### TABLE 1. WATER SOURCES

<table>
<thead>
<tr>
<th>Source</th>
<th>Metric</th>
<th>Remedial Actions/Rationale</th>
</tr>
</thead>
</table>
| **Municipal Water Source** | Must meet the standards for *E. coli* set forth in U.S. EPA National Drinking Water Regulations. | • In general, if water from a municipal water source does not meet the *E. coli* standards set forth in U.S. EPA National Drinking Water Regulations, it should not be used for any purpose that requires water of drinking water quality. Exceeding these levels triggers actions that are outlined in Figure 1: Decision Tree for Municipal Water Sources.  
  • Action Level 1: No further action.  
  • Action Level 2: Implement additional testing and Sanitary Survey.  
  • Action Level 3: Stop using water immediately; implement additional testing and Sanitary Survey.  
  • All test results and corrective actions shall be documented and available for verification for a period of one year.  
  • Rationale: The requirements for this water source are based on regulations promulgated by the U.S. EPA for drinking water. |
| **Target Organism:**    | Generic *E. coli*                                                      |                                                                                                                                                                                                                           |
| **Action Level 1:**     | Non Detect; <2MPN/100ml                                               |                                                                                                                                                                                                                           |
| **Action Level 2:**     | 2 – 576 MPN/100ml                                                     |                                                                                                                                                                                                                           |
| **Action Level 3:**     | >576 MPN/100ml                                                        |                                                                                                                                                                                                                           |
| **Recommended Test Methods:** | Generic *E. coli*: 15 tube MPN                                       |                                                                                                                                                                                                                           |
|                         | Other U.S. EPA, FDA, or AOAC-accredited methods may be used as appropriate |                                                                                                                                                                                                                           |
| **Testing Frequency:**  | Annual Testing or Annual Certificate of Analysis from supplier. Testing of distribution system prior to production and monthly. |                                                                                                                                                                                                                           |
FIGURE 1. DECISION TREE FOR MUNICIPAL WATER SOURCES

Flush distribution system prior to use. Take 1 sample for testing, plus 1 back-up sample at point as close to the point of use as possible, before production begins and biannually. Analyze samples for generic E. coli via EPA, FDA or AOAC-accredited 15-tube MPN.

What was the level of generic E. coli found in the sample?

- < 2 MPN
  No further action necessary. Water from this source may be used for any purpose. Maintain testing records and a COA from the water supplier.

- 2 – 576 MPN
  Water may be used for applications where drinking quality water is not necessary.

- > 576 MPN
  Discontinue water use immediately. Water may not be used for any purpose.

1. Contact municipal water supplier; obtain Certificate of Analysis or perform E. coli testing at municipal water inlet.
2. Initiate Sanitary Survey (Appendix X).
3. Test for pathogenic bacteria (Salmonella spp. and E. coli O157:H7).
4. If pathogens are present, do not use water for any purpose. If water has been used on crops, they may not be marketed as ready to eat produce.
5. Determine pathogen source and take corrective action.
6. Take appropriate corrective action to prevent further contamination.
7. Decontaminate the distribution system.

IF PATHOGENS ARE NOT DETECTABLE, RETEST GENERIC E. COLI AS SOON AS FEASIBLE AFTER TAKING CORRECTIVE ACTIONS AND REPEAT DECISION TREE.
<table>
<thead>
<tr>
<th>Source</th>
<th>Metric</th>
<th>Remedial Actions/Rationale</th>
</tr>
</thead>
</table>
| **Well Head—Greater than 50 feet deep** | **Target Organism:** *Generic E. coli* | • In general, if a well tests positive for the presence of *E. coli*, it requires initiating remedial and additional testing actions as specified in Figure 2a: Decision Tree for Wells Deeper than 50 feet. If greater than 576 MPN *generic E. coli* is detected, then the water should not be used for any purpose until remedial actions have been completed and levels are lower than 576 MPN.  
  • Action Level 1: No further action.  
  • Action Level 2: Implement additional testing and Sanitary Survey.  
  • Action Level 3: Stop using water immediately; implement additional testing and Sanitary Survey.  
  • All test results and corrective actions shall be documented and available for verification for a period of one year.  
  • COMMENT: USGS consult on well depths; STATUS: Discussion w/ USGS on 12/15, indicated that the determinants of likelihood that groundwater is hydrologically connected to surface water can vary widely, and also state by state. It was recommended that we contact state-specific USGS offices to determine best indicators. I have a call into the California office.  
  • Rationale: The requirements for this water source are based on the knowledge that wells typically do not contain any detectable levels of *E. coli*; thus, any detection is a sign that the well may be contaminated and should be evaluated. *E. coli* is currently considered the most appropriate indicator organism by U.S. EPA and other scientists. |
| **Well Head—Less than 50 feet deep** | **Target Organism:** *Generic E. coli* | • In general, if a well tests positive for the presence of *E. coli*. It requires initiating remedial and additional testing actions as specified in Figure 2b: Decision Tree for Wells Less than 50 Feet Deep. If greater than 576 MPN *generic E. coli* is detected, then the water should not be used for any purpose until remedial actions have been completed and levels are lower than 576 MPN.  
  • Action Level 1: No further action.  
  • Action Level 2: Implement additional testing and Sanitary Survey.  
  • Action Level 3: Stop using water immediately; implement additional testing and Sanitary Survey.  
  • All test results and corrective actions shall be documented and available for verification for a period of one year.  
  • Rationale: The requirements for this water source are based on the knowledge that wells typically do not contain any detectable levels of *E. coli*; thus, any detection is a sign that the well may be contaminated and should be evaluated. *E. coli* is currently considered the most appropriate indicator organism by U.S. EPA and other scientists. |

**Action Level 1:**  
- Non Detect <2 MPN/100ml  
**Action Level 2:**  
- 2 - 576 MPN/100ml  
**Action Level 3:**  
- >576 MPN/100ml  

**Recommended Test Methods:**  
- 15 tube MPN  
- Other U.S. EPA, FDA, or AOAC-accredited methods may be used as appropriate.  

