	7.26E+10

Table 26: PDEP-E-08b Acute/Subchronic MOEs for DWB

Receptor	Ingredient	Dermal MOE	Inhalation MOE	Total MOE
Downwind-Bystander Child 0-<2	Imidacloprid	1.75E+06	4.91E+06	1.29E+06
	Glycerin	3.47E+07	3.83E+07	1.82E+07
	Summed	1.66E+06	4.35E+06	1.20E+06
Downwind-Bystander Child 2-<16	Imidacloprid	2.11E+06	5.94E+06	1.56E+06
	Glycerin	4.20E+07	4.64E+07	2.20E+07
	Summed	2.01E+06	5.26E+06	1.46E+06
Downwind-Bystander Adult 16-70	Imidacloprid	1.23E+07	3.44E+07	9.04E+06
	Glycerin	2.43E+08	1.75E+08	1.02E+08
	Summed	1.17E+07	2.88E+07	8.30E+06

Table 27: PDEP-E-08b Chronic MOEs for DWB

Receptor	Ingredient	Dermal MOE	Inhalation MOE	Total MOE
Downwind-Bystander Child 0-<2	Imidacloprid	4.98E+08	1.13E+09	3.46E+08
	Glycerin	1.27E+09	1.40E+10	1.16E+09
	Summed	3.57E+08	1.05E+09	2.66E+08
Downwind-Bystander Child 2-<16	Imidacloprid	4.98E+08	1.13E+09	3.46E+08
	Glycerin	1.27E+09	1.40E+10	1.16E+09
	Summed	3.57E+08	1.05E+09	2.66E+08
Downwind-Bystander Adult 16-70	Imidacloprid	3.49E+09	7.96E+09	2.43E+09
	Glycerin	8.88E+09	6.39E+10	7.80E+09
	Summed	2.51E+09	7.08E+09	1.85E+09

Table 28: PDEP-E-08a and PDEP-E-08b Acute/Subchronic MOEs for PAR

Receptor	Ingredient	Turf Dermal MOE	Turf Hand-to-Mouth MOE	Turf Object-to-Mouth MOE	Soil Ingestion MOE	Soil Dermal MOE	Vegetation Ingestion MOE	Total MOE
Post-Application Resident Child 0-<2	Imidacloprid	1.06E+03	3.76E+03	1.23E+05	8.35E+04	6.05E+05	4.92E+06	8.15E+02
	Glycerin	2.11E+04	1.03E+06	3.36E+07	2.29E+07	1.20E+07	1.01E+07	2.06E+04
	Summed	1.01E+03	3.75E+03	1.22E+05	8.32E+04	5.76E+05	3.31E+06	7.84E+02
Post-Application Resident Child 2-<16	Imidacloprid	1.13E+03	6.42E+03	1.54E+05	1.01E+05	1.88E+05	1.04E+07	9.39E+02
	Glycerin	2.24E+04	1.76E+06	4.23E+07	2.77E+07	3.74E+06	2.14E+07	2.19E+04
	Summed	1.07E+03	6.40E+03	1.54E+05	1.01E+05	1.79E+05	7.02E+06	9.01E+02
Post-Application Resident Adult 16-70	Imidacloprid	2.03E+03	-	-	-	6.13E+05	1.59E+07	2.03E+03
	Glycerin	4.04E+04	-	-	-	1.22E+07	3.25E+07	4.02E+04
	Summed	1.94E+03	-	-	-	5.84E+05	1.07E+07	1.93E+03

Table 29: PDEP-E-08a and PDEP-E-08b Chronic MOEs for PAR

Receptor	Ingredient	Turf Dermal MOE	Turf Hand-to-Mouth MOE	Turf Object-to-Mouth MOE	Soil Ingestion MOE	Soil Dermal MOE	Vegetation Ingestion MOE	Total MOE
Post-Application Resident Child 0-<2	Imidacloprid	4.84E+04	1.71E+05	9.58E+04	4.82E+05	4.47E+06	3.84E+06	2.53E+04
	Glycerin	5.30E+05	2.59E+07	3.36E+06	1.73E+08	9.07E+08	1.01E+06	3.10E+05
	Summed	4.43E+04	1.70E+05	9.32E+04	4.81E+05	4.45E+06	7.98E+05	2.34E+04
Post-Application Resident Child 2-<16	Imidacloprid	5.13E+04	2.92E+05	1.21E+05	5.83E+05	1.09E+06	8.15E+06	2.94E+04
	Glycerin	5.61E+05	4.41E+07	4.23E+06	2.09E+08	2.82E+07	2.14E+06	3.92E+05
	Summed	4.70E+04	2.90E+05	1.17E+05	5.82E+05	1.05E+06	1.69E+06	2.74E+04
Post-Application Resident Adult 16-70	Imidacloprid	9.25E+04	-	-	-	3.54E+06	1.24E+07	8.94E+04
	Glycerin	1.01E+06	-	-	-	9.19E+07	3.25E+06	7.66E+05
	Summed	8.47E+04	-	-	-	3.41E+06	2.57E+06	8.01E+04

