



## Average Market Rate Recommendations - October 1, 2017

### Executive Summary:

The Office of Research and Analysis (ORA) recommends the following Average Market Rates (AMRs) for use by the Colorado Department of Revenue (Department) in levying the excise tax on the sale or transfer of Retail Marijuana from a Retail Marijuana Cultivation Facility<sup>1</sup>:

	Flower Rate (\$/lb)	Trim Rate (\$/lb)	Immature Plant Rate (\$/ea)	Wet Whole Plant Rate (\$/lb)	Seed Rate (\$/ea)	Contaminated Product Allocated for Extraction
Average Market Rate	\$1,305	\$405	\$5	\$227	\$3	\$403

The AMRs were calculated based on retail marijuana transactions recorded from May 1, 2017 through July 31, 2017. The Contaminated Product Allocated for Extraction Rate was added on August 9, 2017. Retail Marijuana Tax Rule 1 CCR 201-18 defines contaminated product allocated for extraction as any bud or trim that failed microbial testing and is transferred to a retail marijuana products manufacturing facility. Because contaminated product is not an item category in METRC prior to August 9, 2017, this methodology identified all transactions for bud or trim that were transferred to a retail marijuana products manufacturing facility.

Transactions excluded the following five types of data: 1) transfers containing processed products (e.g., PreRolls, PreRoll Cones, Joints, and Kief); 2) Medical Marijuana transfers; 3) transfers to testing facilities; 4) transfers between businesses with the same name (affiliated businesses); 5) transfers to retail cultivators.

Detailed information related to the methodology and estimation techniques used to arrive at these results can be found on pages 2-10 of this document.

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<sup>1</sup> Starting August 9, 2017, the AMR is required for transfers between affiliated businesses, whereas, the contract price is required for transfers between non-affiliated businesses (see [Senate Bill 17-192](#)).

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## Average Market Rate Methodology:

The Department's Taxation Division determined that the excise tax upon wholesale sales of Retail Marijuana can effectively be levied upon six product categories:

1. Flower (or bud, smoke-able product);
2. Trim (remaining parts of the plant that contain some amount of THC);
3. Immature Plants (plants that can be transferred to other Licensees);
4. Wet Whole Plants (plants that are cut off just above the roots and are not trimmed, dried, or cured; the plant must be weighed within 2 hours of the plant being harvested and without any further processing);
5. Seeds (the seeds of the marijuana plant); and
6. Contaminated Product Allocated for Extraction (bud or trim that failed microbial testing and is transferred to a retail marijuana products manufacturing facility).

In order to estimate the AMR for each of the categories and in order to comply with the rate-setting requirements of §39-28.8-101(1.5), C.R.S., ORA calculated the AMRs for October 1, 2017, based on wholesale transactions from May 1, 2017, through July 31, 2017, that originated from retail marijuana cultivators and were recorded by manifest numbers in the Marijuana Enforcement Tracking Reporting Compliance (METRC). Transactions excluded the following five types of data: 1) transfers containing processed products (e.g., PreRolls, PreRoll Cones, Joints, and Kief); 2) Medical Marijuana transfers; 3) transfers to testing facilities; 4) transfers between businesses with the same name (affiliated businesses); 5) transfers to retail cultivators.

Pursuant to §12-43.4-104, C.R.S., October 1, 2014, marked the beginning of the retail marijuana market for businesses which did not previously hold medical marijuana licenses. At that time, the Marijuana Enforcement Division updated the METRC system and required that price data be entered and recorded for wholesale marijuana transfers. Initially, price data for entire manifests containing multiple categories was entered into METRC, and as a result, category prices were not able to be calculated. However, in February 2015, the price field was revised to allow prices with multiple categories under the same manifest number. Additionally, in March 2016, the Department made modifications on the data collection in METRC by including the receiver wholesale price and item descriptions.

For the July 1, 2016 AMR, the Department calculated rates for two new categories, Whole Wet Plants and Seeds.

Starting with the July 1, 2017 AMR, the Department began calculating rates using the median instead of the mean.

For the August 9, 2017 AMR, the Department calculated a rate for the Contaminated Product Allocated for Extraction category.

For the October 1, 2017 AMR, prices per pound were calculated for each individual item of the manifest. The distribution of price frequencies was assessed to identify potential outliers or data entry errors. The following tables and graphs display the raw data of all single item transfer manifests from May 1, 2017, through July 31, 2017.