**Testing Frequency:**  
Before production begins and monthly. Testing is not required during non-production periods.
Test before production begins and biannually for generic E. coli via EPA, FDA or AOAC-accredited 15-tube MPN. Take 5 samples for testing, plus 3 back-up samples at location as close to point of use as possible.

What was the mean level of generic E. coli found in the samples?

- **< 2 MPN**
  - No further action necessary. Water from this source may be used for any purpose.

- **2 – 576 MPN**
  - Water may be used for applications where drinking quality water is not necessary.

- **> 576 MPN**
  - Discontinue water use immediately. Water may not be used for any purpose.

1. Perform E. coli testing at well head.
2. Initiate Sanitary Survey (Appendix X)
3. Test for pathogenic bacteria (Salmonella spp. and E. coli O157:H7).
4. If pathogens are present, **do not use water for any purpose**. If water has been used on crops, they may not be marketed as ready to eat produce.
5. Determine pathogen source and take corrective action.
6. Take appropriate corrective action to prevent further contamination.
7. Decontaminate the distribution system.

IF PATHOGENS ARE NOT DETECTABLE, RETEST GENERIC E. COLI AS SOON AS FEASIBLE AFTER TAKING CORRECTIVE ACTIONS AND REPEAT DECISION TREE
FIGURE 2B. DECISION TREE FOR WELL HEAD LESS THAN 50 FEET

Test before production begins and biannually for generic E. coli via EPA, FDA or AOAC-accredited 15-tube MPN. Take 5 samples for testing, plus 3 back-up samples at location as close to point of use as possible.

What was the mean level of generic E. coli found in the samples?

- **< 10 MPN**
  - No further action necessary. Water from this source may be used for any purpose if <2 MPN / 100 ml or for applications where drinking water quality is not necessary if > than 2 MPN / 100 ml.

- **10 - 576 MPN**
  - Water may only be used for irrigation and preharvest applications.

- **> 576 MPN**
  - Discontinue water use immediately. Water may not be used for any purpose.

1. Perform E. coli testing at well head.
2. Initiate Sanitary Survey (Appendix X)
3. Test for pathogenic bacteria (Salmonella spp. and E. coli O157:H7).
4. If pathogens are present, do not use water for any purpose. If water has been used on crops, they may not be marketed as ready to eat produce.
5. Determine pathogen source and take corrective action.
6. Take appropriate corrective action to prevent further contamination.
7. Decontaminate the distribution system.

**IF PATHOGENS ARE NOT DETECTABLE, RETEST GENERIC E. COLI AS SOON AS FEASIBLE AFTER TAKING CORRECTIVE ACTIONS AND REPEAT DECISION TREE**
<table>
<thead>
<tr>
<th>Well Reservoir</th>
<th>Target Organism:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Generic <em>E. coli</em></td>
</tr>
</tbody>
</table>

**Action Level 1:**
- <126 MPN/100ml (average n>5 samples)

**Action Level 2:**
- 126 – 576 MPN/100ml (average n>5 samples)

**Action Level 3:**
- >576 MPN/100ml (average n>5 samples)

**Recommend Test Methods:**
- 15 tube MPN
- Other U.S. EPA, FDA, or AOAC-accredited methods may be used as appropriate.

**Testing Frequency:**
Before production begins and monthly. Testing is not required during non-production periods.

- In general, if a well reservoir tests positive for greater than 126 MPN of generic *E. coli*, it requires initiating remedial and additional testing actions as specified in Figure 3: Decision Tree for Well Reservoir Sources. If greater than 576 MPN generic *E. coli* is detected, then the water should not be used for any purpose until remedial actions have been completed and levels are lower than 576 MPN.
  - Action Level 1: No further action.
  - Action Level 2: Implement additional testing and Sanitary Survey.
  - Action Level 3: Stop using water immediately; implement additional testing and Sanitary Survey.

- All test results and corrective actions shall be documented and available for verification from the grower whom is the responsible party for a period of one year.

- **Rationale:** The requirements for this water source are based on the several sources including scientists (Suslow, 2005) and current Arizona irrigation water standards (Ariz. Admin. Code R18-11-109). *E. coli* is considered the most appropriate indicator organism by U.S. EPA and scientists currently.
Test before production begins and monthly for generic E. coli via EPA, FDA or AOAC-accredited 15-tube MPN. Take 5 samples for testing, plus 3 backup samples at location as close to point of use as possible.

What was the mean level of generic E. coli found in the samples?

- **< 126 MPN**
  - No further action necessary. Water from this source may be used for any purpose if <2 MPN / 100 ml or for applications where drinking water quality is not necessary if > than 2 MPN / 100 ml.

- **126 - 576 MPN**
  - Water may only be used for irrigation and preharvest applications.

- **>576 MPN**
  - Discontinue water use immediately. Water may not be used for any purpose.
| **Surface Water/Canal** | **Target Organism:**  
• Generic *E. coli*  
**Action Level 1:**  
• <126 MPN/100ml  
  (average n≥5 samples)  
**Action Level 2:**  
• 126 – 576 MPN/100ml  
  (average n≥5 samples)  
**Action Level 3:**  
• >576 MPN/100ml  
  (average n≥5 samples)  
**Recommended Test Methods:**  
• 15 tube MPN  
• Other U.S. EPA, FDA, or AOAC-accredited methods may be used as appropriate.  
**Testing Frequency:**  
Before production begins and monthly. Testing is not required during non-production periods.  