Table 30: PDEP-E-08a Acute/Subchronic MOEs for DPAR

Receptor	Ingredient	Turf Dermal MOE	Turf Hand-to-Mouth MOE	Turf Object-to-Mouth MOE	Soil Ingestion MOE	Soil Dermal MOE	Vegetation Ingestion MOE	Drift Dermal MOE	Inhalation MOE	Total MOE
During & Post-Application Resident Child 0-<2	Imidacloprid	1.06E+03	3.76E+03	1.23E+05	8.35E+04	6.05E+05	4.92E+06	6.85E+07	1.92E+08	8.15E+02
	Glycerin	2.11E+04	1.03E+06	3.36E+07	2.29E+07	1.20E+07	1.01E+07	1.36E+09	1.50E+09	2.06E+04
	Summed	1.01E+03	3.75E+03	1.22E+05	8.32E+04	5.76E+05	3.31E+06	6.52E+07	1.71E+08	7.84E+02
During & Post-Application Resident Child 2-<16	Imidacloprid	1.13E+03	6.42E+03	1.54E+05	1.01E+05	1.88E+05	1.04E+07	8.29E+07	2.33E+08	9.39E+02
	Glycerin	2.24E+04	1.76E+06	4.23E+07	2.77E+07	3.74E+06	2.14E+07	1.65E+09	1.82E+09	2.19E+04
	Summed	1.07E+03	6.40E+03	1.54E+05	1.01E+05	1.79E+05	7.02E+06	7.89E+07	2.06E+08	9.01E+02
During & Post-Application Resident Adult 16-70	Imidacloprid	2.03E+03	-	-	-	6.13E+05	1.59E+07	4.81E+08	1.35E+09	2.03E+03
	Glycerin	4.04E+04	-	-	-	1.22E+07	3.25E+07	9.55E+09	6.87E+09	4.02E+04
	Summed	1.94E+03	-	-	-	5.84E+05	1.07E+07	4.58E+08	1.13E+09	1.93E+03

Table 31: PDEP-E-08a Chronic MOEs for DPAR

Receptor	Ingredient	Turf Dermal MOE	Turf Hand-to-Mouth MOE	Turf Object-to-Mouth MOE	Soil Ingestion MOE	Soil Dermal MOE	Vegetation Ingestion MOE	Drift Dermal MOE	Inhalation MOE	Total MOE
During & Post-Application Resident Child 0-<2	Imidacloprid	4.84E+04	1.71E+05	9.58E+04	4.82E+05	4.47E+06	3.84E+06	1.95E+10	4.45E+10	2.53E+04
	Glycerin	5.30E+05	2.59E+07	3.36E+06	1.73E+08	9.07E+08	1.01E+06	4.96E+10	5.48E+11	3.10E+05
	Summed	4.43E+04	1.70E+05	9.32E+04	4.81E+05	4.45E+06	7.98E+05	1.40E+10	4.11E+10	2.34E+04
During & Post-Application Resident Child 2-<16	Imidacloprid	5.13E+04	2.92E+05	1.21E+05	5.83E+05	1.09E+06	8.15E+06	1.95E+10	4.45E+10	2.94E+04
	Glycerin	5.61E+05	4.41E+07	4.23E+06	2.09E+08	2.82E+07	2.14E+06	4.96E+10	5.48E+11	3.92E+05
	Summed	4.70E+04	2.90E+05	1.17E+05	5.82E+05	1.05E+06	1.69E+06	1.40E+10	4.11E+10	2.74E+04
During & Post-Application Resident Adult 16-70	Imidacloprid	9.25E+04	-	-	-	3.54E+06	1.24E+07	1.37E+11	3.12E+11	8.94E+04
	Glycerin	1.01E+06	-	-	-	9.19E+07	3.25E+06	3.48E+11	2.51E+12	7.66E+05
	Summed	8.47E+04	-	-	-	3.41E+06	2.57E+06	9.83E+10	2.78E+11	8.01E+04