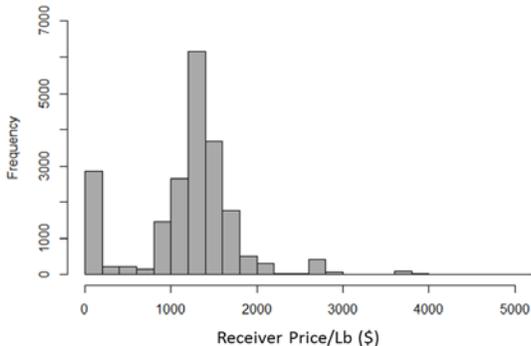
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The frequency tables, histograms, and summary statistics for the raw data are shown below.

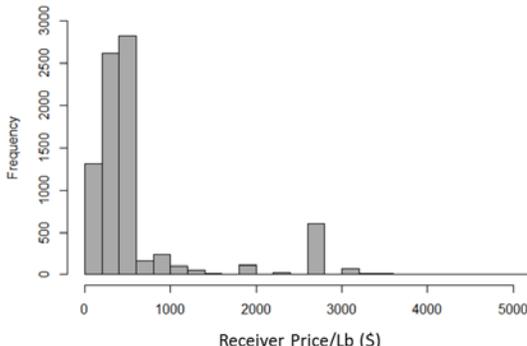
Raw Frequencies	
Flower	
Rate (\$/lb)	Frequency
\$0 - \$200	2,847
\$201 - \$400	218
\$401 - \$600	206
\$601 - \$800	155
\$801 - \$1,000	1,456
\$1,001 - \$1,200	2,645
\$1,201 - \$1,400	6,150
\$1,401 - \$1,600	3,685
\$1,601 - \$1,800	1,786
\$1,801 - \$2,000	505
\$2,001 - \$2,200	297
\$2,201 - \$2,400	29
\$2,401 - \$2,600	26
\$2,601 - \$2,800	418
\$2,801 - \$3,000	74
\$3,001 and over	177

Raw Frequencies	
Trim	
Rate (\$/lb)	Frequency
\$0 - \$200	1,316
\$201 - \$400	2,625
\$401 - \$600	2,827
\$601 - \$800	158
\$801 - \$1,000	241
\$1,001 - \$1,200	105
\$1,201 - \$1,400	52
\$1,401 - \$1,600	14
\$1,601 - \$1,800	8
\$1,801 - \$2,000	108
\$2,001 - \$2,200	7
\$2,201 - \$2,400	26
\$2,401 - \$2,600	4
\$2,601 - \$2,800	608
\$2,801 - \$3,000	5
\$3,001 and over	103

Flower (raw)



Trim (raw)



# Average Market Rate Recommendations - October 1, 2017

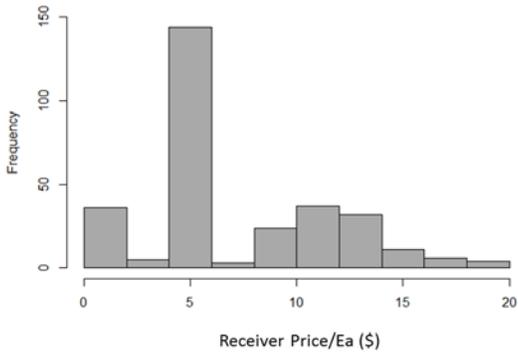
## Raw Frequencies

Immature Plant	
Rate (\$/ea)	Frequency
\$0 - \$2.00	36
\$2.01 - \$4.00	5
\$4.01 - \$6.00	144
\$6.01 - \$8.00	3
\$8.01 - \$10.00	24
\$10.01 - \$12.00	37
\$12.01 - \$14.00	32
\$14.01 - \$16.00	11
\$16.01 - \$18.00	6
\$18.01 - \$20.00	4

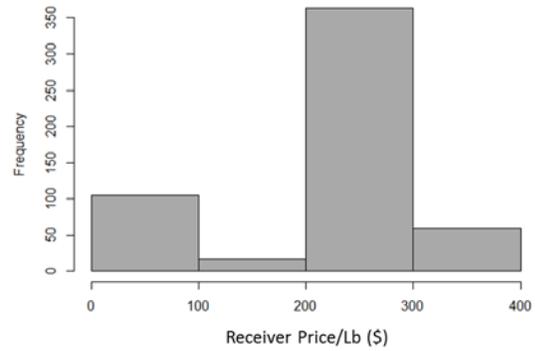
## Raw Frequencies

Wet Whole Plant	
Rate (\$/lb)	Frequency
\$0 - \$100	105
\$101 - \$200	16
\$201 - \$300	363
\$301 - \$400	59