| **In general, if a surface water source tests positive for greater than 126 MPN of generic *E. coli* it requires initiating remedial and additional testing actions as specified in Figure 4: Decision Tree for Surface Water Sources. If greater than 576 MPN generic *E. coli* is detected, then the water should not be used for any purpose until remedial actions have been completed and levels are lower than 576 MPN.**  
• **Action Level 1:** No further action.  
• **Action Level 2:** Implement additional testing and Sanitary Survey.  
• **Action Level 3:** Stop using water immediately; implement additional testing and Sanitary Survey.  
• **COMMENT:** Consult w/ Coachella Water District on feasibility of 126 MPN.  
**STATUS:** Have been playing phone tag w/ Steve Bigley; left last message for him on 12/15.  

| **All test results and corrective actions shall be documented and available for verification for a period of one year.**  

**Rationale:** The requirements for this water source are based on the several sources including scientists (Suslow, 2005) and current Arizona irrigation water standards (Ariz. Admin. Code R18-11-109). *E. coli* is considered the most appropriate indicator organism by U.S. EPA and scientists currently. |
FIGURE 4. DECISION TREE FOR SURFACE WATER OR CANAL

< 126 MPN
No further action necessary. Water from this source may be used for any purpose if <2 MPN / 100ml or for applications where drinking water quality is not necessary if > than 2 MPN / 100 ml.

126 – 576 MPN
Water may only be used for irrigation and preharvest applications. If this is following 4 day sample set and levels are still greater than 126 MPN / 100ml, this water may be used for irrigation water if the water does not directly contact the edible portions of the crop.

> 576 MPN
Discontinue water use immediately. Water may not be used for any purpose.

1. Perform E. coli testing at source.
2. Initiate Sanitary Survey (Appendix X)
3. Test for pathogenic bacteria (Salmonella spp. and E. coli O157:H7).
4. If pathogens are present, do not use water for any purpose. If water has been used on crops, they may not be marketed as ready to eat produce.
5. Determine pathogen source and take corrective action.
6. Take appropriate corrective action to prevent further contamination.
7. Decontaminate the distribution system.

IF PATHOGENS ARE NOT DETECTABLE, RETEST GENERIC E. COLI AS SOON AS FEASIBLE AFTER TAKING CORRECTIVE ACTIONS AND REPEAT DECISION TREE
**Reclaimed Water For Irrigation on Edible Crops**

*Growers should check for state-specific regulations regarding the use of reclaimed water prior to using it for agricultural purposes.

<table>
<thead>
<tr>
<th>Reclaimed Water means wastewater that is: Oxidized, Coagulated, Filtered, Disinfected Adequately</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Target Organism:</strong></td>
</tr>
<tr>
<td>• <strong>Generic E. coli</strong></td>
</tr>
<tr>
<td><strong>Action Level 1:</strong></td>
</tr>
<tr>
<td>• <strong>Generic E. coli:</strong></td>
</tr>
<tr>
<td>Non Detect &lt;2MPN/100ml</td>
</tr>
<tr>
<td><strong>Action Level 2:</strong></td>
</tr>
<tr>
<td>• <strong>Generic E. coli:</strong></td>
</tr>
<tr>
<td>2 – 576 MPN/100ml</td>
</tr>
<tr>
<td><strong>Action Level 3:</strong></td>
</tr>
<tr>
<td>• <strong>Generic E. coli:</strong></td>
</tr>
<tr>
<td>&gt;576 MPN/100ml</td>
</tr>
</tbody>
</table>

**Recommended Test Methods:**

- **Generic E.coli:**
  - 15 tube MPN
- Other U.S. EPA, FDA, or AOAC-accredited methods may be used as appropriate.

**Testing Frequency:**

Before production begins and monthly and appropriate Certificates of Analysis for the same time periods.

**Rationale:** The requirements for this water source are based on U.S. EPA requirements for reclaimed water.

- Water from a source that does not meet the acceptable source criteria shall not be used for irrigation or other purposes until acceptable levels have been met.
- Find a water source that meets the acceptable source criteria.
- Take remedial action(s) to bring the water source into compliance with acceptable microbial criteria.

- All test results and corrective actions shall be documented and available for verification from the grower whom is the responsible party for a period of one year.
FIGURE 5. DECISION TREE FOR RECLAIMED WATER

BEFORE BEGINNING:
Does your state allow the use of reclaimed water?
Is the water reclaimed water?
Proceed if the answer to both is, yes.

Test weekly and before production begins for generic E. coli via EPA, FDA or AOAC-accredited 15-tube MPN. Take 5 samples for testing, plus 3 back-up samples.
What was the mean level of generic E. coli found in the samples?

< 2 MPN
No further action necessary. Water from this source may be used for any purpose.

2 – 576 MPN
Water may be used for applications where drinking quality water is not necessary.

> 576 MPN
Discontinue water use immediately. Water may not be used for any purpose.

1. Notify reclaimed water provider.
2. Perform E. coli testing at reclaimed water inlet.
3. Initiate Sanitary Survey (Appendix X)
4. Test for pathogenic bacteria (Salmonella spp. and E. coli O157:H7).
5. If pathogens are present, do not use water for any purpose. If water has been used on crops, they may not be marketed as ready to eat produce.
6. Determine pathogen source and take corrective action.
7. Take appropriate corrective action to prevent further contamination.
8. Decontaminate the distribution system.