Table 32: PDEP-E-08b Acute/Subchronic MOEs for DPAR

Receptor	Ingredient	Turf Dermal MOE	Turf Hand-to-Mouth MOE	Turf Object-to-Mouth MOE	Soil Ingestion MOE	Soil Dermal MOE	Vegetation Ingestion MOE	Drift Dermal MOE	Inhalation MOE	Total MOE
During & Post-Application Resident Child 0-<2	Imidacloprid	1.06E+03	3.76E+03	1.23E+05	8.35E+04	6.05E+05	4.92E+06	1.75E+06	4.91E+06	8.14E+02
	Glycerin	2.11E+04	1.03E+06	3.36E+07	2.29E+07	1.20E+07	1.01E+07	3.47E+07	3.83E+07	2.06E+04
	Summed	1.01E+03	3.75E+03	1.22E+05	8.32E+04	5.76E+05	3.31E+06	1.66E+06	4.35E+06	7.83E+02
During & Post-Application Resident Child 2-<16	Imidacloprid	1.13E+03	6.42E+03	1.54E+05	1.01E+05	1.88E+05	1.04E+07	2.11E+06	5.94E+06	9.39E+02
	Glycerin	2.24E+04	1.76E+06	4.23E+07	2.77E+07	3.74E+06	2.14E+07	4.20E+07	4.64E+07	2.19E+04
	Summed	1.07E+03	6.40E+03	1.54E+05	1.01E+05	1.79E+05	7.02E+06	2.01E+06	5.26E+06	9.00E+02
During & Post-Application Resident Adult 16-70	Imidacloprid	2.03E+03	-	-	-	6.13E+05	1.59E+07	1.23E+07	3.44E+07	2.03E+03
	Glycerin	4.04E+04	-	-	-	1.22E+07	3.25E+07	2.43E+08	1.75E+08	4.02E+04
	Summed	1.94E+03	-	-	-	5.84E+05	1.07E+07	1.17E+07	2.88E+07	1.93E+03

Table 33: PDEP-E-08b Chronic MOEs for DPAR

Receptor	Ingredient	Turf Dermal MOE	Turf Hand-to-Mouth MOE	Turf Object-to-Mouth MOE	Soil Ingestion MOE	Soil Dermal MOE	Vegetation Ingestion MOE	Drift Dermal MOE	Inhalation MOE	Total MOE
During & Post-Application Resident Child 0-<2	Imidacloprid	4.84E+04	1.71E+05	9.58E+04	4.82E+05	4.47E+06	3.84E+06	4.98E+08	1.13E+09	2.53E+04
	Glycerin	5.30E+05	2.59E+07	3.36E+06	1.73E+08	9.07E+08	1.01E+06	1.27E+09	1.40E+10	3.10E+05
	Summed	4.43E+04	1.70E+05	9.32E+04	4.81E+05	4.45E+06	7.98E+05	3.57E+08	1.05E+09	2.34E+04
During & Post-Application Resident Child 2-<16	Imidacloprid	5.13E+04	2.92E+05	1.21E+05	5.83E+05	1.09E+06	8.15E+06	4.98E+08	1.13E+09	2.94E+04
	Glycerin	5.61E+05	4.41E+07	4.23E+06	2.09E+08	2.82E+07	2.14E+06	1.27E+09	1.40E+10	3.92E+05
	Summed	4.70E+04	2.90E+05	1.17E+05	5.82E+05	1.05E+06	1.69E+06	3.57E+08	1.05E+09	2.74E+04
During & Post-Application Resident Adult 16-70	Imidacloprid	9.25E+04	-	-	-	3.54E+06	1.24E+07	3.49E+09	7.96E+09	8.94E+04
	Glycerin	1.01E+06	-	-	-	9.19E+07	3.25E+06	8.88E+09	6.39E+10	7.65E+05
	Summed	8.47E+04	-	-	-	3.41E+06	2.57E+06	2.51E+09	7.08E+09	8.01E+04

7.4 Uncertainty Analysis

In characterizing risks from exposure to imidacloprid and glycerin, it is important to address the variability and uncertainty associated with the exposure/risk estimates. The risk characterization should provide information on: (1) potential measurement errors based on the precision and accuracy of the available data, (2) variability of the input data used in the exposure/risk estimates, and (3) uncertainty that results from data gaps or the assumptions used. The risk characterization also assesses the relative importance of these components on the estimates of exposure/dose and risk.