**Immature Plant (raw)**



**Wet Whole Plant (raw)**



# Average Market Rate Recommendations - October 1, 2017

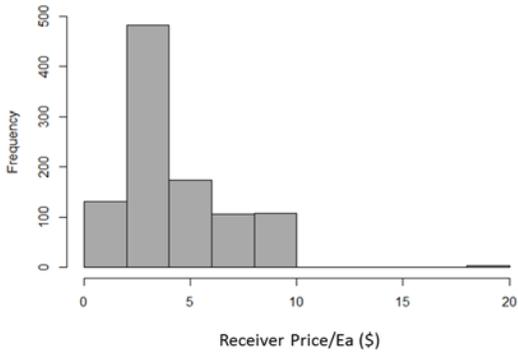
## Raw Frequencies

Seeds	
Rate (\$/ea)	Frequency
0 - \$2.00	131
\$2.01 - \$4.00	483
\$4.01 - \$6.00	174
\$6.01 - \$8.00	108
\$8.01 - \$10.00	109
\$10.01 and over	4

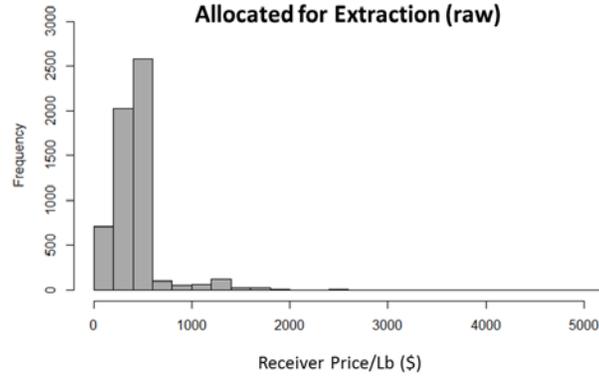
## Raw Frequencies

Contaminated Product Allocated for Extraction	
Rate (\$/lb)	Frequency
\$0 - \$200	712
\$201 - \$400	2,029
\$401 - \$600	2,581
\$601 - \$800	97
\$801 - \$1,000	52
\$1,001 - \$1,200	67
\$1,201 - \$1,400	120
\$1,401 - \$1,600	29
\$1,601 - \$1,800	25
\$1,801 - \$2,000	4
\$2,001 and over	15

Seeds (raw)



Contaminated Product Allocated for Extraction (raw)



# Average Market Rate Recommendations - October 1, 2017

Summary statistics (the minimum, maximum, median, mean, mode, median absolute deviation, standard deviation, skewness, and kurtosis) related to the distribution of prices in each category are shown in the table below. The median absolute deviation is a robust measure of how spread out the values are, relative to the median. Skewness is a measure of the asymmetry of a distribution. A symmetric distribution has skewness = 0. Kurtosis is a measure of the size and shape of the distribution's tails. A normal distribution has kurtosis = 3.

## Summary Statistics (Raw Data)

### Descriptive Statistics

	Flower Rate (\$/lb)	Trim Rate (\$/lb)	Immature Plant Rate (\$/ea)	Wet Whole Plant Rate (\$/lb)	Seed Rate (\$/ea)	Contaminated Product Allocated for Extraction Rate (\$/lb)
Min	\$0	\$0	\$0	\$0	\$0	\$0
Max	\$498,952	\$181,437	\$20	\$387	\$19	\$181,437
Median	\$1,301	\$401	\$5	\$227	\$3	\$401
Mean	\$1,256	\$638	\$7	\$194	\$4	\$450
Mode	\$1,316	\$2,722	\$5	\$304	\$3	\$405
Median Absolute Deviation	\$298	\$165	\$4	\$5	\$3	\$158
Standard Deviation	\$5,136	\$2,132	\$5	\$99	\$3	\$2,409

### Distribution Statistics

Skewness	91	74	0	-1	1	74
Kurtosis	8,647	6,309	2	3	5	5,559

We identified some extreme outliers in each product category that were likely errors.