IF PATHOGENS ARE NOT DETECTABLE, RETEST GENERIC E. COLI AS SOON AS FEASIBLE AFTER TAKING CORRECTIVE ACTIONS AND REPEAT DECISION TREE
| Tail Water | Shall meet microbial quality standards as specified for surface water or well reservoir water if used for any purpose that might contact produce. | • Corrective actions are identical to those outlined for surface or well reservoir water.  
• Rationale: This requirement is based on the specific use for tail water, which was determined to be the most appropriate basis. |
<table>
<thead>
<tr>
<th>Use</th>
<th>Metric</th>
<th>Remedial Actions/Rationale</th>
</tr>
</thead>
</table>
| **Irrigation Water**                          | Water used for this application must be tested in accordance with the microbial action levels outlined for various water sources. (See Table 1.) These source waters can be used for any type of irrigation (e.g., overhead sprinkler, furrow, drip). | • Water from a source that does not meet the acceptable source criteria above shall not be used except as specified in the accompanying decision trees.  
• Find a water source that meets the acceptable source criteria outlined above.  
• Take remedial action(s) to bring the water source into compliance with acceptable microbial criteria for that water source type as outlined above.  
• All test results and corrective actions shall be documented and available for verification from the grower whom is the responsible party for a period of one year. |
<p>| <strong>PreHarvest Foliar Applications</strong>            | Water used for this application must be tested in accordance with the microbial action levels outlined for various water sources. (See Table 1. Water Sources) |                                                                                                                                                                                                                           |
| <strong>Postharvest Water Used for Direct Product Contact or Food Contact Surfaces</strong> (e.g. Re-hydration, Core In Field, harvest equipment cleaning) | Water used for this application, must meet microbial standards set forth in U.S. EPA National Drinking Water Regulations. (See Table 1. Water Sources) |                                                                                                                                                                                                                           |</p>
<table>
<thead>
<tr>
<th>Use</th>
<th>Metric</th>
<th>Remedial Actions/Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Postharvest Re-circulated Water Used for Direct Product Contact (e.g. hydro-vac cooler water, hydro coolers, etc)</td>
<td><strong>Criteria:</strong></td>
<td>• Water from a source that does not meet the acceptable source criteria above shall not be used in a manner that may contaminate food crops.</td>
</tr>
<tr>
<td></td>
<td>• Source Water Criteria</td>
<td>• Find a water source that meets the acceptable source criteria outlined above.</td>
</tr>
<tr>
<td></td>
<td>Source water used for this application, must meet microbial standards set forth in U.S. EPA National Drinking Water Regulations. (See Table 1. Municipal Water Source Criteria)</td>
<td>• Take remedial action(s) to bring the water source into compliance with acceptable microbial criteria for that water source type as outlined above.</td>
</tr>
<tr>
<td></td>
<td>• Re-circulated Water Criteria</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Re-circulated water used for this application must be routinely monitored to assure that sufficient water disinfectant is present to prevent cross contamination.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Target Variable:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• approved water disinfectant (e.g. chlorine)</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Acceptance Criteria:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• $\geq$4 ppm free chlorine @</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• pH 6.5 - 7.5 or</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• an ORP of $\geq$ 700 mV</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Test:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Chemical reaction based colorimetric test.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Ion specific probe.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• ORP</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Testing Frequency:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Continuous monitoring OR</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Routine hourly monitoring</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>All test results and corrective actions shall be documented and available for verification from the grower whom is the responsible party for a period of one year.</strong></td>
<td></td>
</tr>
<tr>
<td>Dust Abatement Water</td>
<td>Criteria: Water used for this application, must meet the aforementioned microbial acceptance criteria outlined for various water sources. (See Table 1. Water Sources)</td>
<td></td>
</tr>
</tbody>
</table>
**TABLE 3. SOIL AMENDMENTS**

<table>
<thead>
<tr>
<th>Amendment</th>
<th>Metric/Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw Manure or Not Fully Composted Animal Manure Containing Soil Amendments (see composted manure process definition below)</td>
<td><strong>DO NOT USE OR APPLY</strong> soil amendments that contain un-composted, incompletely composted or non-thermally treated animal manure to fields which will be used for edible crop production</td>
</tr>
<tr>
<td>Amendment</td>
<td>Metric/Rationale</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Composted Soil Amendments</td>
<td>Please see Figure 6: Decision Tree for Use of Composted Soil Amendments.</td>
</tr>
<tr>
<td>*Composted soil amendments should not be applied after emergence of plants.</td>
<td></td>
</tr>
</tbody>
</table>

**Composting Process Validation:**
- Enclosed or within-vessel composting:
  - Active compost must maintain a minimum of 131°F for 3 days, with a curing/aging period 3-6 weeks before application to fields.
- Windrow composting:
  - Active compost must maintain aerobic conditions for a minimum of 131°F for 15 days, with a minimum of five turnings followed by a curing/aging period 3-6 weeks before application to fields.
- Aerated static pile composting:
  - Active compost must be covered with 6 to 12 inches of insulating materials and maintain a minimum of 131°F for 3 days, with a curing/aging period 3-6 weeks before application to fields.

**Target Organisms:**
- Fecal Coliforms
- *Salmonella* spp
- *E. coli* O157:H7

**Acceptance Criteria:**
- Fecal Coliforms <1000 MPN/gram
- *Salmonella*: Absence <3/4 grams
- *E. coli* O157:H7: Absence <1/4 grams

**Recommended Test Methods:**
- Fecal coliforms: 9 tube MPN
- *Salmonella* spp: BAM Chapter 5
- *E. coli* O157:H7: BAM Chapter 4
- Other U.S. EPA, FDA, or AOAC-accredited methods may be used as appropriate.

**Sampling Plan:**
- 12 point sampling plan composite sample
- Sample may be taken by the supplier if trained by the testing laboratory
- Laboratory must be certified/accredited

**Testing Frequency:**
- Each lot before application to production fields. A lot is defined as a unit of production equal to or less than 5,000 cubic yards.

**Application Interval:**
- Must be applied >45 before harvest

**Documentation:**
- All test results and/or Certificates of Analysis shall be documented and available for verification from the grower whom is the responsible party for a period of one year.

**Rationale:**
- The microbial metrics and validated processes for compost are based on allowable levels from California state regulations (Title 13 CCR, Chapter 3.1, Article 5), with the addition of testing for *E. coli* O157:H7 as a microbe of particular concern. Although the 45-day is shorter than the 120-day raw manure interval, this was deemed appropriate due to the three hurdle metric design. Not only does raw manure have to be composted with an approved process, it must also pass testing requirements, before an application interval is observed. Considering that the 120-day period is specific to raw manure (not compost), it was felt that the raw manure interval could be shortened safely.
FIGURE 6. DECISION TREE FOR COMPOSTED SOIL AMENDMENTS (SA)

Do current and/or past applications of SA contain raw or incompletely composted animal manure?