Uncertainty may be introduced into the exposure/risk calculations at various stages of the risk assessment process. Uncertainty may occur as a result of: (1) site-specific variations of imidacloprid and glycerin fate and transport that could impact chemical partitioning, retention, and degradation, (2) the selection of exposure scenarios and exposure factors, (3) and the uncertainties associated with imidacloprid and glycerin toxicity data that have been extrapolated from high doses in animals to low doses in humans, and that do not account for the interactions of exposures to multiple chemical substances over a lifetime.Variability can occur as a result of variations in individual day-to-day or event-to-event exposure factors or variations among the exposed population.

The remainder of this section discusses uncertainties associated with the Exposure Assessment and the Toxicity Assessment.

7.4.1 Exposure Assessment

To address the exposure assessment uncertainties, the following assumptions were made. In some cases, as noted below, conservative assumptions likely resulted in an over-estimate of actual risk.

7.4.1.1 Inert Ingredient Information Quality

This HHRA evaluated information on inert ingredients to the extent that information was available. Glycerin was the only inert ingredient identified in Merit 2F. The quality and depth of information available on inert ingredient(s) in pesticide products can be highly variable; in some instances, full disclosure of inert ingredient(s) is a trade secret and cannot be divulged. In instances where inert ingredient(s) were not disclosed and no information was available to estimate risk, the extent of risk, if any, remains unknown.

7.4.1.2 Model Limitations

When using models to derive environmental media concentrations and exposure values in the HHRA, model limitations were encountered. To overcome these limitations, various assumptions were made based on professional judgment. When possible, conservative assumptions (i.e., ones that result in the highest exposure estimate) were made. For a description of the models discussed in this section, please refer to Section 5.

Limitations of each model are presented below.

7.4.1.2.1 USEPA Occupational Pesticide Handler Exposure Data (OPHED)

OPHED required the user to select from the given combinations of application techniques, settings, and PPE. When a requested application scenario did not match any of the OPHED choices, the most suitable surrogate was chosen based on professional judgment. Most studies used to derive the OPHED unit exposures were unavailable.

7.4.1.2.2 Briggs Equation

The Briggs equation was used to estimate imidacloprid and glycerin concentration in vegetation. It allows for the calculation of expected tissue concentrations due to imidacloprid and glycerin uptake from soil residues for plants. If the Log K_{ow} was estimated at greater than 7, the model assumed there was no imidacloprid and glycerin uptake from the soil, limiting the analysis to foliar residues only, if applicable. When the Log K_{ow} was estimated as negative, the TSCF is assumed to be 1.0 (Collins *et al*., 2006).

7.4.1.2.3 AgDRIFT

For this HHRA, most of the default values in the AgDRIFT model were left unchanged. AgDRIFT makes assumptions for a variety of parameters associated with application methods and meteorological data that may not match site specific conditions and may lead to over- or under-estimation of percent off-site drift.

7.4.1.2.4 USEPA Standard Operating Procedures for Residential Exposure Assessments

USEPA's Residential SOPs are more reliable for estimating acute exposure than continuous exposure. The user is limited to the application settings, exposure pathways, and activity patterns provided in the SOP so a surrogate had to be chosen if the requested application and exposure options were not available. Using conservative surrogates, such as USEPA's Exposure Factors Handbook, provided more confidence that the resulting exposure was an over-estimate compared to actual exposure.

7.4.1.2.5 USEPA Risk Assessment Guidance for Superfunds (RAGS)

RAGS methodology is most commonly used to estimate continuous exposure, but in some cases (e.g., ingestion of vegetation), it was used for acute exposure assessments due to lack of appropriate alternative methodology. Alternative methodologies that were considered but deemed less conservative or less appropriate for the specific analysis included, but were not limited to, USEPA *Standard Operating Procedures for Residential Exposure Assessments* (USEPA, 2012l) and USEPA's *Occupational Pesticide Handler Exposure Data* (USEPA, 2013b).

7.4.2 Toxicity Assessment

To address the toxicity assessment uncertainties, the following assumptions were made. In some cases, as noted below, conservative assumptions likely resulted in an over-estimate of actual risk.

7.4.2.1 Toxicological Endpoints

The toxicity assessment evaluated non-cancerous adverse effects that were derived from animal data observed in controlled experiments. Uncertainty associated with the NO(A)EL extrapolated for human exposure are addressed through use of the uncertainty factors which determine the target MOE. For this HHRA, a higher target MOE of 300, instead of 100 as was used in the Statewide PEIR, was used to be consistent with OEHHA's recent analysis (OEHHA, 2016). The uncertainty factors were inter-species extrapolation (10-fold) and intra-species variation (30-fold), which multiplied together result in a total target MOE of 300 for the Proposed Program. There also exists uncertainty in the extrapolation of an oral endpoint to dermal and inhalation exposure pathways. Differences in metabolism and susceptibility at different sites influence the dose of a chemical that interacts at a receptor level, as well as whether the adverse effects are local or systemic.