It is ORA's recommendation that the Department should levy the excise tax using the median for each category after removing the following outliers:

- **For all product categories:** Receiver Wholesale Prices  $\leq$  \$.01

Additionally, the following outliers were removed for these three categories:

- **Flower:** Receiver Price/lb  $\geq$  \$200,000
- **Trim:** Receiver Price/lb  $\geq$  \$180,000
- **Contaminated Product Allocated for Extraction:** Receiver Price/lb  $\geq$  \$180,000

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The frequency tables, histograms, and summary statistics for the data excluding outliers are shown below.

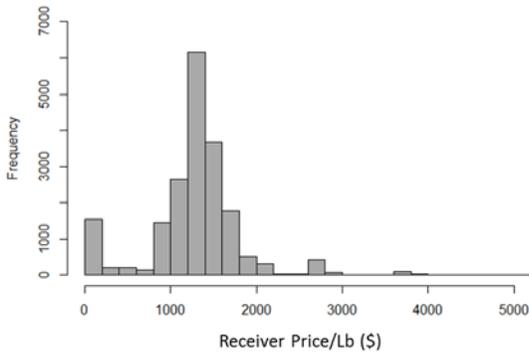
**Excluding Outliers  
Frequencies**

Flower	
Rate (\$/lb)	Frequency
\$0 - \$200	1,553
\$201 - \$400	218
\$401 - \$600	206
\$601 - \$800	155
\$801 - \$1,000	1,456
\$1,001 - \$1,200	2,645
\$1,201 - \$1,400	6,150
\$1,401 - \$1,600	3,685
\$1,601 - \$1,800	1,786
\$1,801 - \$2,000	505
\$2,001 - \$2,200	297
\$2,201 - \$2,400	29
\$2,401 - \$2,600	26
\$2,601 - \$2,800	418
\$2,801 - \$3,000	74
\$3,001 and over	174

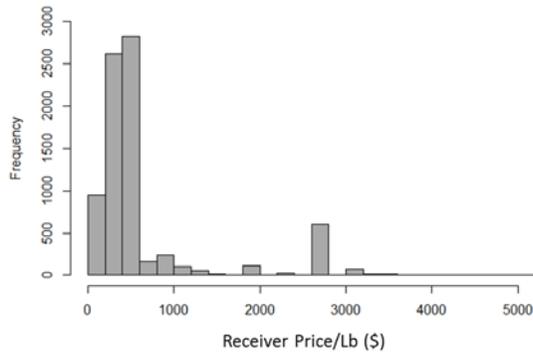
**Excluding Outliers Frequencies**

Trim	
Rate (\$/lb)	Frequency
\$0 - \$200	944
\$201 - \$400	2,625
\$401 - \$600	2,827
\$601 - \$800	158
\$801 - \$1,000	241
\$1,001 - \$1,200	105
\$1,201 - \$1,400	52
\$1,401 - \$1,600	14
\$1,601 - \$1,800	8
\$1,801 - \$2,000	108
\$2,001 - \$2,200	7
\$2,201 - \$2,400	26
\$2,401 - \$2,600	4
\$2,601 - \$2,800	608
\$2,801 - \$3,000	5
\$3,001 and over	102

**Flower (excluding outliers)**



**Trim (excluding outliers)**



# Average Market Rate Recommendations - October 1, 2017

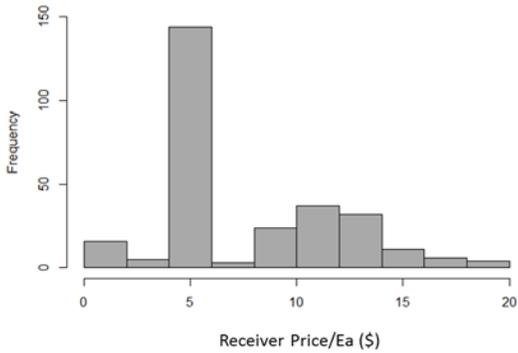
## Excluding Outliers Frequencies

Immature Plant	
Rate (\$/ea)	Frequency
\$0 - \$2.00	16
\$2.01 - \$4.00	5
\$4.01 - \$6.00	144
\$6.01 - \$8.00	3
\$8.01 - \$10.00	24
\$10.01 - \$12.00	37
\$12.01 - \$14.00	32
\$14.01 - \$16.00	11
\$16.01 - \$18.00	6
\$18.01 - \$20.00	4