**YES**
Do not use in edible crop production.
For previously treated fields – a 1 year waiting period shall be observed before planting any variety of leafy green crops.

**NO**
SA contains only fully composted animal manure. Verify with compost supplier that the active composting process follows the guidelines outlined below. Also adjust on-site active compost production process to comply with Title 13 CCR, Chapter 3.1, Article 5 guidelines. The compost supplier should be able to provide a certificate verifying their process. **Does the compost supplier provide a certificate of analysis?**

**YES**

However, microbial levels are above action levels. **Do not use in edible crop production.**

**NO**
A certificate of analysis is not available. Samples may be collected by grower or third-party consultant. Microbial testing must be performed by an accredited/certified laboratory.

**YES**
And microbial levels are below action levels.
- Keep records of certificate for at least one year
- Observe application time interval of >45 days before harvest

**Microbial Testing**
- Divide each compost lot/pile into a 3 x 4 grid and extract 12 equivolume samples.
- Combine samples & submit to a certified/accredited laboratory for testing of the following:
  - Test for fecal coliforms – Action level: <1000 MPN/gram
  - Test compost for *Salmonella* spp. – Action level: Absence <3 per 4 grams
  - Test compost for *E. coli* O157:H7 – Action level: Absence <1 per 4 grams

Are the microbe levels below the corresponding action levels?

**NO**
Do not use in edible crop production.

**YES**
Observe application time interval of >45 days before harvest.

**NO**
SA does not contain animal manure.
- Must have a manure-free certificate available for verification before harvest
- Keep records of certificate for at least one year (grower is responsible for compost quality for 1 yr.)
Physically Heat Treated Animal Manure Containing Soil Amendments

Please see Figure 7: Decision Tree for Use of Physically Heat Treated Soil Amendments.

Physical Heat Process Validation
- The physical heat treatment processes shall be validated recognized by a process authority that the process in fact does pasteurize the animal manure containing soil amendment.

Target Organism:
- Fecal Coliforms
- *Salmonella* spp
- *E. coli* O157:H7

Acceptance Criteria:
- Fecal Coliforms <10 MPN/gram
- *Salmonella*: Absence <3/4 grams
- *E. coli* O157:H7: Absence <1/4 grams

Recommended Test Methods:
- Fecal coliforms: 9 tube MPN
- *Salmonella* spp: BAM Chapter 5
- *E. coli* O157:H7: BAM Chapter 4
- Other U.S. EPA, FDA, or AOAC-accredited methods may be used as appropriate.

Sampling Plan:
- 12 point sampling plan composite sample
- Sample may be taken by the supplier if trained by the testing laboratory
- Laboratory must be certified/accredited by annual review of laboratory protocols based on GLPs by recognized NGO.

Testing Frequency:
- Each lot before application to production fields.

Application Interval:
- If the physical heat treatment process used to "pasteurize" the animal manure containing soil amendment is validated and meets that microbial acceptance criteria outlined below, no time interval is needed between application and harvest.
- If a physical heat treatment process (minimum temperature: 300°F (150 °C) for 60 minutes resulting in a moisture content <30 % dry weight) is used that will likely significantly reduce microbial populations of human pathogens in an animal manure containing soil amendment, but the process is not validated, yet meets that microbial acceptance criteria outlined below, a 45 day time interval is needed between application and harvest.

Documentation:
- All test results and/or Certificates of Analysis shall be documented and available for verification from the grower whom is the responsible party for a period of one year.

Rationale:
The microbial metrics and validated processes for compost are based on allowable levels from California state regulations (Title 13 CCR, Chapter 3.1, Article 5), with the addition of testing for *E. coli* O157:H7 as microbe of particular concern. A more stringent level of fecal coliform was also included to address the much more controlled nature of soil amendments produced in this manner. Although the 45-day is shorter than the 120-day raw manure interval, this was deemed appropriate due to the three hurdle metric design. Not only does raw manure have to be composted with an approved process, it must also pass testing requirements, before an application interval is observed. Considering that the 120-day period is specific to
raw manure (not compost), it was felt that the raw manure interval could be shortened safely.
| Soil Amendments Not Containing Animal Manure | • All organic (i.e. chemically organic) soil amendments that DO NOT contain animal manure must have a certificate that it is manure-free.  
• The certificate must be available for verification before harvest begins.  
• All test results and/or Certificates of Analysis shall be documented and available for verification from the grower whom is the responsible party for a period of one year. |
FIGURE 7. DECISION TREE FOR PHYSICALLY HEAT TREATED ANIMAL MANURE CONTAINING SOIL AMENDMENTS

Does soil amendment (SA) contain physically heat treated animal manure that has been validated by a recognized authority?

NO
Verify with supplier (and obtain documentation) that the process is either validated by a recognized authority, or observes the following:
- Minimum temp: 300°F (150°C)
- Process duration: 60 min
- Moisture content: <30% dry weight

Does the supplier provide a certificate of analysis?

YES
Obtain documentation of validated process.

Does the supplier provide a certificate of analysis?

NO
Verify with supplier (and obtain documentation) that the process is either validated by a recognized authority, or observes the following:
- Minimum temp: 300°F (150°C)
- Process duration: 60 min
- Moisture content: <30% dry weight

YES
A certificate of analysis is not available. Samples may be collected by grower or third-party consultant. Microbial testing must be performed by an accredited/certified laboratory.