7.4.2.2 Endocrine Disruptors

Endocrine disruptors are chemicals or mixtures of chemicals that may interfere with the body's endocrine system and produce developmental, reproductive, neurological and immune effects in both humans and wildlife (NIEHS, 2013). Although endocrine disruptors are generally considered to have the potential to cause adverse effects, considerable uncertainty exists regarding the relationship between endocrine disruptor exposure and adverse health outcomes. In many cases, only screening level data are available indicating the potential for a chemical to interact with the endocrine system in a way that may produce an adverse effect (USEPA, 2011v). No data were available to indicate that either imidacloprid or glycerin are endocrine disruptors. In general, these and other forms of endocrine disruptor data are not sufficient for conducting a risk assessment. As a result, endocrine disruption was not explicitly assessed in this HHRA.

7.4.2.3 Synergism

Synergism is the effect caused when exposure to two or more chemicals concurrently or consecutively results in health effects that are greater than the sum of the effects of the individual chemicals (Health Canada, 2013). Uncertainty exists as to whether any of the chemicals analyzed in this HHRA produce synergistic effects. Although methodologies were available for assessing synergism, no usable endpoints were available in the literature to evaluate synergistic relationships between and within imidacloprid and glycerin. Therefore, synergistic effects could not be evaluated in this risk assessment.

7.5 Conclusions

This HHRA was conducted in order to assess the potential health risk to humans from implementation of Proposed Program. The HHRA was conducted using procedures and methodologies commonly used by government agencies such as USEPA and CDPR as well as the wider risk assessment community. The HHRA, relied upon the four stage process for risk assessments: hazard identification, toxicity dose response assessment, exposure assessment, and risk characterization. In the hazard identification phase, CDFA and its risk assessment team consulted with CDPR, CDPH and OEHHA to determine the appropriate scenarios to assess, which models should be used to evaluate exposure, default input parameters, and appropriate toxicity effects representations based on scientific literature. The toxicity dose-response assessment phase selected health-protective values for both acute and chronic non-cancer health effects. Cancer slope factors (CSF) were not obtained because neither imidacloprid nor glycerin are carcinogenic. Non-cancer health effects were based on NO(A)ELs obtained from literature studies. In the exposure assessment phase, ADD and AADD for potential exposed populations were estimated using various models accounting for concentration of imidacloprid and glycerin in various environmental media and subsequently absorbed by a human receptor. The risk characterization phase provided a quantitative assessment as calculated MOEs on the potential for adverse effects to human receptors.

For each of the application scenarios analyzed for the Proposed Program, the calculated MOE exceeded the target MOE value of 300. This indicates that exposure to imidacloprid and glycerin during the Proposed Program is unlikely to result in adverse impacts to human health.

This HHRA, along with the Statewide PEIR, will be used to assist CDFA in assessing potential impacts to human health. This HHRA did not identify any new significant human health impacts or any substantial increase in the severity of the significant effects identified in the PEIR. No alterations to PD/EP-E-08 that were not already indicated for other scenarios in the PEIR are recommended.

8 References

Agency for Toxic Substances and Disease Registry (ATSDR). 2013. Agency for Toxic Substances & Disease Registry Toxicological Profiles. Available http://www.atsdr.cdc.gov/toxprofiles/index.asp (Accessed: December 30, 2013)

California Department of Pesticide Regulation (CDPR). 2006b. Imidacloprid risk characterization document, dietary and drinking water exposure, health assessment section. Medical Toxicology Branch. Sacramento, CA. 114 pp. Available http://www.cdpr.ca.gov/docs/risk/rcd/imidacloprid.pdf.

California Department of Pesticide Regulation (CDPR). 2009a. Sampling for pesticide residues in California well water: 2008 update of well inventory database, 23rd Annual Report. Environmental Monitoring Branch, Ground Water Protection Program. Sacramento, CA. 201 pp. Available http://www.cdpr.ca.gov/docs/emon/pubs/ehapreps/eh2008.pdf.

California Department of Pesticide Regulation (CDPR). 2009b. Memorandum: Procedure for identifying pesticides with a high potential to contaminate surface water. Environmental Monitoring Branch. Sacramento, CA. 24 pp. Available http://www.cdpr.ca.gov/docs/emon/surfwtr/pepple_memo_052909.pdf.