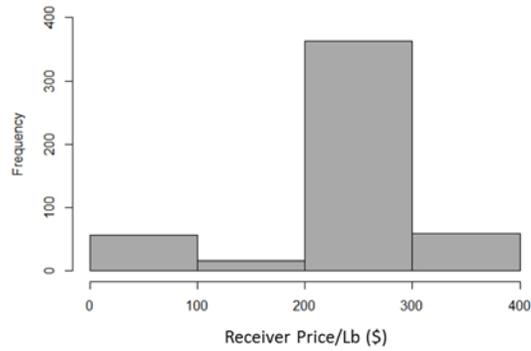
## Excluding Outliers Frequencies

Wet Whole Plant	
Rate (\$/lb)	Frequency
\$0 - \$100	57
\$101 - \$200	16
\$201 - \$300	363
\$301 - \$400	59

Immature Plant (excluding outliers)



Wet Whole Plant (excluding outliers)



# Average Market Rate Recommendations - October 1, 2017

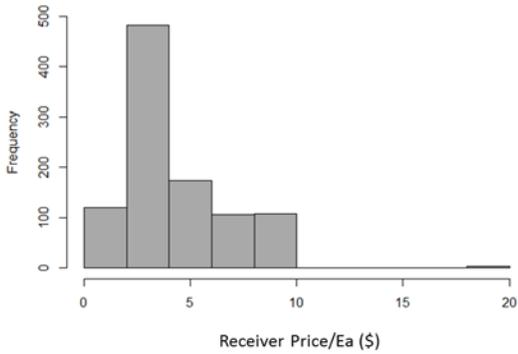
## Excluding Outliers Frequencies

Seeds	
Rate (\$/ea)	Frequency
\$0 - \$2.00	120
\$2.01 - \$4.00	483
\$4.01 - \$6.00	174
\$6.01 - \$8.00	108
\$8.01 - \$10.00	109
\$10.01 and over	4

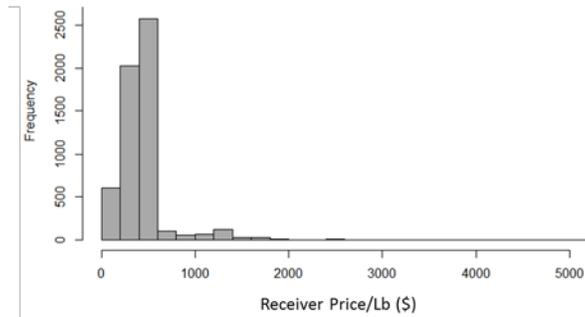
## Excluding Outliers Frequencies

Contaminated Product Allocated for Extraction	
Rate (\$/lb)	Frequency
\$0 - \$200	605
\$201 - \$400	2,029
\$401 - \$600	2,581
\$601 - \$800	97
\$801 - \$1,000	52
\$1,001 - \$1,200	67
\$1,201 - \$1,400	120
\$1,401 - \$1,600	29
\$1,601 - \$1,800	25
\$1,801 - \$2,000	4
\$2,001 and over	14

**Seeds (excluding outliers)**



**Contaminated Product  
Allocated for Extraction  
(excluding outliers)**



# Average Market Rate Recommendations - October 1, 2017

## Summary Statistics (Excluding Outliers)

### Descriptive Statistics

	Flower Rate (\$/lb)	Trim Rate (\$/lb)	Immature Plant Rate (\$/ea)	Wet Whole Plant Rate (\$/lb)	Seed Rate (\$/ea)	Contaminated Product Allocated for Extraction Rate (\$/lb)
Min	\$0	\$0	\$0	\$0	\$0	\$0
Max	\$14,680	\$7,667	\$20	\$387	\$19	\$7,667
Median	\$1,305	\$405	\$5	\$227	\$3	\$403
Mean	\$1,278	\$645	\$8	\$213	\$4	\$426
Mode	\$1,316	\$2,722	\$5	\$304	\$3	\$405
Median Absolute Deviation	\$290	\$159	\$0	\$5	\$3	\$154
Standard Deviation	\$592	\$753	\$4	\$82	\$3	\$292

### Distribution Statistics

Skewness	2	2	1	-2	1	6
Kurtosis	36	8	2	5	6	96