Microbial Testing
- Divide each lot/pile into a 3 x 4 grid and extract 12 equivolume samples. Combine samples & submit to a certified/accredited laboratory for testing of the following:
  - Test for fecal coliforms – Action level: <1000 MPN/gram
  - Test compost for Salmonella spp. – Action level: Absence <3 per 4 grams
  - Test compost for E. coli O157:H7 – Action level: Absence <1 per 4 grams

Are the microbe levels below the corresponding action levels?

NO
Do not use in edible crop production.

YES
And microbial levels are below action levels.
- Keep records of certificate for at least one year
- For non-validated process, observe application time interval of >45 days before harvest
- For validated process, no application time interval
<table>
<thead>
<tr>
<th>Treatment</th>
<th>Metric/Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any crop input that contains animal manure, an animal product and/or animal by-product that is reasonably likely to contain human pathogens.</td>
<td>Please see Figure 8: Decision Tree for Use of Nonsynthetic Crop Treatments.</td>
</tr>
<tr>
<td>Examples include but are not limited to:</td>
<td></td>
</tr>
<tr>
<td>• Compost Teas,</td>
<td></td>
</tr>
<tr>
<td>• Fish emulsions</td>
<td></td>
</tr>
<tr>
<td>• Fish meal</td>
<td></td>
</tr>
<tr>
<td>• Blood meal</td>
<td></td>
</tr>
<tr>
<td>• &quot;Bio-fertilizers&quot; commonly used for pest control, greening, disease control, fertilizing.</td>
<td></td>
</tr>
</tbody>
</table>

**Process Validation**
- The physical, chemical and/or biological treatment(s) process used to render the crop input safe for application to edible crops must be validated by a recognized process authority.

**Target Organism:**
- Fecal Coliforms
- *Salmonella* spp
- *E. coli* O157:H7

**Acceptance Criteria:**
- Fecal Coliforms <1000 MPN/gram
- *Salmonella*: Absence <3/4 grams
- *E. coli* O157:H7: Absence <1/4 grams

**Recommended Test Methods:**
- Fecal coliforms: 9 tube MPN
- *Salmonella* spp: BAM Chapter 5
- *E. coli* O157:H7: BAM Chapter 4
- Other U.S. EPA, FDA, or AOAC-accredited methods may be used as appropriate.

**Sampling Plan:**
- 12 point sampling plan composite sample
- Sample may be taken by the supplier if trained by the testing laboratory
- Laboratory must be certified/accredited by annual review of laboratory protocols based on GLPs by recognized NGO.

**Testing Frequency:**
- Each lot before application to production fields.
<table>
<thead>
<tr>
<th>Treatment</th>
<th>Metric/Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Application Interval:</strong></td>
<td></td>
</tr>
<tr>
<td>• If the physical, chemical and/or biological treatment process used to render the crop input safe for application to edible crops is validated and meets that microbial acceptance criteria outlined below, no time interval is needed between application and harvest.</td>
<td></td>
</tr>
<tr>
<td>• If the physical, chemical and/or biological treatment process used to render the crop input safe for application to edible crops is not validated, yet meets that microbial acceptance criteria outlined above, a 45 day time interval is needed between application and harvest.</td>
<td></td>
</tr>
<tr>
<td>• If the physical, chemical and/or biological treatment process used to render the crop input safe for application to edible crops is not validated, and does not meet that microbial acceptance criteria outlined below, the product should not be applied to the edible portion of crops.</td>
<td></td>
</tr>
<tr>
<td><strong>Documentation:</strong></td>
<td></td>
</tr>
<tr>
<td>• All test results and/or Certificates of Analysis shall be documented and available for verification from the grower whom is the responsible party for a period of one year.</td>
<td></td>
</tr>
<tr>
<td><strong>Rationale:</strong></td>
<td></td>
</tr>
<tr>
<td>• The microbial metrics and validated processes for compost are based on allowable levels from California state regulations (Title 13 CCR, Chapter 3.1, Article 5), with the addition of testing for E. coli 0157:H7 as microbe of particular concern. Although the 45-day is shorter than the 120-day raw manure interval, this was deemed appropriate due to the three hurdle metric design. Not only does raw manure have to be composted with an approved process, it must also pass testing requirements, before an application interval is observed. Considering that the 120-day period is specific to raw manure (not compost), it was felt that the raw manure interval could be shortened safely.</td>
<td></td>
</tr>
</tbody>
</table>
FIGURE 8. DECISION TREE FOR NONSYNTHETIC CROP TREATMENTS

Does the crop treatment contain animal products or by-products that have been produced by a validated process? (examples include compost teas, fish emulsions, fish meal, blood meal, and biofertilizers).

NO
Does the supplier provide a certificate of analysis?

YES
Obtain documentation of validated process.
Does the supplier provide a certificate of analysis?

YES
However, microbial levels are above action levels. Do not use in edible crop production.

NO
A certificate of analysis is not available. Samples may be collected by grower or third-party consultant. Microbial testing must be performed by an accredited/certified laboratory.

YES
And microbial levels are below action levels.
• Keep records of certificate for at least one year
• For non-validated process, observe application time interval of >45 days before harvest
• For validated process, no application time interval

Microbial Testing
Divide each lot/pile into a 3 x 4 grid and extract 12 equivolume samples. Combine samples & submit to a certified/accredited laboratory for testing of the following:
• Test for fecal coliforms – Action level:  <1000 MPN/gram
• Test compost for Salmonella spp. – Action level: Absence <3 per 4 grams
• Test compost for E. coli O157:H7 – Action level: Absence <1 per 4 grams
Are the microbe levels below the corresponding action levels?

NO
Do not use in edible crop production.

YES
• For non-validated process, observe application time interval of >45 days before harvest
• For validated process, no application time interval.
TABLE 5. FLOODING
When evidence of flooding in a production block occurs.