California Department of Pesticide Regulation (CDPR). 2010b. Sampling for pesticide residues in California well water: 2009 update of well inventory database, 24th annual report. Environmental Monitoring Branch, Ground Water Protection Program. Sacramento, CA. 153 pp. Available http://www.cdpr.ca.gov/docs/emon/pubs/ehapreps/eh2009.pdf.

California Department of Pesticide Regulation (CDPR). 2011b. Surface Water Database, complete chemical analysis results. Sacramento, CA. Available http://www.cdpr.ca.gov/docs/emon/surfwtr/surfcont.htm (Accessed: July, 2011).

California Department of Pesticide Regulation (CDPR). 2012. Primary review of turf reenty exposure monitoring and residue dissipation study through oxadiazon. Available at http://www.cdpr.ca.gov/docs/whs/memo/hsm12005.pdf.

California Department of Pesticide Regulation (CDPR). 2012a. California Department of Pesticide Regulation homepage. Sacramento, CA. Available http://www.cdpr.ca.gov/

California Department of Pesticide Regulation (CDPR). 2012b. Sampling for Pesticide Residues in California Well Water: 26th Annual Report. Sacramento, CA. 142 pp. Available http://www.cdpr.ca.gov/docs/emon/pubs/ehapreps/eh2011.pdf.

California Department of Pesticide Regulation (CDPR). 2012f. Risk Characterization Documents. Available http://www.cdpr.ca.gov/docs/risk/rcd.htm (Accessed: December 21. 2012)

California Department of Pesticide Regulation (CDPR). 2013. Human pesticide exposure assessment to simazine. Available at http://www.cdpr.ca.gov/docs/risk/rcd/simazine_exposure.pdf

California Environmental Protection Agency (Cal/EPA). 2010. Underground Storage Tank Cleanup Fund Action Plan. State Water Resources Control Board. Sacramento, CA. Available http://www.waterboards.ca.gov/water_issues/programs/ustcf/docs/taskforce/ruskin%20_rprt.pdf (Accessed: March 28, 2014).

Collins, C., M. Fryer, and A. Grosso. 2006. Plant uptake of non-ionic organic chemicals. Environmental Science & Technology 40(1): 45-52.
Hazardous Substances Data Bank (HSDB). 2011d. Hazardous Substances Data Bank. U.S.

Department of Health and Human Services, National Institutes of Health, National Library of Medicine. Available http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB (Accessed: December 30, 2013)

Health Canada. 2013. Synergism. Canadian Centre for Occupational Health and Safety. Available http://www.ccohs.ca/oshanswers/chemicals/synergism.html (Accessed: 11/12/13).

Office of Environmental Health Hazard Assessment (OEHHA). 2001a. A guide to human health risk assessment. California Environmental Protection Agency. Sacramento, CA. 12 pp. Available http://www.oehha.ca.gov/pdf/HRSguide2001.pdf

Office of Environmental Health Hazard Assessment (OEHHA). 2003c. Air Toxics Hot Spots Program risk assessment guidelines: the Air Toxics Hot Spots Program guidance manual for preparation of health risk assessments. Office of Environmental Health Hazard Assessment, California Environmental Protection Agency, and California Air Resources Board. Oakland, CA. 144 pp. Available http://oehha.ca.gov/air/hot_spots/pdf/HRAguidefinal.pdf

Office of Environmental Health Hazard Assessment (OEHHA). 2012d. Technical Support Document for Exposure Assessment and Stochastic Analysis.

Office of Environmental Health Hazard Assessment (OEHHA). 2016. Evaluation of Exposure to beta-Cyfluthrin, Carbaryl, and Imidacloprid Related to the Treatment of Japanese Beetle under the Invasive Species Program. Attachment in Memorandum - Japanese Beetle Eradication Treatment: Resident's Concerns. California Environmental Protection Agency, Sacramento, CA.

Pachter, H.M. 1951. Magic into science - the story of Paracelsus. Henry Schuman, Inc. New York. 302 pp.

U.S. Environmental Protection Agency (USEPA). 1989e. Risk assessment guidance for superfund volume 1, Human Health Evaluation Manual (Part A). Office of Superfund Remediation and Technology Innovation. Washington D.C. 287 pp. Available http://www.epa.gov/oswer/riskassessment/ragsa/pdf/rags-vol1-pta_complete.pdf

U.S. Environmental Protection Agency (USEPA). 1993c. Reference Dose (RfD): Description and use in health risk assessments. Integrated Risk Information System (IRIS). Available http://www.epa.gov/iris/rfd.htm (Accessed: November 11, 2011).

U.S. Environmental Protection Agency (USEPA). 1999f. Overview of issues related to the Standard Operating Procedures for Residential Exposure Assessment. Office of Pesticide Programs. Washington, D.C. 111 pp. Available http://www.epa.gov/scipoly/sap/meetings/1999/september/resid.pdf (Accessed: Oct. 14, 2011).

U.S. Environmental Protection Agency (USEPA). 2001. General principles for performing aggregate exposure and risk assessments. Available at https://www.epa.gov/sites/production/files/2015-07/documents/aggregate.pdf.

U.S. Environmental Protection Agency (USEPA). 2004i. Risk assessment guidance for superfund volume I, Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). Office of Superfund Remediation and Technology Innovation.Washington, D.C. 156 pp. Available http://www.epa.gov/oswer/riskassessment/ragse/pdf/part_e_final_revision_10-03-07.pdf

U.S. Environmental Protection Agency (USEPA). 2005q. Supplemental guidance for assessing susceptibility from early-life exposure to carcinogens. Washington, D.C. pp 44.

U.S. Environmental Protection Agency (USEPA). 2006q. PE5 user's manual. Office of Pesticide Programs. Available http://www.epa.gov/oppefed1/models/water/pe5_user_manual.htm (Accessed: August 22, 2012)

U.S. Environmental Protection Agency (USEPA). 2007k. Review of worker exposure assessment methods. Office of Pesticide Programs, Health Effects Division, Health Canada. 114 pp. Available http://www.epa.gov/hsrb/files/meeting-materials/apr-18-20-2007-public-meeting/ReviewOfWorkerExposureAssessmentMethods.pdf

U.S. Environmental Protection Agency (USEPA). 2011p. Exposure Factors Handbook: 2011 Edition. 1466 pp. Available at: http://cfpub.epa.gov/ncea/risk/recordisplay.cfm?deid=236252 (Accessed: January 18, 2012).

U.S. Environmental Protection Agency (USEPA). 2011v. Endocrine Disruptor Screening Program (EDSP) Phases. Office of Chemical Safety and Pollution Prevention. Available http://www.epa.gov/endo/pubs/edspoverview/components.htm (Accessed: June 20, 2013).

U.S. Environmental Protection Agency (USEPA). 2012a. Terminology Service. Available http://iaspub.epa.gov/sor_internet/registry/termreg/searchandretrieve/termsandacronyms/search.do (Accessed: January 23, 2012).

U.S. Environmental Protection Agency (USEPA). 2012l. Standard Operating Procedures for Residential Pesticide Exposure Assessment. Office of Chemical Safety and Pollution Prevention.

Washington, D.C. Available http://www.epa.gov/pesticides/science/residential-exposure-sop.html.

U.S. Environmental Protection Agency (USEPA). 2012p. Pesticide Registration Status. Available http://www.epa.gov/oppsrrd1/reregistration/status.htm (Accessed: December 30, 2013)
U.S. Environmental Protection Agency (USEPA). 2013b. Occupational pesticide handler unit exposure surrogate reference table. Office of Pesticide Programs. Washington, D.C. Available http://www.epa.gov/pesticides/science/handler-exposure-table.pdf (Accessed: March 18, 2013).

U.S. Environmental Protection Agency (USEPA). 2014. Risk Assessment Guidance for Superfunds: Update of Standard Default Exposure Factors. Available at https://rais.ornl.gov/documents/OSWER-Directive-9200-1-120-Exposure-Factors_corrected.pdf

U.S. Environmental Protection Agency (USEPA). 2014a. Guidance for Assessing Pesticide Risk to Bees. Office of Pesticide Programs, United States Environmental Protection Agency, Washington DC. 59 pp.

U.S. Environmental Protection Agency (USEPA. 2015. Occupational pesticide handler unit exposure surrogate reference table. Office of Pesticide Programs. Washington, D.C. Available: https://www.epa.gov/sites/production/files/2015-09/documents/handler-exposure-table-2015.pdf.

Appendix Human A: Program Material Data Sheet (PMDS).