<table>
<thead>
<tr>
<th>Practice</th>
<th>Metric/Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flooding Defined</td>
<td>The flowing or overflowing of a field with water outside a grower’s control that is reasonably likely to contain microorganisms of significant public health concern and is reasonably likely to cause adulteration of edible portions of fresh produce in that field</td>
</tr>
<tr>
<td>Allowable Harvest Distance from Flooding</td>
<td>• Buffer and do not harvest any product within 20 ft of the high water mark of flooding.</td>
</tr>
<tr>
<td>Verification</td>
<td>• Required buffer distance may be greater than 20 ft based on risk analysis.</td>
</tr>
<tr>
<td>Time Interval Before Harvest Can Commence</td>
<td>• 120 days prior to harvest.</td>
</tr>
<tr>
<td>Harvest Following a Flooding Event</td>
<td>• Appropriate soil testing can be used to shorten this period to 45 days prior to harvest. This testing must be performed in a manner that accurately represents the production field, and demonstrate soil levels of microorganisms lower than the recommended standards for processed compost. Suitable representative samples should be collected for the entire area suspected to have been exposed to flooding. For additional guidance on appropriate soil sampling techniques, it is recommended that Soil Screening Guidance: Technical Background Document (U.S. EPA, 1996) is used as a basis for sampling programs. Specifically, Part 4 provides guidance for site investigations. Reputable third-party environmental consultants or laboratories also should be able to provide sampling services consistent with this guidance.</td>
</tr>
<tr>
<td>Rationale</td>
<td>• The basis for the 20 foot distance is the turn around distance for production equipment.</td>
</tr>
</tbody>
</table>
## Table 6. Animal Activity in Field (Wild or Domestic)
When evidence of wild or domestic animal intrusion in a production block occurs.

<table>
<thead>
<tr>
<th>Issue</th>
<th>Metric</th>
<th>Remedial Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evidence of Intrusion</td>
<td>• Physical observation of animals in the field.</td>
<td>• If there is evidence of intrusion the production block, it must undergo a detailed food safety assessment prior to harvest by appropriately trained food safety personnel, as defined in the text of this document.</td>
</tr>
<tr>
<td></td>
<td>• Downed fences.</td>
<td>• If remedial actions cannot be formulated that control or eliminate the identified risk, the block will be destroyed by disking under the crop.</td>
</tr>
<tr>
<td></td>
<td>• Animal tracks in production block.</td>
<td>• Investigate potential causes for intrusion and assess the extent of intrusion and impact on crop food risk.</td>
</tr>
<tr>
<td></td>
<td>• Animal feces or urine in production block</td>
<td>• Corrective actions shall be documented and available for verification.</td>
</tr>
<tr>
<td></td>
<td>• Eaten plants in production block</td>
<td>• Equipment used to destroy crop must be cleaned and sanitized upon exiting the field.</td>
</tr>
<tr>
<td>Wild Animals of Significant Risk</td>
<td>• Deer</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Geese</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Wild Pigs</td>
<td></td>
</tr>
<tr>
<td>Domestic Animals of Significant Risk</td>
<td>• Cattle</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Goats and Sheep</td>
<td></td>
</tr>
</tbody>
</table>

### Allowable Harvest Distance from Evidence of Intrusion

<table>
<thead>
<tr>
<th>Issue</th>
<th>Metric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Harvest Assessment</td>
<td>The pre-harvest assessment shall be conducted not more than one week prior to harvest.</td>
</tr>
<tr>
<td>Fecal Material</td>
<td>Do not harvest any produce that has come into direct contact with fecal material.</td>
</tr>
<tr>
<td></td>
<td>If evidence of fecal material is found, a food safety assessment shall be conducted, and any crop found within a distance of one crop row (80 to 84&quot;) from the spot of the contamination shall not be harvested, unless remedial actions can be found that adequately control the risk.</td>
</tr>
<tr>
<td>Incursion</td>
<td>If evidence of animal intrusion is found in a production field, a food safety assessment shall be conducted. The food safety professional will determine whether the areas of intrusion can be adequately controlled (i.e., solitary deer track with no evidence of feeding), or whether a one crop row non-harvest areas should be applied (i.e., wide areas of wild pig rooting and tracks).</td>
</tr>
<tr>
<td>Harvest Assessment</td>
<td>If evidence of animal intrusion into the production block is only discovered during harvest operations.</td>
</tr>
<tr>
<td></td>
<td>Stop harvest operations.</td>
</tr>
<tr>
<td></td>
<td>Initiate an intensified block assessment for evidence of further contamination and take appropriate actions as per the aforementioned actions.</td>
</tr>
<tr>
<td>Issue</td>
<td>Metric</td>
</tr>
<tr>
<td>-------</td>
<td>--------</td>
</tr>
</tbody>
</table>
|       | • If harvesting equipment has passed through areas where food safety professionals have indicated no harvest should occur then it must be removed from the field and cleaned and sanitized before resuming harvest operations.  
• All employees must wash and sanitize their hands/gloves before resuming harvest operations. | |
| Verification | • Documentation of pre harvest assessments and any evidence of intrusion and or the corrective actions employed shall be archived for a period of one year following the harvest. Documentation may include photographs, sketched maps, or other means of delineating affected portions of production fields. | |
| Rationale | • The basis for the metrics above is primarily related to a qualitative assessment of the relative risk from a variety of intrusions. Some animal feces are considered to be of more concern than others, and some signs of intrusion (feces vs. tracks) are considered to be of more concern than others. It would be difficult to develop quantitative metrics for these types of risks, thus a food safety assessment was considered to be appropriate for this issue. | |
FIGURE 9. DECISION TREE FOR CONDUCTING PRE-HARVEST AND HARVEST ASSESSMENT OF ANIMAL ACTIVITY IN FIELD (WILD OR DOMESTIC)

One week prior to harvest (for pre-harvest assessment) or during harvesting operations conduct visual assessment of production block. Look for:
- Live or dead animals
- Animal tracks – high risk animals include deer, geese, wild pigs, cattle, sheep, or goats
- Downed fences
- Animal feces or urine
- Eaten plants

Is there evidence of animal intrusion in the production block?