California Department of Food & Agriculture
Program Material Data Sheet (PMDS)

PMDS Status Summary
Prepared by (CDFA):**L. Petro** Date: 3/10/2016 ☒Reviewed, ☒ Revised, ☐ Approved by: (Blankinship): **J. Sullivan** Date: **3.16.16**
☒Reviewed, ☒ Revised, ☐ Approved by: (CDFA): **L. Petro** Date: 4/8/2016 ☒ Reviewed, ☒ Revised, ☐ Approved by: (Blankinship): **J. Sullivan** Date: **4/11/16**
☐Reviewed, ☒ Revised, ☒ Approved by: (CDFA): **L. Petro** Date: 4/12/16 ☐ Reviewed, ☒ Revised, ☒ Approved by: (Blankinship): **J. Sullivan** Date: **4/12/16**

INSTRUCTIONS:

1.) Fill in the PMDS template with the specific application scenario details.
2.) In the "Application Description" section, please provide a description of the application in thorough detail.
3.) Please refer to the Example PMDS (attached) to ensure the template has been filled in properly.
4.) Please attach product label and Safety Data Sheet.
5.) If the scenario involves fumigation, trapping, varying application intervals, or if multiple active ingredients are used, please contact Blankinship & Associates at (530) 757-0941.
6.) For PMDS revisions, do so in track changes and "save as" with the following file naming convention:
PMDS Program Name Pesticide Scenario App Method Author Initials Date
Ex.: PMDS JB Acelepryn Turf Spray Drench LP 4.2.16

Program Name: PDEP-E-08

Product Name	Specialty Label (e.g., Section 18, 24c) (Yes/No)	Active Ingredient(s)	Target Pest(s)	Target Host(s) (e.g., citrus tree, ornamental, turf, etc.)
Merit 2F	No	Imidacloprid	Beetle	Ornamental/turf/ground cover

General Scenario Setting (e.g., Large Production Nursery, Residential, etc.)	Specific Scenario Setting Description (e.g., containerized plants on loading dock)	Geographic Scenario Setting Description (Statewide or specific region)
Residential	Urban/residential on turf/ground* cover landscapes. See "*" definition below	Statewide

Non-target Areas Affected (e.g., potential overspray to turf)	Application Technique (e.g., broadcast, drench, spot spray, etc.)	Application Equipment (e.g., mechanically pressurized handgun, boom sprayer, etc.)
None	Spray drench	Mechanically pressurized sprayer, boom sprayer, hand sprayers, backpack sprayers

Applications per year	Application Interval	Application Rate	Application Rate Units	Tank Spray Volume per Area	Tank Spray Volume per Area Unit
1	Annual	0.6	Oz/1000 SF	3.75	gal/1000 SF

Application Area	Application Area Units	Area Treated/Day	Area Treated/Day Units
640	acres	20,000 (18)	sq. Ft with backpack (acres with boom) see attached

Adjuvant(s) or Additive(s) Product:	Adjuvant Application Rate	Adjuvant Application Rate Units
None	NA	NA

Application Description & Assumptions (please describe the application in as much detail as possible. Use the 2nd page if needed):

In a 200 meter radius around detections, * ground application of Merit 2F to turf (includes lawns/golf courses), recreational areas, and ornamental plants (includes flowers, containerized plants, and ground cover areas/followed by "watering in" of material through "thatch" per label. Mitigations include; no application within 48 hrs of predicted rain, buffer areas maintained around food crop plants per label, residents provided information & material/ post treatment precautions. Applications made under supervision of CDFA and CAC PUE. Urban residential settings include: homes, parks, schools, sports fields, commercial settings, cemeteries, greenbelts, and road sides. Applications may be made during off hours in school settings or business areas to avoid impacts. Hand pump & pressurized sprayer application except sports fields or other large areas may be treated using a tractor boom sprayer. Watering is done using similar ground spray equipment applied per label.

Follow all label requirements. Program staff will conduct a Site Assessment to verify each program area to determine if there are any specific conditions that need further evaluation.

APPENDIX 1A

CDFA PMDS (Add additional detail as needed below to fully describe the proposed activity):

Add text here.

- Application timing as early as June 15th.
- Applications will not be made if rainfall is predicted within 48 hrs. CDFA will make every effort to ensure the area is ready for treatment and corresponding watering in. Monitoring weather will ensure that chemicals will be applied under favorable weather conditions. Assumptions are all subject to weather models and predictions.
- Registered beekeepers within 1 mile of application site will be notified prior to application.
- Following the pesticide application, the watering in will be done with a minimum of two and up to three gallons per 1,000 square feet.
- Staff wearing PPE identical to the applicators will hold up a barrier to act as a shield to prevent drift on cement with residues on the edging board washed onto lawn.
- Application areas will be 20,000 sq. ft. with a backpack sprayer made by an individual applicator; 18 acres with a boom sprayer with a single applicator.
- Large lawn areas will be mowed prior to application to remove pollination resources.
- Treated landscape signs will be posted with a four hour re-entry period for landscape.