**YES**
If animal intrusion is suspected (i.e. a broken fence, but no tracks due to recent rain), food safety assessment should be performed by qualified personnel. The following information is important to make a decision regarding remedial and corrective actions:
- Type of animal
- Extent of intrusion
- Crop area affected

Can remedial action be formulated that controls or eliminates the identified risk?

**NO**
Production block should not be marketed as ready-to-eat commodity.

**YES**
Initiate remedial action. May include:
- Isolation of affected area
- Elimination of potentially contaminated crops
- Fences or other physical barriers

Investigate potential cause for intrusion:
- Is there water present in the production area? If so, drain/dry area as much as possible.
- Is the field closer to wooded area than is necessary?

Performance of a post-remedial action visual inspection. Have the measures mitigated the potential risks from animal intrusion?

**NO**
Repeat assessment of animal intrusion and possible mitigation measures.

**YES**
Continue normal harvest schedule.

**NO**
Continue normal harvest schedule.
## Table 7. Crop Land and Water Source Adjacent Land Use

<table>
<thead>
<tr>
<th>Land Use/Water Source</th>
<th>Metric (Proximal Safe Distance)</th>
<th>Considerations for Risk Analysis</th>
</tr>
</thead>
</table>
| Composting Operations                       | 500 ft from the edge of crop. This distance may be either increased or decreased depending on risk and mitigation factors. | • Topography (uphill, downhill, level)  
• Wind direction & speed  
• Opportunity for Water Run Off (creeks, streams, etc)  
• Opportunity for soil leaching |
| Concentrated Animal Feeding Operations      | 500 ft from the edge of crop. This distance may be either increased or decreased depending on risk and mitigation factors. | • Fencing/barriers that are adequate to prevent intrusion of domestic animals.  
• Topography (uphill, downhill, level)  
• Wind direction & speed  
• Opportunity for water run off (creeks, streams, etc)  
• Opportunity for soil leaching |
| Non-synthetic Soil Amendment Pile           | 500 ft from the edge of crop. This distance may be either increased or decreased depending on risk and mitigation factors. | • Access and review of COA for materials in question.  
• Topography (uphill, downhill, level)  
• Wind direction & speed  
• Opportunity for water run off (creeks, streams, etc)  
• Opportunity for soil leaching  
• Covering on pile to prevent wind dispersion. |
| Grazing Lands (Domesticated Animals)        | 20 ft from the edge of crop. This distance may be either increased or decreased depending on risk and mitigation factors. | • Fencing/barriers that are adequate to prevent intrusion of domestic animals.  
• Topography (uphill, downhill, level)  
• Wind direction & speed  
• Opportunity for water run off (creeks, streams, etc)  
• Opportunity for soil leaching |
| Homes or other building with a septic leach field. | 20 ft from the edge of crop. This distance may be either increased or decreased depending on risk and mitigation factors. | • Age of leach field  
• Active or inactive leach field  
• Topography (uphill, downhill, level)  
• Physical Barriers |
Growers should check for local, state and federal laws and regulations that protect riparian habitat, restrict removal of vegetation or habitat, or restrict construction of wildlife deterrent fences in riparian areas or wildlife corridors. Growers may want to contact the relevant agencies (e.g., the Regional Water Quality Control Board and state and federal fish and wildlife agencies) to confirm the details of these requirements.

<table>
<thead>
<tr>
<th>Location</th>
<th>Required Distance</th>
<th>Factors to Consider</th>
</tr>
</thead>
</table>
| Undisturbed open non farmed land with evidence of wildlife. (including wildlife buffer strips) * | 20 ft from the edge of crop. This distance may be either increased or decreased depending on risk and mitigation factors. | • Level of wildlife activity (e.g. amphibians, birds, mammals and reptiles).  
• Wildlife type contamination potential: feces deposition potential (animal size X number of animals), propensity to carry human pathogens, feces dispersion.  
• Evidence of activity = tracks, feces, crop damage.  
• Rodent traps, checked daily, set 50ft apart along the fields edge.  
• Noise makers (e.g. carbide cannons) deter wildlife intrusion.  
• Fencing/barriers that are adequate to deter wildlife intrusion. |
| Ponds, Sloughs, Rivers, Lakes, Wetlands, Creeks *, | 20 ft from the edge of crop. This distance may be either increased or decreased depending on risk and mitigation factors. | • Level of wildlife activity (e.g. amphibians, birds, mammals and reptiles).  
• Wildlife type contamination potential: feces deposition potential (animal size X number of animals), propensity to carry human pathogens, feces dispersion.  
• Evidence of activity = tracks, feces, crop damage.  
• Rodent traps, checked daily, set 50ft apart along the fields edge.  
• Noise makers (e.g. carbide cannons) deter wildlife intrusion.  
• Fencing/barriers that are adequate to deter wildlife intrusion. |
| Well Head Distance from Untreated Manure | 200 ft separation of untreated manure from wells, although less distance may be sufficient. | • Topography (uphill, downhill, level)  
• Wind direction & speed  
• Opportunity for water run off (creeks, streams, etc)  
• Opportunity for soil leaching |
| Surface Water Distance from Untreated Manure | At least 100 feet separation for sandy soil and 200 feet separation for loamy or clay soil (slope less than 6%; increase distance to 300 feet if slope greater than 6%) is recommended. | • Topography (uphill, downhill, level)  
• Wind direction & speed  
• Opportunity for water run off (creeks, streams, etc)  
• Opportunity for soil leaching |

Rationale

*The basis for almost all of the distances above is arbitrary. Some of them used the 200 feet distance specified by FDA for separation of manure from wellheads as a starting point, and some used the 30 foot turn-around distance for production equipment. But in general there was little scientific literature to support these distances. In the face of this uncertainty, a qualitative assessment of the relative risk from various types of land use was used to determine appropriate distances.*